The A-TANGO project - featuring G-TAK, a novel combinatorial therapy for acute-on-chronic liver failure (ACLF)

Expected Impact

- More than 10 million people suffer from decompensated cirrhosis worldwide.
- Effective treatment of ACLF is an urgent and unmet need.
- A-TANGO performs Phase II clinical studies of G-TAK, a novel and innovative therapeutic strategy that aims to reduce inflammation and improve hepatocyte proliferation.
- A-TANGO also strives to identify reliable biomarkers for better patient stratification and increased survival.

14 partners, one goal: Helping cirrhosis patients in Europe!

www.a-tango.eu
info@atango.eu

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 945096.
The objective of DECISION is to better understand the pathophysiology of decompensated cirrhosis leading to acute-on-chronic liver failure (ACLF) or death. This consortium will take advantage of already existing large and clinically well-characterised patient cohorts to develop reliable prognostic and response tests and combinatorial therapies tailored to the needs of individual patients to decrease the risk of short-term death.

- Pathophysiologic elucidation of acute decompensated cirrhosis at the systems level (genetics, epigenetics, transcriptomics, metabolomics, lipidomics, miR, and analysis of extracellular vesicles)
- Integration of existing clinical data and new multi-omics data from 2,200 patients with more than 8,600 measurements
- Development of new combinatorial therapies
- Optimization of therapies using existing and new animal models
- Development of novel and robust tests for prediction of outcome following traditional treatment versus response to new therapies
- Phase II clinical trials to test new combination therapies
- Creation of new guidelines for outcome prediction and personalized treatment of acute decompensated cirrhosis to prevent ACLF to death
Liver Matters
Voices and views from our community

- ALEH: The Latin American perspective on fighting liver disease
- Across generations and fields: EASL members tell their stories
- Introducing the new EASL Scientific Committee
- and much more...

easl.eu/easl-blog
Open-access eLearning anytime, anywhere

8,700+ resources available
38 CME-accredited courses

• 19 CPG slide decks
• 24,200 registered users
• 5,500 ePosters
• 2,800 webcasts
## CONTENTS

**Oral Presentations**

- General session I: S1
- General session II: S7
- Late-breaker Orals: S10
- Nurses & AHPs Forum: S15
- Alcohol-related liver disease and drug-induced liver injury: S18
- Gut microbiome/organ crosstalk: S24
- Liver tumours — Basic: S27
- NAFLD: Diagnostics and non-invasive assessment: S30
- Viral hepatitis B/D - New treatments: S34
- Cirrhosis and its complications: Clinical: S37
- Experimental liver fibrosis: S41
- (1) Immune-mediated and cholestatic liver diseases: S44
- Liver transplantation and hepatobiliary surgery: S47
- Liver tumours — Therapy: S50
- NAFLD: Therapy: S53
- Viral hepatitis B/D - Current treatments: S55
- (2) Immune-mediated and cholestatic diseases: S59
- Liver immunology: S62
- Liver tumours - Clinical except therapy: S65
- NAFLD: Clinical aspects: S69
- Public health - viral hepatitis: S72
- Senescence, circadian rhythm and sexual dimorphism: S75
- Cirrhosis and its complications: Portal Hypertension: S78
- Liver failure and regeneration: S82
- NAFLD: Experimental: S85
- Public Health - Except viral hepatitis: S88
<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rare liver diseases</td>
<td>90</td>
</tr>
<tr>
<td>Viral hepatitis C</td>
<td>95</td>
</tr>
<tr>
<td><strong>Poster Presentations</strong></td>
<td>100</td>
</tr>
<tr>
<td>Late-breaker Posters</td>
<td>100</td>
</tr>
<tr>
<td>Acute liver failure and drug induced liver injury</td>
<td>126</td>
</tr>
<tr>
<td>Alcohol-related liver disease</td>
<td>145</td>
</tr>
<tr>
<td>Cirrhosis and its complications ACLF and Critical illness</td>
<td>182</td>
</tr>
<tr>
<td>Cirrhosis and its complications Experimental and pathophysiology</td>
<td>205</td>
</tr>
<tr>
<td>Cirrhosis and its complications Other clinical complications except ACLF</td>
<td>233</td>
</tr>
<tr>
<td>Cirrhosis and its complications Portal Hypertension</td>
<td>279</td>
</tr>
<tr>
<td>Fibrosis Stellate cell biology</td>
<td>321</td>
</tr>
<tr>
<td>Gut microbiota and liver disease Liver-organ crosstalk</td>
<td>342</td>
</tr>
<tr>
<td>Hepatocyte biology</td>
<td>358</td>
</tr>
<tr>
<td>Immune-mediated and cholestatic disease Clinical aspects</td>
<td>366</td>
</tr>
<tr>
<td>Immune-mediated and cholestatic disease Experimental and pathophysiology</td>
<td>409</td>
</tr>
<tr>
<td>Liver development and regeneration</td>
<td>433</td>
</tr>
<tr>
<td>Liver immunology</td>
<td>442</td>
</tr>
<tr>
<td>Liver transplantation and hepatobiliary surgery</td>
<td>454</td>
</tr>
<tr>
<td>Liver tumours Clinical aspects except therapy</td>
<td>489</td>
</tr>
<tr>
<td>Liver tumours Experimental and pathophysiology</td>
<td>524</td>
</tr>
<tr>
<td>Liver tumours Therapy</td>
<td>571</td>
</tr>
<tr>
<td>NAFLD Clinical aspects except therapy</td>
<td>600</td>
</tr>
<tr>
<td>NAFLD Diagnostics and non-invasive assessment</td>
<td>647</td>
</tr>
<tr>
<td>NAFLD Experimental and pathophysiology</td>
<td>730</td>
</tr>
<tr>
<td>NAFLD Therapy</td>
<td>806</td>
</tr>
<tr>
<td>Non-invasive assessment of liver disease except NAFLD</td>
<td>831</td>
</tr>
<tr>
<td>Nurses and Allied Health Professionals</td>
<td>845</td>
</tr>
<tr>
<td>Public Health Except viral hepatitis</td>
<td>854</td>
</tr>
<tr>
<td>Public Health Viral hepatitis</td>
<td>872</td>
</tr>
<tr>
<td>Rare liver diseases (including paediatric and genetic)</td>
<td>936</td>
</tr>
<tr>
<td>Viral Hepatitis Experimental and pathophysiology</td>
<td>1013</td>
</tr>
<tr>
<td>Viral hepatitis AE Clinical aspects</td>
<td>1052</td>
</tr>
<tr>
<td>Viral hepatitis B and D Clinical aspects</td>
<td>1054</td>
</tr>
<tr>
<td>Viral Hepatitis B and D Current therapies</td>
<td>1130</td>
</tr>
<tr>
<td>Viral Hepatitis B and D New therapies, unapproved therapies or strategies</td>
<td>1147</td>
</tr>
</tbody>
</table>
EASL Congress
Milan, Italy
5–8 June 2024

The International Liver Congress™

Save the date

easlcongress.eu #EASLCongress
FUTURE EVENTS 2023–2024

2023
21–23 September EASL NAFLD Summit Prague, Czechia

2024
22–24 February EASL Liver Cancer Summit Rotterdam, The Netherlands
5–8 June EASL Congress 2024 Milan, Italy
TBC September EASL NAFLD Summit 2024 TBC
TBC TBC AASLD-EASL Endpoints USA

SEE OUR CALENDAR
The EASL–Lancet Liver Commission

The EASL–Lancet Liver Commission has published a landmark report on liver diseases in Europe.

DOWNLOAD THE REPORT

CHECK OUT THE WEBSITE
Patient & Advocate Forum:
Making the patient voice heard

WATCH ON DEMAND

EASL™
The Home of Hepatology
+ Testing your guidelines knowledge since June 2020
+ Sharpening your skills

Earn up to two badges with gamification on EASL Campus

+ Hear directly from authors and experts in the field
+ Get answers to your questions
+ Take part every month
Your weekly hepatology broadcast news
Every Wednesday at 18:00 CET

Topics:
+ JHEP Live
+ YIs Choice
+ Nurses & AHPs Focus
+ and more...
The GENIAL Project is funded by the European Union within the Horizon Europe program under grant agreement No 101096312.

Understanding **Gene ENvironment Interaction in ALcohol-related hepatocellular carcinoma**

A project that will use AI models to integrate genetic and non-genetic information, including digital imaging, to develop novel cost-effective strategies towards prevention and early-stage detection of ALD-HCC

**AIM:**

- To portray genetic and environmental determinants promoting ALD-HCC;
- To evaluate how they interact at cellular level in human samples and preclinical models to get novel insights into liver carcinogenesis and identify chemopreventive targets; and
- To assess how they modulate the risk of ALD-HCC in several retrospective and prospective cohorts of patients included in HCC surveillance programs.
Liver disease in patients with type 2 diabetes

Low alcohol consumption key in compensated cirrhosis

CCA surveillance in PSC

Tenofovir vs. entecavir on HCC risk

HBsAg loss decreases risk of decompensation but not HCC

Liver transplantation

HOPE in liver transplantation

RNA interference therapeutic for the treatment of NASH

Cellular and spatial organization of a tumor immune barrier in HCC

Acute severe non-A-E-hepatitis of unknown origin in children
JHEP Reports
Innovation in Hepatology

EASL’s first open-access journal

+ **Discoverability**
  Indexed by PubMed Central, Clarivate, and Scopus

+ **Speed**
  Time to first decision: 3.6 weeks
  Acceptance to online publication: 2.2 weeks

+ **Excellence**
  High-quality peer review guaranteed by an international Editorial team led by Prof. Jessica Zucman-Rossi

Submit your article now

© Clarivate Analytics

2021
IMPACT FACTOR
9.917

JOURNAL CITATION REPORTS 2022
The LITMUS project has received funding from the Innovative Medicines Initiative 2 Joint Undertaking under grant agreement No. 777377. This Joint Undertaking receives support from the European Union’s Horizon 2020 research and innovation programme and EFPIA.

Liver Investigation: Testing Marker Utility in Steatohepatitis

- 54 partners
- 14 countries for clinical recruitment
- True public-private co-funding model

The overarching aim of LITMUS is to develop, robustly validate and advance towards regulatory qualification biomarkers that diagnose, risk stratify and/or monitor NAFLD/NASH progression and fibrosis stage.

litmus-project.eu
imi.europa.eu
Screening for liver fibrosis population-based study across European Countries

A project that will change the paradigm of diagnosis of chronic liver diseases

AIM:
To assess the prevalence of liver fibrosis in the general population using Transient Elastography, with the objective of establishing criteria for screening for liver fibrosis in the population.
MICROBiome-based biomarkers to PREDICT decompensation of liver cirrhosis and treatment response

Project duration
6 ¼ years

Start
01 January 2019

Grant amount
15 million €

Follow-us on Twitter and LinkedIn:

@MicrobPredict
MICROB-PREDICT

10 Countries
22 Partners

www.microb-predict.eu

The human microbiome to identify predictors and mechanisms associated with the development of decompensation of cirrhosis and progression to acute-on-chronic liver failure (ACLF) and death.

- New microbiome-based tests for better stratification of cirrhosis patients
- Personalized prediction and prevention of decompensation and ACLF
- Clinical trial to predict response to treatment
- Modern, effective nanobiosensors as clinical tools with improved specificity
- More personalized treatment
- Increased survival times
- Decreased costs for the health systems

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 825694.
EASL™ Nurses & AHPs
On the frontline of hepatology

- Nurses & AHPs Task Force
- Nurses & AHPs webinars
- Nurses & AHPs Forum
- Rising Star Award
- Abstracts & Bursaries at events
EASL Young Investigators
The future of hepatology

+ YIs Task Force
+ YIs webinars
+ EASL Schools & Masterclasses
+ Fellowships & Mentorships
+ EASL Emerging Leader Award
+ Abstracts & Bursaries at events
+ YIs newsletter
General session I

GS-001
Primary results from MAESTRO-NASH a pivotal phase 3 52-week serial liver biopsy study in 966 patients with NASH and fibrosis
Stephen Harrison1, Pierre Bedossa2, Cynthia Guy3, Jörn Schattenberg4,5,6, Rohit Loomba7, Rebecca Taub8, Dominic Labriola9, Sam Moussa10, Guy Neff10, Arun Sanyal11, Mazen Noureddin12, Meena Bansal13, Naim Alkhouri14, Vlad Ratziu15, 1Pinnacle Research, United States; 2LiverPat, France; 3Duke University, United States; 4Mainz University, Germany; 5Metabolic Liver Research Program, I. Department of Medicine, University Medical Center Mainz, Mainz, Germany; 6Department of Internal Medicine I, University Medical Center of the Johannes Gutenberg-University, Mainz, Germany, Germany; 7UCSD, United States; 8Madrigal Pharmaceuticals, United States; 9Adobe Research, United States; 10Covenant Research, United States; 11VCU, United States; 12CSHS, United States; 13Mount Sinai, United States; 14AZ Liver, United States; 15Inserm, France
Email: rebeccataub@yahoo.com

Background and aims: MAESTRO-NASH (NCT03900429) is an ongoing 54-month, Phase 3, registrational double blind, placebo-controlled NASH clinical trial to study the effect of once daily 80 mg or 100 mg resmetirom as compared with placebo in patients with NASH and liver fibrosis. Eligibility required: presence of ≥3 metabolic risk factors, FibroScan VCTE ≥8.5 kPa, baseline MRI-PDFF ≥8% and biopsy-proven NASH with fibrosis stage 1B, 2, or 3 and NAFLD activity score (NAS) ≥4 with at least 1 in each NAS component. An analysis of the Week 52 primary end points of MAESTRO-NASH were conducted and presented here. Week 52 dual primary end points included resolution of NASH (ballooning 0, inflammation 0, 1 with at least a 2-point reduction in NAS) with no worsening of fibrosis OR ≥1 stage reduction in fibrosis with no worsening of NAS. The key secondary end point was % reduction in LDL-C at Week 24.

Method: 966 patients were enrolled at ~200 global sites. Liver biopsies were read by two central pathologists using glass slides (primary analysis) with results combined using a statistical algorithm to generate a single treatment effect; if readers disagreed on the response for either primary end point, a supportive consensus read using digitized images was conducted. The mITT population excluded 11 patients with liver biopsies after Week 60 due to COVID site issues.

Results: Baseline characteristics included age 57 (11) (mean (SD)), female 56%, white 90%, BMI 36 (7), type 2 diabetes 67%, hypertension 78%, dyslipidemia 71%, FibroScan VCTE 13 kPa (7), CAP 348 (38), MRI-PDFF 18 (7)%; fat fraction, baseline liver biopsy NAS ≥5 84%, baseline fibrosis stage: F3-62%, F2-33%, F1B-5%. Both primary histologic end points and the key secondary end point (LDL cholesterol lowering) were met at both doses (table); consensus review confirmed results. Similar results for both end points were obtained by both central pathologists, and results were independent of diabetes status or baseline fibrosis stage. Multiple other liver biopsy end points were met including NASH resolution and fibrosis reduction (combined) and a 2-stage reduction in fibrosis. Biomarker end points including reduction in ALT, AST and GGT, ELF, MRI-PDFF, CAP and FibroScan VCTE were met. Resmetirom appeared generally safe and well-tolerated with similar numbers of SAEs across groups and an increase in the incidence of diarrhea and nausea in resmetirom treatment groups only at the beginning of therapy.

Figure.

<table>
<thead>
<tr>
<th>End points</th>
<th>Resmetirom 80 mg (n = 316)</th>
<th>p value</th>
<th>Resmetirom 100 mg (n = 321)</th>
<th>p value</th>
<th>Placebo (n = 318)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary End points (Dual)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NASH resolution (ballooning 0, inflammation 0, 1) with ≥2-point reduction in NAS and no worsening of fibrosis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥1-stage improvement in fibrosis with no worsening of NAS</td>
<td>26%</td>
<td>&lt;0.0001</td>
<td>30%</td>
<td>&lt;0.0001</td>
<td>10%</td>
</tr>
<tr>
<td>Key Secondary End point</td>
<td>LDL-C lowering (24 – 12 weeks)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;0.0001</td>
<td>16%</td>
<td>&lt;0.0001</td>
<td>1%</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: NASH resolution and fibrosis reduction end points on liver biopsy were achieved at both resmetirom doses in a large Phase 3 pivotal clinical trial. Resmetirom appeared safe and was generally well-tolerated. These data support the potential for resmetirom treatment to provide benefit to patients with NASH and liver fibrosis.

GS-002-YI
Myeloid IL-8 enrichment associates with immunotherapy resistance in advanced hepatocellular carcinoma
Tsz Tung Kwong1, Zhewen Xiong2, Yiling Zhang2, Patrick Pak-Chun Wong2, Jingying Zhou2, Alfred Sze-Lok Cheng2, Stephen Chan1, 1The Chinese University of Hong Kong, Department of Clinical Oncology, Hong Kong; 2The Chinese University of Hong Kong, School of Biomedical Sciences, Hong Kong
Email: tsztungkwong@cuhk.edu.hk

Background and aims: Despite the therapeutic options with immunotherapy have been emerging in advanced hepatocellular carcinoma (HCC), durable response is confined to a small fraction of patients. Thereby, ineffectiveness of immune checkpoint blockade (ICB) and resistance acquisition caused by the immunosuppressive drivers including inflammatory cytokines and myeloid cells within the liver tumor microenvironment (TME) had to be tackled urgently. In this study, we analyzed the immune contexture of advanced HCC patients before and after pembrolizumab treatment to investigate the role of myeloid IL-8 in ICB-resistance mechanism and aim to intervene the IL-8 pathway through inhibition of its receptor by a clinical in-use CXCR2 antagonist.
**Method:** Patients with advanced HCC (n = 26) were enrolled prior to pembrolizumab therapy with their baseline and on-treatment biopsies collected to perform single cell RNA transcriptomic analysis. Simultaneously, circulating IL-8 level was quantified in the paired peripheral blood samples. Therapeutic efficacy of CXCR2 pathway inhibition by AZD5069 in potentiating ICB response was evaluated in our ICB-resistant orthotopic mouse model which is generated by serial in vivo passaging of anti-PD-L1 residual tumor. Profiling of immune landscape in the TME were assessed by high-parameter flow cytometry.

**Results:** In our advanced HCC cohort with anti-PD-1 treatment, patients with higher baseline plasma IL-8 had worse overall survival compared to those with lower IL-8 level (hazard ratio (HR), 2.899, 95% confidence interval (CI), 1.112–7.558; p = 0.0294). Single cell RNA sequencing further revealed that IL-8 was originated from myeloid cell cluster in tissue biopsies. In particular, the upregulated expression of IL8 on polymorphonucler myeloid-derived suppressor cells (PMN-MDSCs) were strongly linked with poorer progressive free survival (HR, 2.327; 95% CI, 0.867–6.248; p = 0.0352). Inhibition of the IL-8 receptor with a CXCR2 antagonist (AZD5069) improved the survival benefit of anti-PD-L1 treatment in our ICB-resistant orthotopic pre-clinical HCC model. Mechanistically, the suppression of CXCR2 signaling hindered the MDSC recruitment to tumor site, in turn reverted the immunosuppression in the TME which favors ICB treatment.

**Conclusion:** We demonstrated the importance of myeloid IL-8/ CXCR2 pathway in ICB-resistance from our advanced HCC cohort which paved way for IL-8 to become a novel prognostic target for immunotherapy. Blocking CXCR2 could reduce MDSC trafficking and overcome ICB-resistance in our pre-clinical HCC model, suggesting a promising combination regimen in future development. This work is supported by the Collaborative Research Fund C4045-18W.

**GS-003** Rivaroxaban improves survival and decompensation in cirrhotic patients with moderate liver dysfunction. Double-blind, placebo-controlled trial

Angela Puente Sanchez1, Fanny Turon2,3, Javier Martinez2,4, Jose Ignacio Fortea1, Manuel Hernandez-Guerra3, Edilmar Alvarado-Tapias3,6, Monica Pons7, Marta Magaz2,3, Elba Llop8, Carmen Alvarez-Navascues9, Jose Castellote Alonso10, Marina Berenguer11, Helena Masnou11,12, Rafael Banares3,13, Marta Casado14, Javier Ampuero15, Georgina Casanovas16, Carlos Redondo1, Patricia Huelin1, Luis Tellez2,4, Dalia Morales Arreaza3, Manuel Rodriguez2, Victoria Aguilera11, Anna Baiges2,3, Virginia Hernandez-Gea2,3, Christie Perelló9.
José Luis Calleja Panero, Joan Genesca, Càndid Villanueva, Carlos González-Alayón, Agustin Albillos, Javier Crespo, Juan Carlos Garcia Pagan, Marqués de Valdecilla University Hospital. Gastroenterology department, Santander, Spain; Hospital Clinic, Barcelona Hepatic Hemodynamic Laboratory, Liver Unit. Institut de Investigacions Biomèdiques August Pi i Sunyer (IDIBAPS), University of Barcelona. Health Care Provider of the European Reference Network on Rare Liver Disorders (ERN-Liver), Barcelona, Spain; Centro de Investigación Biomédica en Red de Enfermedades Hepáticas y Digestivas (CIBEREHD), Spain; Ramón y Cajal University Hospital- IRYCIS (Madrid), University of Alcalá, Gastroenterology and Hepatology department, Madrid, Spain; Canarias University Hospital, Gastroenterology and Hepatology department, Tenerife, Spain; Hospital de la Santa Creu i Sant Pau, Biomedical Research Institute Sant Pau (IIB Sant Pau). Universitat Autònoma de Barcelona, Bleeding Unit. Gastroenterology and Hepatology department, Barcelona, Spain; Vall d’Hebron University Hospital, Vall d’Hebron Research Institute (VHIR), Vall d’Hebron Barcelona Hospital Campus, Autonomous University of Barcelona, Liver Unit, Barcelona, Spain; Puerta de Hierro University Hospital, Gastroenterology and Hepatology department, Madrid, Spain; Hospital Central de Asturias, Gastroenterology department, Oviedo, Spain; Bellvitge Hospital, Gastroenterology department, Barcelona, Spain; La Fe University Hospital, Hepatology and Liver Transplantation Unit, Valencia, Spain; Germans Trias i Pujol Hospital, Liver Unit. Instituto de Investigación Germans Trias i Pujol (IGTP), Badalona, Spain; Gregorio Marañon University Hospital, Gastroenterology department, Madrid, Spain; Torrecárdenas Hospital, Gastroenterology department, Almería, Spain; Virgen del Rocio University Hospital, Gastroenterology department, Sevilla, Spain; Hospital Clinic, Medical Statistics Core Facility, Institut d’Investigacions Biomèdiques August Pi i Sunyer (IDIBAPS), Barcelona, Spain. Email: angelpuente@hotmail.com

Background and aims: Observational studies and a non-double-blind non-placebo randomized study suggested that anticoagulation decreases the probability of developing portal hypertension (PHT) complications and improves survival in cirrhotic patients. However, anticoagulation is not routinely used in these patients showing that stronger evidence is required. Our study aimed to evaluate the efficacy/safety of the direct anticoagulant Rivaroxaban (Rban) in patients with cirrhosis.

Method: Randomized, double-blind, placebo-controlled multicenter trial (EudraCT: 2014-005523-27) in cirrhotic patients with PHT and moderate liver dysfunction (Child-Pugh: 7–10) of Rban 10 mg/24 hours vs. placebo for 24 months. Primary composite end point: development of a PHT complication (grade>II ascites, grade>II encephalopathy, or PHT related bleeding) or death/transplantation whatever occurred first. An intention-to-treat (mITT) and per-protocol (PP) analysis was performed.

Results: 90 patients were included (Age: 58.1 ± 7.6 years; 82.2% male; Child-Pugh: 7.4 ± 0.8; MELD: 12.4 ± 2.5; 86.7% alcoholic cirrhosis), median follow-up: 10.1 (0.4–24) months. 49 received placebo (P) and 41 Rban. In the mITT analysis, 34 patients developed the primary end point, 23 (46.9%) in the P vs 11 (26.8%) in the Rban group, with an actuarial cumulative probability of primary end point at 1 and 2 years of 40.1% and 60.9% in P vs 21.6 and 33.2% in Rban (Log-rank; p = 0.069). This difference reached statistical significance (HR = 0.466 [95% CI 0.222–0.980] p = 0.044) when adjusted by Child-Pugh. This beneficial effect of Rban was especially relevant in the subgroup of Child-Pugh B7 (n = 66) (HR: 0.292 [95% CI 0.098–0.870] p = 0.017). The main benefit relies in the prevention of ascites (Log-rank; p = 0.056). Twelve patients had a protocol deviation due to therapeutic non-compliance. In the PP analysis (41 P and 37 Rban), the main event was reached in 19 P (38.7%) vs. 9 (21.9%) in the Rban group (Log-rank; p = 0.05). Figure.

Thirty-one non-PHT bleeding events were registered in twenty four patients (26.6%) [placebo (n = 10) vs Rban (n = 22), OR 3.34 (95% CI 1.36–7.74) p = 0.008]. However, no differences were observed in major bleeding events: P (n = 2) vs Rban (n = 6): OR 4.02. (95% CI 0.767–21.167, p = NS]. One death associated with major bleeding (hemoperitoneum) was recorded in the P group.

Conclusion: In cirrhotic patients with moderate liver dysfunction, rivaroxaban improves PHT complication-free survival without significantly increasing major bleeding events.
Background and aims: Offspring of parents with alcohol-related liver disease (ALD) likely grow up in families with significant exposure and access to alcohol and may themselves be vulnerable to adverse health outcomes. We compared the risk of adverse health outcomes in such offspring to that of controls.

Method: We used nationwide healthcare registries to identify offspring of parents diagnosed with ALD (ICD-10: K70.x) in Denmark 1996–2018 and age- and gender-matched controls (20:1). We compared the incidence rates of: diagnosis of ALD, any alcohol-related hospital contacts, emergency room visits for fractures or injury, hospital contacts for intentional or accidental poisoning, and

Figure: (abstract: 004).
all-cause death in offspring of parents with ALD with that of the matched controls, overall and within subgroups. We used a self-controlled case series design to examine whether hospitalization for poisoning was more likely to occur during the first year after the parent’s ALD diagnosis vs. at any other time among offspring aged 13–25 years.

Results: There were 60,708 offspring of parents with ALD and 1,213,380 matched controls. Offspring had a median age of 31 years (IQR 23–39) when their parent was diagnosed with ALD; 51% were male. Offspring had a higher incidence rate of ALD, any alcohol-related hospital contacts, fractures or injury, poisoning, and all-cause death compared to controls (Figure 1). Offspring whose ALD parent had only primary education experienced higher risks compared to controls, than offspring whose parents had a higher education [incidence rate ratios (IRR) for an alcohol-related hospital contact compared to controls were 2.63 (95%CI: 2.58–2.68) vs 1.60 (95%CI: 1.53–1.68) respectively]. Offspring aged 13–25 years were most likely to have their first admission for poisoning in the first year after their parent’s ALD diagnosis than at any other time (IRR = 1.25, 95% CI: 1.01–1.55), suggesting that the event of the parent’s diagnosis of ALD might cause the offspring to self-harm.

Conclusion: Offspring of parents with ALD have a higher risk of adverse health outcomes; only the minority with well-educated parents are partially protected from those consequences. The first year after a parent’s ALD diagnosis is a particularly vulnerable time for the offspring of a young age with respect to hospitalization with poisoning.

GS-005
Selective activation of the IL-2 pathway in CD8+ T cells drives antiviral activity to Hepatitis B Virus (HBV)
Francesco Andreata1, Kelly Moynihan2, Pietro Di Lucia1, Danielle Peppas2, Irene Ni2, Henri Nguyen2, Chiara Perucchini1, Mike Chin2, Elisa Bono1, Leonardo Giustini1, Paul Bessette2, Andy Yeung2, Craig Gibbs2, Ivana Djuretic2, Matteo Iannacone1.

Background and aims: CD8+ T cells are critical for mediating anti-viral activity against Hepatitis B virus (HBV); however, CD8+ T cell responses against HBV antigens may be deficient in chronically infected HBV patients.1–3 In murine HBV models that recapitulate key features of HBV-induced CD8+ T cell dysfunction, IL-2–based therapy (but not PD-1 checkpoint blockade) successfully rescued CD8+ T cell function and anti-viral immunity4, suggesting that the IL-2 pathway may be a promising approach to reinvigorate CD8+ T cell immunity. Unfortunately, IL-2-based therapeutics are limited by pleiotropy, as IL-2 receptors are expressed broadly on many cell types, including regulatory T cells (Tregs) and natural killer (NK) cells, which may oppose anti-viral responses or contribute to toxicity, respectively. We developed a cis-targeted IL-2 fusion protein called AB359 that selectively acts on CD8+ T cells in order to evaluate its potential for the treatment of chronic HBV.

Method: AB359 was generated by fusing an attenuated IL-2 mutein to an anti-CD8 antibody, and activity was characterized on human cells. Cynomolgus monkeys were dosed with AB359 and peripheral blood pharmacodynamics were assessed by flow cytometry. AB359’s murine surrogate, muAB359, was tested in a murine HBV model5.

Results: In a murine HBV model5, muAB359 significantly increased the number of HBV-reactive CD8+ T cells in the liver without substantial changes to NK and Treg numbers. The expanded HBV-specific CD8+ T cells following muAB359 treatment showed enhanced expression of IFNγ and granzyme B relative to controls. Therapy with muAB359 resulted in strong anti-HBV activity: a single dose of muAB359 demonstrated over 100-fold reduction in serum HBV core DNA and a 79% decrease in serum Hepatitis B surface antigen (HBsAg) levels. In contrast, an untargeted not-α IL-2 (CTRL-IL2) demonstrated preferential expansion of IL-2Rγhigh NK cells, modest CD8+ T cell expansion, and minimal changes to IFNγ and granzyme B expression by HBV-reactive CD8+ T cells following therapy. As a result, less robust viral control was observed with CTRL-IL2: a 9.5-fold reduction in HBV core DNA and a 37% decrease in HBsAg were observed. In cynomolgus monkeys, AB359 induced the selective expansion of peripheral blood CD8+ Tcells by approximately 20-fold without substantial changes to NK and Treg numbers.

Conclusion: Selectively providing an IL-2 signal to CD8+ T cells via cis-targeting shows considerable anti-viral activity in a preclinical model of HBV, with superior performance to an untargeted IL-2. These data support the development of AB359 as a therapy for the treatment of chronic HBV.

Figure: (abstract: 005): “Cis-targeting of IL-2 to CD8+ T cells avoids the pleiotropy associated with untargeted IL-2 therapy and drives potent anti-HBV immunity”
Randomised controlled trial of ceftriaxone versus no antibiotic to prevent infection in patients with Child-Pugh A cirrhosis with acute variceal bleeding

Anany Gupta1, Samagra Agarwal1, Sanchit Sharma2, Deepak Gunjan3, Srikanth Gopi3, Jamshed Nayer4, Anoop Saraya1. 1All India Institute Of Medical Sciences, Department of Gastroenterology and HNU, New Delhi, India; 2Liver Unit, Queen Elizabeth Hospital, Birmingham, United Kingdom, Liver Unit, Birmingham, United Kingdom; 3All India Institute Of Medical Sciences, Department of Gastroenterology and HNU, New Delhi, India; 4All India Institute Of Medical Sciences, Department of emergency medicine, New Delhi, India
Email: ansaraya@yahoo.com

Background and aims: Administering antibiotics reduce the risk of bacterial infections and improve survival in advanced decompenated cirrhosis presenting with acute variceal bleeding. However, their role in patients with Child-Pugh A cirrhosis with variceal bleed is not clearly defined. We studied the impact of antibiotic prophylaxis on outcomes in patients with Child-A cirrhosis.

Method: We conducted a single centre open label randomised controlled trial with a non-inferiority study design. Eligible patients of Child-A cirrhosis with suspected variceal bleeding were randomly assigned at presentation to receive either 5-day course of intravenous Ceftriaxone (active control) or no antibiotic (test regimen). Patients were otherwise managed as per Baveno-VI recommendations for variceal bleeding. The primary outcome was incidence of infection at day-5 in both arms. Secondary outcomes were incidence of early rebleeding and mortality at day-5, new onset decompensation at 6 weeks and 6-week mortality in both arms.

Results: One hundred eighty patients of Child-A cirrhosis with variceal bleeding (Mean age 45.1±13.1 years, 76.9% males) of...
predominant non-viral aetiology (alcohol 43.4%; NAFLD 21.7%) were randomised. Baseline characteristics including MELD score were comparable between two arms. The incidence of 5-day infection in Ceftriaxone arm and no antibiotic arm was 7% (95%CI: 2.8–15.1%) and 12% (6.02–20.8%) respectively (p = 0.397; non-inferiority margin met). Spontaneous bacterial peritonitis following early decompen-
sation was the most common site of infection in both groups (10/16; 66.7%). The incidence of rebleeding at day-5 (4.9 vs 0; p = 0.117), in hospital mortality (2.5% vs 0%; p = 0.456), new onset decompen-

dation at 6-weeks (16.0% vs 11.8%; p = 0.566) and 6-week mortality (2.5% vs 1.4%; p = 0.93) were comparable across both the arms although non-

inferiority could not be established.

**Conclusion:** Among patients with Child-A cirrhosis with acute variceal bleeding, the incidence of post-bleed infectionsand other outcomes in those receiving no antibiotics was comparable to those receiving ceftriaxone (CRII/2021/06/033939).

---

**ORAL PRESENTATIONS**

**FRIDAY 23 JUNE**

---

**General session II**

**GS-007**

**Faecal microbiota transplant restores gut barrier function and augments ammonia metabolism in patients with advanced cirrhosis: a randomised single-blind placebo-controlled trial**

Lindsey A Edwards1, Charlotte Woodhouse1, 2, Sunjae Lee3, Benjamin H. Mullish4, Theo Portlock2, Lilianeleny Meoli1, Victoria Kronsten1, 2, Julian Marchesi4, Ane Zamalloa2, Thomas Tranah1, 2, Vishal Patel1, 2, 5, Saeed Shoaei5, 2, Simon Goldenberg5, Debbie L. Shawcross1, 2. 1King’s College London, Institute of Liver Sciences, School of Immunology and Microbial Sciences, Faculty of Life Sciences and Medicine, London, United Kingdom; 2King’s College Hospital NHS Foundation Trust, Institute of Liver Studies, London, United Kingdom; 3Gwangju Institute of Science and Technology, School of Life Sciences, Gwangju, Rep. of Korea, Dem. People’s Rep. of; 4Imperial College London, Division of Integrative Systems Medicine and Digestive Disease, Department of Surgery and Cancer, Faculty of Medicine, London, United Kingdom; 5King’s College London, Centre for Host-Microbiome Interactions, Dental Institute, London, United Kingdom; 6The Roger Williams Institute of Hepatology London (Foundation for Liver Research), London, United Kingdom; 7Science for Life Laboratory, KTH-Royal Institute of Technology, Stockholm, Sweden; 8Guy’s and St Thomas’ Hospitals NHS Trust, Centre for Clinical Infection and Diagnostics Research, London, United Kingdom

**Email:** lindsey.edwards@kcl.ac.uk

**Background and aims:** Patients with cirrhosis have reduced gut bacterial diversity, and a gut microbiome over-represented by pathobionts. This, coupled with gut barrier damage and bacterial translocation, increases susceptibility to infection and death. Bacterial translocation is a significant driver of cirrhosis-associated immune dysfunction which increases the susceptibility to developing infection. Faecal microbiota transplant (FMT) has been shown to restore gut diversity and improve hepatic encephalopathy (HE) in 10 patients with cirrhosis. We hypothesised that modifying the gut microbiota with FMT may alter intestinal barrier function, mucosal immunity and microbial ammonia metabolism in patients with cirrhosis.

**Method:** We performed a placebo-controlled randomised single-blinded feasibility trial of FMT transplanted in 32 patients with advanced cirrhosis (MELD score 10–16) [NCT02862249], 50 grams of liquid frozen FMT versus placebo [allocated in a 3:1 ratio] was administered into the jejunum via endoscopy. To assess efficacy in modulating the patient’s own microbiome and inflammatory status: blood and stool were collected at baseline and day 7, 30 and 90 post-FMT/placebo. Cytokine production, markers of barrier integrity (electrochemiluminescence/ELISA), global metabolite profile ([1H-NMR] and faecal proteomics (LC-MS/MS) were assessed.

**Results:** Deep metagenomic sequencing confirmed FMT increased recipient species richness with significant donor engraftment. FMT significantly reduced stool carriage of *E. faecalis* and other pathobionts. FMT reduced biomarkers of inflammation and increased markers associated with gut barrier repair. FMT led to a reduction at 30-days in plasma ammonia (p = 0.0006). Faecal ammonia was higher in the FMT group versus placebo at days 30 (p = 0.011) and 90 (p = 0.025). Faecal proteomics quantified 301 proteins, 154 proteins found were of human origin and 147 were of bacterial origin. Many of these proteins were found to be both human and microbial enzymes. In converse to the enzymes found reduced in blood, increases in the abundance of microbial enzymes involved in denitrification and ammonification were observed in the stool [enzyme EC.4.3.11 (aspartate ammonia-lyase), with 17 high-confi-
dent peptides, was enhanced in patients administered FMT versus placebo (p = 0.031)]. Enzymes required for nitrogen assimilation and excretion via the urea cycle were enhanced, with enhanced secretion of urinary hippurate (p = 0.0299) at day 30 in FMT versus placebo.

**Conclusion:** These data support FMT as playing an important role in enteric pathogen reduction, altering the gut-microbiota to promote inflammatory restoration of the gut barrier. FMT reduced microbial-associated ammonia production in the blood and upregulated ammonia excretion in stool and augmenting the anaerobic metabol-

ism of L-aspartate providing proof of concept that FMT augments ammonia metabolism, central in the pathogenesis of HE.

**GS-008-VI**

**Naltrexone is safe and effective in achieving abstinence and reducing alcohol craving in cirrhotic patients: a double blind randomized placebo controlled trial**

Vinod Arora1, Shiv Kumar Sarin1.

**Email:** shivsarin@gmail.com

**Background and aims:** Continued alcohol use is the single important driver of long term outcomes in alcohol associated liver diseases. But there are no FDA approved drugs for alcohol use disorder (AUD) that have been approved in patients with liver cirrhosis. Considering the importance of maintaining abstinence and the positive effect on survival in patients with alcohol liver disease, this study assumes the importance of establishing safety and efficacy of naltrexone in patients with alcohol related liver disease.
Method: This is a single centre double blind placebo controlled randomized trial conducted in ILBS hospital (April 2020–July 2022) in patients with compensated cirrhosis with AUD. 147 patients were screened and 100 consecutive patients with compensated cirrhosis fulfilling the DSM-5 criteria for AUD as per inclusion and exclusion criteria of the study were enrolled and randomized between Naltrexone or placebo, given for 12 weeks. The primary objective was proportion of patients achieving and maintaining alcohol abstinence at 12 weeks and secondary objectives were proportion of patients maintaining abstinence at 6 months and 12 months, adverse effects, lapses and relapses at 3, 6 and 12 months. Behavioural therapy and counselling was offered to both the groups.

Results: Baseline demographics, clinical characteristics, AUDIT and OCDS scores were comparable between the groups. Significantly higher number of patients i.e., 32/50 (64%) achieved abstinence with Naltrexone compared to placebo at 12 weeks (11/50 (22%)), P < 0.001. Similarly maintenance of abstinence after 6 months of follow-up was higher with Naltrexone (22% vs. 8%, P = 0.09). Number of lapses at 12 weeks (14/50 (28%) vs. 27/50 (54%), P = 0.01) were significantly lower in Naltrexone group. Relapses were higher with the placebo (14/50 (28%) vs. 6/50 (12%), P = 0.07). Mean craving scores were significantly lower with Naltrexone by 12 weeks- OCDS-O score (6.63 ± 1.16 vs 9.29 ± 1.78, P < 0.01) and OCDS-C score (6.35 ± 1.23 vs 9.02 ± 1.86, P < 0.01). Significant difference in visual analog scale for craving was also noted between the groups in comparison of means values (4.27 ± 1.301 vs 6.51 ± 1.27, P < 0.01). Adverse events were comparable in both the groups and none required discontinuation of drug. Mild abdominal discomfort was the most common adverse effect noted in 5/50 (10%) patients in Naltrexone group vs. 3/50 (6%) in placebo, P = 0.71. 2/50 (4%) patients in naltrexone group developed jaundice with bilirubin values >3 mg/dl, likely due to modification. Inclusion criteria included biopsy proven NASH with NAS ≥ 3 and fibrosis stage from F1 to F3. 18 patients from the ESG group and 19 from the ESI group completed follow-up. (72 weeks). We evaluated changes from baseline to end of follow-up in body weight, liver function tests, liver stiffness by Fibroscan® and liver histology.

Results: (mean ± SD) Both groups had similar clinical characteristics at baseline. 55% of the patients were men, with a median age of 56.5 years (23–69). The mean BMI was 37.85. Half of patients had type 2 diabetes. Total body weight loss (TBWL) was 9.47% (± 9.38) in ESG group vs 3.91% (± 5.43) in ESI group (p < 0.05). Only patients in the ESG group achieved more than 15% of their body weight (22.2%). Liver stiffness decreased 5.63 (± 7.17) kPa in ESG group vs 0.2 (± 5.38) kPa in ESI group (p < 0.05). Steatosis was significantly reduced in ESG group (−0.94 ± 0.87 vs ESI group (−0.26 ± 0.99). NAS score, but not fibrosis stage, was reduced in patients achieving weight loss >10% (−4 ± 0.94 vs. −0.81 ± 1.62, p < 0.01). Only 2 patients of the ESG group had adverse events that required admission (perigastric hematoma and perigastric collection), that resolved conservatively in 72 hours.

Conclusion: Naltrexone can be safely administered for AUD in patients with compensated cirrhosis and is effective in achieving abstinence and as well as decreasing the craving scores at 3 months.

GS-009

Endoscopic sleeve gastropasty is an effective treatment in steatohepatitis patients: a prospective, multicenter, randomized trial

Javier Abad Guerra1, Elba Llop1, María Teresa Arias Loste2, Diego Burgos Santamaria1, José Luis Martínez Porras1, Javier Graus3, Paula Irazubia1, Belén Ruiz Antoran1, Manuel Romero Gomez4, Agustín Albillos1, Javier Crespo2, José Luis Calleja Panero1.1 Puerta de Hierro Hospital, Spain; 2 Marques de Valdecilla Hospital, Spain; 3 Ramon y Cajal Hospital, Spain; 4 Virgen del Rocio Hospital, Spain

Email: javiabagd83@gmail.com

Background and aims: Non-alcoholic steatohepatitis (NASH) affect over 5% of the population, and patients are at risk of progressing to cirrhosis. Life-style intervention with diet and exercise achieving a weight loss >10% promotes NASH resolution, but this goal is only achieved by <25% of the patients. Endoscopic sleeve gastropasty (ESG) with Overstitch® system has recently emerged as a safe and effective option to promote weight loss in patients with obesity. We report the results of a multicenter, randomized, controlled and double-blind study to evaluate the efficacy and safety of ESG in NASH patients.

Method: 40 patients were 1:1 randomized to ESG with OverStitch® (Apollo Endosurgery) plus lifestyle modification vs. endoscopic simulated intervention (ESI) with upper endoscopy plus lifestyle modification. Inclusion criteria included biopsy proven NASH with NAS ≥ 3 and fibrosis stage from F1 to F3. 18 patients from the ESG group and 19 from the ESI group completed follow-up. (72 weeks). We evaluated changes from baseline to end of follow-up in body weight, liver function tests, liver stiffness by Fibroscan® and liver histology.

Results: Table 1:

<table>
<thead>
<tr>
<th>WEIGHT CHANGES (n)</th>
<th>ESI (19)</th>
<th>ESG (18)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>N° patients weight lost% (SD)</td>
<td>11 (57.9)</td>
<td>17 (94.4)</td>
<td>0.010</td>
</tr>
<tr>
<td>TBVLX (SD)</td>
<td>−3.91 (5.43)</td>
<td>−9.47 (9.38)</td>
<td>0.025</td>
</tr>
<tr>
<td>LIVER STIFFNESS CHANGES (n)</td>
<td>ESI (18)</td>
<td>ESG (16)</td>
<td>p</td>
</tr>
<tr>
<td>LS Kpa (SD)</td>
<td>−0.2 (5.38)</td>
<td>−5.63 (7.17)</td>
<td>0.017</td>
</tr>
<tr>
<td>HISTOLOGICAL CHANGES (n)</td>
<td>ESI (19)</td>
<td>ESG (18)</td>
<td>p</td>
</tr>
<tr>
<td>NAS score (SD)</td>
<td>−1.47 (2.01)</td>
<td>−1.89 (2.11)</td>
<td>0.544</td>
</tr>
<tr>
<td>Steatosis (SD)</td>
<td>−0.26 (0.99)</td>
<td>−0.94 (0.87)</td>
<td>0.033</td>
</tr>
<tr>
<td>Lobulillar inflammation (SD)</td>
<td>−0.53 (0.84)</td>
<td>−0.44 (0.86)</td>
<td>0.771</td>
</tr>
<tr>
<td>Ballooning (SD)</td>
<td>−0.68 (0.75)</td>
<td>−0.50 (0.86)</td>
<td>0.490</td>
</tr>
<tr>
<td>HISTOLOGICAL BY WEIGHT CHANGES (n)</td>
<td>No weight loss (9)</td>
<td>Weight loss (28)</td>
<td>p</td>
</tr>
<tr>
<td>NAS score (SD)</td>
<td>−0.22 (1.48)</td>
<td>−2.14 (2)</td>
<td>0.012</td>
</tr>
</tbody>
</table>

Conclusion: ESG is an effective and safe method to promote weight reduction associated with significant improvement in liver stiffness and histological parameters in patients with NASH and obesity that achieve a significant weight loss. ESG could be an option in the management of obese patients with NASH failing to lose weight by life-style intervention.
An integrative multi-omic approach defines therapeutic pathways associated with altered cell state and chromatin organisation in human liver fibrosis

Elliot Jokl1, Aoibheann Mullan1, Varinder Athwal1, Kara Simpson1, Nigel Hammond2, Sokratia Georgak2, Syed Murtuza-Baker2, Oliver Street2, Neil Hanley1, Karen Piper Hanley1.1The University of Manchester, Division of Diabetes, Endocrinology and Gastroenterology, Manchester, United Kingdom; 2The University of Manchester, United Kingdom

Email: karen.piperhanley@manchester.ac.uk

Background and aims: Liver fibrosis is characterised by the deposition of pathological extracellular matrix from myofibroblasts, leading to progressive scarring and loss of organ function. As a progressive step in most chronic liver diseases, fibrosis is almost always diagnosed too late with limited treatment options. There is a massive unmet clinical need to halt tissue damaging fibrosis. In this study we have utilised a multi-omic integrative approach to define a novel targetable pathway driving profibrotic myofibroblasts.

Method: In human liver cirrhosis, we carried out single cell RNA and Assay for Transposase-Accessible Chromatin (ATAC) sequencing to deconvolute our multi-cell spatial transcriptomic (ST) using the Visium platform. Molecular mechanisms were validated in vitro and in vivo through genetic manipulation of the actin cytoskeleton and modelling in fibrosis.

Results: Through an integrative approach using RNA, ATAC and ST sequencing we defined molecular signatures associated with human liver myofibroblasts. Computational approaches identified altered cell state driven by nuclear lamina proteins in scar associated myofibroblasts (Figure). In cell biology, the nuclear lamina provides nuclear elasticity and chromatin organisation. Through in vitro and in vivo interrogation, we investigated how physical tension from increasing scar alters spatial organisation of the genome and transcription in liver fibrosis. We uncovered that when myofibroblasts encounter a stiffer environment (e.g. due to fibrosis) the nuclear response is to soften. Significantly, this is in parallel to a radical shift in cytoskeletal cell shape and pro-fibrotic gene expression. Through uncoupling the actin cytoskeleton by Pak1-loss (P21-activated kinase 1 associated with actomysin signalling) we highlight a functional mechanoresponsive of myofibroblasts driven by nuclear deformation and H3K9me3-mediated chromatin remodelling. These findings are consistent with a profound switch in profibrotic gene expression and one that further permits their migratory, contractile phenotype. By integrating chromatin accessibility profiles (ATAC and RNA sequencing) we provide insight into the transcription network and open chromatin landscape underlying the switch in profibrotic myofibroblast states, emphasizing mechanoadaptive pathways linked to Pak1 as key drivers. In addition, we demonstrated increased chromatin accessibility parallels loss of heterochromatin H3K9me3 marks in profibrotic myofibroblasts. The correlation with enhanced nuclear adaptation, measured by atomic force microscopy (AFM), and pro-fibrotic gene expression as myofibroblasts switch to an activated pro-fibrotic phenotype supports the idea that H3K9me3 compacts chromatin structure and restricts gene expression programmes.

Conclusion: This study provides insight into the chromatin landscape and nuclear mechanics driving pro-fibrotic myofibroblasts and highlights acto-mysin-dependent mechanisms linked to chromatin state as urgently needed therapeutic targets in liver disease.

IMbrave050: Efficacy, safety and patient-reported outcomes (PROs) for adjuvant atezolizumab (atezo) + bevacizumab (bev) vs active surveillance in hepatocellular carcinoma (HCC) patients at high risk of disease recurrence following resection or ablation

Ahmed Kasebi1, Minshan Chen2, Pierce Chow3, Masatoshi Kudo4, Han Chu Lee5, Adam Yopp5, Lars Becker5, Sairy Hernandez6, Bruno Kovic7, Qinshu Lian7, Ning Ma8, Chun Wu9, Shukui Qin1, Ann-Lii Cheng10.1 MD Anderson Cancer Center, Houston, TX, United States; 2Sun Yat-sen University Cancer Center, Guangdong Province, China; 3National Cancer Centre Singapore, Singapore and Duke-NUS Medical School Singapore, Singapore, Singapore; 4Kindai University, Osaka, Japan, Japan; 5Asan Medical Center, University of Ulsan College of Medicine, Seoul, Republic of Korea, Korea, Dem. People’s Rep. of; 6UT Southwestern Medical Center, Dallas, TX, United States; 7E Hoffmann-La Roche, Basel, Switzerland, Switzerland; 8Genentech, Inc., South San Francisco, CA, United States; 9Hoffmann-La Roche Limited, Mississauga, ON, Canada, Canada; 10Roche (China) Holding Ltd., Shanghai, China, China; 11Jinling Hospital of Nanjing University of Chinese Medicine, Nanjing, China, China; 12National Taiwan University Cancer Center and National Taiwan University Hospital, Taipei, Taiwan, Taiwan

Email: akasebi@mdanderson.org

Background and aims: In IMbrave050, adjuvant atezo + bev demonstrated a statistically significant and clinically meaningful improvement in recurrence-free survival (RFS) vs active surveillance in patients (pts) at high risk of HCC recurrence following resection or ablation with curative intent. Further, the safety of atezo + bev was generally manageable. Here, we additionally report PRO data from IMbrave050.

Method: IMbrave050 (NCT04102098) enrolled pts HCC pts at high risk of recurrence following resection or ablation. Pts were randomized to Arm A (atezo + bev) or Arm B (active surveillance). Pts in Arm A received atezo 1200 mg + bev 15 mg/kg IV q3w for a period of one year (17 cycles). Pts in Arm B underwent active surveillance for one year and were eligible to crossover to atezo + bev following independent review facility (IRF) confirmation of recurrence. The primary end point was IRF-assessed RFS. Pre-specified exploratory analyses included change from baseline in global health status (GHS)/quality of life (QoL), physical functioning, emotional functioning, and social functioning. Clinically meaningful deterioration was defined as a ≥10-point decrease. Pts completed the IL42-EORTC QLQ-C30 (reduced) questionnaire at baseline and then at every odd treatment/surveillance visit through Cycle 17.

Results: The ITT population included 334 pts in both Arms A and B. With a median follow-up time of 17.4 mo (clinical cutoff date: 21 Oct 2022), IRF-RFS HR was 0.72 (95% CI: 0.56, 0.93; p = 0.0120). In the safety population, Grade 3 or 4 adverse events occurred in 41% of 332 Arm A pts and 13% of 330 Arm B pts. In ITT pts, IL42 completion rates remained ≥93% in both arms from baseline through treatment/surveillance Cycle 17. Mean scores at baseline in both arms were high and similar, as measured by the GHS/QoL and physical, role, emotional and social functioning scales. Mean changes from baseline were not considerable through Cycle 17 and were similar between arms as evidenced by overlapping 95% CIs. Pts’ GHS/QoL and functioning was maintained through Cycle 17, with no clinically meaningful deterioration observed at any time.

Conclusion: Statistically significant and clinically meaningful improvement in RFS was seen in pts receiving atezo + bev vs active surveillance. Atezo + bev safety was generally manageable, and consistent with the established safety profiles of each therapeutic agent and with the underlying disease. PRO outcome analyses
revealed similar overall health-related QoL (HRQoL) and functioning between atezo + bev and active surveillance, and that treating high-risk pts with HCC with adjuvant atezo + bev following procedures with curative intent did not result in a clinically meaningful deterioration in HRQoL or function.

© 2023 American Society of Clinical Oncology, Inc. Reused with permission. This abstract was presented at the 2023 ASCO Annual Meeting. All rights reserved.

**GS-012**

**Week 48 results of the phase 3 D-LIVR study, a randomized double-blind, placebo-controlled trial evaluating the safety and efficacy of Lonafarnib-boosted with Ritonavir with or without Peginterferon Alfa in patients with chronic hepatitis delta**

Ohad Etzion1, Saeed Sadiq Hamid2, Tarik Asselah3, George Sebastian Gherlan4, Adela Turcanu5, Tsarynna Petrinv6, Lisa Weissfield7, Ingrid Choong8, Colin Hislop9, David Apelian9, Maria Buti10, Liana Geogheorgi11, Elena Laura Iliescu10, Natalia Voronkova11, Natalia Barsukova, Soo Aleman12, Jordan J. Feld13, Nancy S Reau14, Maurizia Brunetto15, Pietro Lampertico16, Theo Heller17, Chris Koh17, Cihan Yurdayan18, Jeffrey Glenn19, Soroka University Medical Center, Israel; 2Aga Khan University, Pakistan; 3University of Paris, France; 4Fundación “Dr. Victor Babes”, Romania; 5ISMP Spitalul Clinic Republic “Timofei Mosneag” Moldova; 6Medical Center OKIClinic+ of International Institute of Clinical Research LLC, Ukraine; 7Statistics Collaborative, Inc, United States; 8Eiger BioPharmaceuticals, Inc, United States; 9Hospital Universitari Vall d’Hebron, Spain; 10Institut Clinic Fundenii, Romania; 11H-Clinic, LLC, Russian Federation; 12Karolinska Universitetssjukhuset Huddinge, Sweden; 13University Health Network, Canada; 14Rush University Medical Center, United States; 15Azienda Ospedaliero Universitaria Pisana (Presidio di Cisanello), Italy; 16University of Milan; Fondazione IRCCS CA’ Granda Ospedale Maggiore Policlinico, Italy; 17National Institute of Diabetes and Digestive and Kidney Diseases, United States; 18Koc University Hospital, Turkey; 19Stanford University School of Medicine, United States

Email: ohadet34@yahoo.com

**Background and aims:** Chronic hepatitis delta (CHD) is the most severe form of human viral hepatitis for which there is no FDA approved therapy. Lonafarnib (LNF) is a farnesyl transferase inhibitor that interferes with HDV virion assembly through inhibition of the interaction of the large delta antigen with hepatitis B surface antigen. The purpose of this study is to evaluate the safety and efficacy of LNF boosted with ritonavir (RTV) + peginterferon alfa-2a (Alfa) for the treatment of CHD.

**Method:** D-LIVR (NCT03719313) is a randomized, double-blind, placebo-controlled, parallel-group clinical trial. Adults with CHD and compensated liver disease were enrolled and randomized (7:5:2:2) to receive LNF 50 mg BID + RTV 100 mg BID (oral), LNF 50 mg BID + RTV 100 mg BID + Alfa 180 mcg QW (combo), Alfa 180 mcg QW (Alfa), or placebo for 48 weeks, followed by 24 weeks post-treatment. All patients were on background entecavir or tenofovir approved therapy. Lonafarnib (LNF) is a farnesyl transferase inhibitor severe form of human viral hepatitis for which there is no FDA approved therapy. Lonafarnib-boosted with Ritonavir with or without Peginterferon Alfa in patients with chronic hepatitis delta

**Results:** A total of 407 patients (mean age 42.7 years, 69% male, 73% white) were enrolled, of whom 405 were randomized to the oral (n = 178), combo (n = 125), Alfa (n = 52) and placebo arms (n = 52). At BL, mean ALT, total bilirubin, albumin, platelets and HDV RNA levels were comparable across the four arms. 27% of patients had evidence of cirrhosis per investigator assessment. At Week 48, by intention to treat analysis, composite response rate was 10.1% (oral), 19.2% (combo), 9.6% (Alfa) and 1.9% (placebo). Composite response rates for both LNF-based arms were statistically significant vs placebo arm (p = 0.0044, oral; p < 0.001, combo). HDV RNA decline of ≥2 log IU/ml was observed in 14.6% (p = 0.0026, oral) and 32% (p < 0.001, combo), vs 3.8% (placebo). ALT normalization was achieved in 24.7% (p = 0.003, oral) and 34.4% (p < 0.001, combo), vs 7.7% in placebo. Of the 229 evaluable paired liver biopsies, statistically significant improvement in the histology end point was seen between the combo (35/66, 53%, p = 0.0139) and placebo arms (8/30, 27%), but not between the oral or Alfa and the placebo arms. Overall, both LNF-based regimens were well-tolerated, with comparable rates of treatment discontinuations across all arms.

**Conclusion:** The Phase 3 D-LIVR trial achieved the primary efficacy end point for both LNF-based regimens compared to placebo with oral arm matching and combo arm doubling the Alfa response rate. Encouragingly, statistically significant histologic improvement was observed in the combo arm. Week 72 results of this trial are awaited.

**Late-breaker Orals**

**S99 LBO-001**

Simvastatin plus Rifaximin to prevent ACLF in patients with decompensated cirrhosis. A randomised, double-blind, placebo-controlled, phase-3 trial: the liverhope efficacy trial

Elisa Pose1, César Jiménez2, Giacomo Zaccomeri3, Daniela Campion4, Salvatore Piana5, Frank Erhard Uschner5, Koos de Wit6, Olivier Roux6, Kohilan Ganandan7, Wim Laleman8, Cristina Sole9, Sonia Alonso10, Berta Cuyas11, Xavier Ariza12, Adrià Juanola13, Ann T Ma14, Laura Napoleone15, Jordi Gracó16, Marta Tomon15, Enrico Pompili17, Jordi Sánchez-Delgado17, Marta Carol18, Martina Perez19, Núria Fabrellas20, Judit Pich20, Claudia Martell20, Georgina Casanovas21, Gemma Domenech1, Ferran Torres1, Víctor Manuel, Vargas Blasco2, Paolo Caraceni2, Paolo Alessandri2, Paolo Angeli2, Jonel Trebicka22, Claire Francoz23, Raj Mookerjee24, Ella Fañares25, German Soriano26, Ruben Hernaez27, Andrew S. Allegretti28, Manuel Morales-Ruiz2, Miquel Serra29, Hugh Watson30, Juan G Abrahales31, Patrick S. Kamath32, Pere Gines33, Hospital Clinic de Barcelona, Barcelona, Spain; 2Vall d’Hebron University Hospital, Barcelona, Spain; 3University of Bologna, Italy; 4Azienda Ospedaliero-Universitaria Città della Salute e della Scienza di Torino, Torino, Italy; 5Padova University Hospital, Padova, Italy; 6Goethe-Univ Frankfurt (Campus Riedberg), Frankfurt am Main, Germany; 7Amsterdam UMC, locatie AMC, Amsterdam, Netherlands; 8Hospital Beaujon AP-H, Clichy, France; 9UCL
Background and aims: Preliminary data suggest that simvastatin may have beneficial effects in decompensated cirrhosis. Rifaximin is effective in preventing recurrent hepatic encephalopathy but it is not known whether it can prevent other complications of cirrhosis. The current study was aimed at assessing whether simvastatin associated with rifaximin improves the natural history of decompensated cirrhosis.

Method: Double-blind, placebo-controlled, phase 3 trial in patients with decompensated cirrhosis from 14 European university hospitals. Patients with Child Pugh Turcotte (CPT) B or C were randomly assigned to receive either simvastatin 20mg/day plus rifaximin 1,200mg/day or placebo of both for 12 months, stratified according to Child Pugh class. Primary end point was time to first episode of Acute-On-Chronic Liver Failure (ACLF), analyzed using Cox regression analysis with competing risk for death or transplant and stratified by CPT class. Secondary end points included transplant-free survival, composite of ACLF, death and transplant, and composite of cirrhosis decompensating events (new-onset/worsening ascites, hepatic encephalopathy, variceal bleeding, acute kidney injury and infections).

Results: 254 patients were randomized. After exclusion of 17 patients, 237 (194 CPT B and 43 CPT C) were randomly assigned to receive either simvastatin 20mg/day plus rifaximin 1,200mg/day or placebo of both for 12 months, stratified according to Child Pugh class. Primary end point was time to first episode of Acute-On-Chronic Liver Failure (ACLF), analyzed using Cox regression analysis with competing risk for death or transplant and stratified by CPT class. Secondary end points included transplant-free survival, composite of ACLF, death and transplant, and composite of cirrhosis decompensating events (new-onset/worsening ascites, hepatic encephalopathy, variceal bleeding, acute kidney injury and infections).

Conclusion: In decompensated cirrhosis, treatment with simvastatin plus rifaximin for 12 months was not associated with reduction of ACLF, complications or death. These results do not support the use of this combination therapy in decompensated cirrhosis.

LBO-02 Safety and efficacy of VIR-2218 with or without pegylated interferon alfa in virally-suppressed participants with chronic hepatitis B virus infection: post-treatment follow-up

Man-Fung Yuen1, Young-Suk Lim2, Ki Tae yoon3,4, Tien Huey Lim5, Jeong Heo6, Piyathittwattana Pipat7, Won Young Tak8, Vaidhehi Thanawala9, Daniel Cloutier9, Shenghua Mao9, Andre Arizpe9, Andrea Cathcart9, Sneha V. Gupta9, Carey Hawng9, Edward J. Gane10, Department of Medicine, Queen Mary Hospital, School of Clinical Medicine, The University of Hong Kong, Hong Kong, China; 2Department of Gastroenterology, Liver Center, Asan Medical Center, University of Ulsan College of Medicine, Seoul, Korea, Rep. of South; 3Liver Center, Pusan National University Yangsan Hospital, Yangsan, Korea, Rep. of South; 4Division of Gastroenterology and Hepatology, Department of Internal Medicine, Pusan National University College of Medicine, Yangsan, Korea, Rep. of South; 5Department of Gastroenterology and Hepatology, Department of Internal Medicine, Pusan National University Yangsan Hospital, Yangsan, Korea, Rep. of South; 6Department of Gastroenterology and Hepatology, McMaster University, Hamilton, Canada; 7Department of Internal Medicine, College of Medicine, Pusan National University and Biomedical Research Institute, Pusan National University Hospital, Busan, Korea, Rep. of South; 8Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand; 9Division of Gastroenterology and Hepatology, Department of Internal Medicine, Kyungpook National University Hospital, School of Medicine Kyungpook National University, Daegu, Korea, Rep. of South; 10VIR Biotechnology Inc., San Francisco, United States; 11Department of Medical and Health Sciences, University of Auckland, Auckland, New Zealand

Email: mfyuen@hku.hk

Background and aims: VIR-2218, an investigational small interfering ribonucleic acid (siRNA) targeting the HBx region of the hepatitis B virus (HBV) genome, reduces hepatitis B surface antigen (HBsAg) levels in patients with chronic HBV infection. Pegylated interferon alfa-2a (PEG-IFNα) is approved for treatment of HBV infection; however, 3-7% of patients achieve HBsAg loss after 48 weeks of PEG-IFNα treatment. Preliminary safety and efficacy follow-up data of VIR-2218 with or without PEG-IFNα at least 24 weeks post-end of treatment (EOT) are described.

Method: This open-label phase 2 study includes non-cirrhotic adults with chronic HBV infection that are virally suppressed. Participants were enrolled into 1 of 5 cohorts (C1-C5) to receive dosing regimens...
containing 200 mg VIR-2218 subcutaneous (SC) every 4 weeks ± PEG-IFNa 180 µg SC weekly (Figure).

Results: To date, 79 participants have been enrolled and are included in the analyses. Seventy-six have completed at least 24 weeks post-EOT on study and 3 discontinued the study. Eleven (n = 11/64, 17.2%) participants receiving VIR-2218 + PEG-IFNa had HBsAg loss (C2 [n = 1/15, 7%], C3 [n = 1/18, 5.5%], C4 [n = 5/18, 28%] and C5 [n = 4/13, 30.8%]), 10 of whom had anti-HBs seroconversion. Of the 11 with HBsAg loss, 6 participants (C2 [n = 1/15, 7%], C3 [n = 3/18, 16.7%] and C5 [n = 2/13, 15.3%]) sustained HBsAg loss and remained anti-HBs positive for at least 24 weeks post-EOT. Among those who achieved HBsAg loss, 10% of whom had anti-HBs titers >500 mIU/ml at EOT predicted achieving sustained HBsAg loss for at least 24 weeks post-EOT. Most treatment-emergent adverse events (TEAEs) reported were grade ≤ 2, with 3 serious TEAEs: ankle fracture and gall bladder pain (unrelated to treatment) and PEG-IFNa-related acute psychosis.

Conclusion: These preliminary data show that the antiviral activity of VIR-2218 can be potentiated by PEG-IFNa to achieve sustained off-treatment HBsAg loss at least 24 weeks after EOT. Anti-HBs titers at the end of treatment predicted off-treatment responses. Rates of HBsAg loss were higher with longer duration of VIR-2218 and PEG-IFNa treatment.

LBO-03

A phase 3, randomized, double-blind, placebo-controlled study evaluating the efficacy and safety of cilofexor in patients with non-cirrhotic primary sclerosing cholangitis (PRIMIS)

Michael Trauner1, Cynthia Levy2,3, Atsushi Tanaka4, Zachary Goodman5, Douglas Thoburn6, Deepak Joshi7, Kimmo Salminen8, Kidist Yimam9, Hiroyuki Isayama10, Aldo J Montano–Loza11, Mark Danta12,13, Holger Hinrichsen14, Pietro Invernizzi15,16, Xiaoyan Liu17, Xiaomin Lu17, Muhsen Alani17, William Barchuk18, Timothy R. Watkins17, Mark Genovese17, Christopher Bowlus18,1 Medical University of Vienna, Division of Gastroenterology and Hepatology, Department of Medicine III, Vienna, Austria; 2University of Miami Miller School of Medicine, Division of Digestive Health and Liver Diseases, Miami, United States; 3University of Miami Miller School of Medicine, Schiff Center for Liver Diseases, Miami, United States; 4Tokyo University School of Medicine, Department of Medicine, Tokyo, Japan; 5Inova Fairfax Hospital, Center for Liver Diseases, Falls Church, United States; 6Royal Free Hospital, The Sheila Sherlock Liver Centre and UCL Institute of Liver and Digestive Health, London, United Kingdom; 7King’s College Hospital, Institute of Liver Studies, London, United Kingdom; 8Turku University Hospital, Division of Gastroenterology, Department of Medicine, Turku, Finland; 9California Pacific Medical Center, Department of Hepatology and Liver Transplantation, San Francisco, United States; 10Juntendo University, Department of Gastroenterology, Graduate School of Medicine, Tokyo, Japan; 11University of Alberta, Division of Gastroenterology and Liver Unit, Edmonton, Canada; 12UNSW, School of Clinical Medicine, Faculty of Medicine, Sydney, Australia; 13St Vincent’s Hospital, Department of Gastroenterology, Sydney, Australia; 14Gastroenterologisch-Hepatologisches MVZ Kiel GmbH, Kiel, Germany; 15 Fondazione IRCCS San Gerardo dei Tintori, Gastroenterology Unit, Monza, Italy; 16University of Milano-Bicocca, Department of Medicine and Surgery, Monza, Italy; 17Gilead Sciences, Inc, Foster City, United States; 18University of California Davis School of Medicine, Division of Gastroenterology and Hepatology, Sacramento, United States.

Background and aims: A recent phase 2 trial in participants with primary sclerosing cholangitis (PSC) without cirrhosis showed that treatment with cilofexor (CIL0), a farnesoid X receptor agonist, led to dose-dependent reductions in serum alkaline phosphatase (ALP) vs placebo (PBO) and was well tolerated. Here we present results from the phase 3 PRIMIS trial designed to evaluate CIL0 efficacy (in terms of fibrosis progression) and safety in patients with non-cirrhotic PSC (ClinicalTrials.gov ID NCT03890120).

Method: In this phase 3, randomized, double-blind, placebo-controlled trial, adults with large duct PSC and liver fibrosis stage F0-F3 (Batts-Ludwig scale) were randomized 2:1 to receive CIL0 100 mg or PBO orally once daily for 96 weeks. The primary end point was the proportion with progression of liver fibrosis (≥1-stage increase in fibrosis score) at week 96. A pre-planned, interim futility analysis was performed after 180 randomized and dosed participants had either completed week 96 or an early termination visit. Early trial termination was considered if the likelihood, based on a predictive power approach, of meeting its primary end point (if continued) was <10%.

Results: The trial was terminated early as the interim futility analysis showed that the estimated probability of meeting the primary end point was 6.8%. A total of 419 participants were randomized: of these, 416 took at least 1 dose and were included in the final analysis set (CIL0: n = 277; PBO: n = 139), and 189 (45.4%) completed 96 weeks of trial drug. Baseline characteristics were generally similar across treatment groups. Overall, the median age was 43 years, 38.2% were women and 70.2% had inflammatory bowel disease. At baseline, 68.6% (CIL0) and 70.5% (PBO) had elevated ALP levels and fibrosis staging was distributed as follows (F0: 17.7% [CIL0], 19.4% [PBO]; F1: 26.4% [CIL0], 28.8% [PBO]; F2: 30.3% [CIL0], 27.3% [PBO]; F3: 25.6% [CIL0], 18.4% [PBO]).
LBO-04
Deep learning predicts sensitivity to atezolizumab-bevacizumab from digital slides of hepatocellular carcinoma
Laboratoire d’Informatique Paris Descartes (LIPADE), Université Paris Cité, France; 2.Centre d’Histologie, d’Imagerie et de Cytométrie (CHIC), Centre de Recherche des Cordeliers; 3.Inserm UMR 1682, France; 4.Université Paris Est Créteil, INSEMM, IMRB, F-94010 Créteil, France; 5.Cleveland Clinic, United States; 6.Liver Unit, Hospital Vall d’Hebron, Barcelona, Catalonia, Spain; 7.Fondazione IRCCS Ca’ Granda Ospedale Maggiore Policlinico, University of Milan, Italy; 8.Centre Hospitalier Universitaire de Lille, Hôpital Hurliez, Maladies de l’Appareil Digestif, Lille, France, France; 9.Deptartment of Oncology, Vita-Salute San Raffaele University, IRCCS San Raffaele Scientific Institute Hospital, Milan, Italy, Italy; 10.IRCCS San Raffaele Hospital, Italy; 11.IRCCS San Raffaele Scientific Institute Hospital, Department of Oncology, Vita-Salute San Raffaele University, Milan, Italy, Italy; 12.Division of Gastroenterology and Hepatology, Foundation IRCCS Ca’ Granda Ospedale Maggiore Policlinico, Milan, Italy, France; 13.Reims University Hospital, Department of Pathology, Reims, France, France; 14.Reims University Hospital, Department of Hepatology, Reims, France, France; 15.Department of Pathology, Fondazione IRCCS Ca’ Granda Ospedale Maggiore Policlinico, Italy; 16.The Institute of Liver Disease and Transplantation, Dr. Rela Institute and Medical Centre, Bharath Institute of Higher Education and Research, Chennai, India, India; 17.Dr Rela Institute and Medical Centre, Bharath Institute of Higher Education and Research, Chennai, India, India; 18.Institut Curie Research Center, France; 19.Institut Curie Genomics of Excellence (ICGex) NGS Platform, Institut Curie, Paris, France, France; 20.University Hospital of Lausanne (CHUV), Switzerland; 21.Department of Oncology, Centre Hospitalier Universitaire Vaudois, 1011 Lausanne, Switzerland, Switzerland; 22.Department of Medicine III, University Hospital RWTH Aachen, RWTH Aachen university, Aachen, Germany, Germany; 23.TU Dresden, Germany; 24.Else Kroener Freiburg Institute for Digital Health, Medical Faculty Carl Gustav Carus, Technical University Dresden, Dresden, Germany, Germany; 25.Department of Pathology and Immunology, Washington University in St. Louis, St. Louis, MO, 63110, United States; 26.Division of Gastroenterology and Hepatology, Department of Internal Medicine, National Taiwan University Hospital, Taipei, Taiwan, Taiwan; 27.Mayo Clinic, United States; 28.Pathology Department, Hospital Universitario Vall d’Hebron, Vall d’Hebron Barcelona Hospital Campus, Spain; 29.Liver Cancer Research Group, Liver Diseases, Vall d’Hebron Institut de Recerca (VHIR), Vall d’Hebron Barcelona Hospital Campus, 08035 Barcelona, Spain, Spain; 30.oncology Mayo clinic, United States; 31.Hôpitaux Universitaires Henri Mondor, France; 32.Department of Gastroenterology, Hepatopancreatogastroenterology and Digestive Oncology, Hôpital Eramse, Belgium; 33.Laboratory of Experimental Gastroenterology, Université Libre de Bruxelles, Brussels, Belgium, Belgium; 34.Liver Unit, Division of Gastroenterology and Hepatology, Hospital Universitario Central de Asturias, Oviedo, Spain, Spain; 35.Hôpital Saint-Antoine, France; 36.Center hospitalier universitaire Henri-Mondor, France; 37.Assistance Publique-Hôpitaux de Paris, Henri Mondor University Hospital, Department of Hepatology, Paris, France, France; 38.Barcelona Clinic Liver Cancer (BCLC) Group, Department of Pathology, Hospital Clinic de Barcelona, Universitat de Barcelona, Barcelona, Spain, Spain; 39.Barcelona Clinic Liver Cancer (BCLC), Liver Unit, Hospital Clinic de Barcelona, IDIBAPS, CIBEREHD, Universidad de Barcelona, Barcelona, Spain, Spain; 40.Department for Visceral Surgery and Medicine, Inselspital, Bern University Hospital, University of Bern, Switzerland, Switzerland; 41.Swiss NASH Fondation, Switzerland; 42.Department of Clinical Oncology and State Key Laboratory of Translational Oncology, Sir YK Pao Centre for Cancer, The Chinese University of Hong Kong, Hong Kong SAR, People’s Republic of China, Hong Kong; 43.The University of Texas Southwestern Medical Center, United States; 44.Service d’Anatomie Pathologique, Centre de Biologie Pathologique, CHU Lille, 59037 Lille, France, France; 45.Inserm, France; 46.Department of Radiology, Research Institute of Radiological Science, Center for Clinical Imaging Data Science, Severance Hospital, Yonsei University College of Medicine, Seoul, Korea, Korea, Rep. of South; 47.Yonsei University College of Medicine, Korea, Rep. of South, 48.Liver Unit, Clinica Universitaria de Navarra, Av. Pio XII, 36, 31008, Pamplona, Spain, Spain; 49.University of Navarra, Spain; 50.Clinica Universitaria, University of Navarra, Spain, Spain; 51.Department of Surgery and Cancer, Imperial College London, Hammersmith Hospital, London, UK, United Kingdom; 52.Division of Gastroenterology and Hepatology, Department of Internal Medicine III, Medical University of Vienna, Vienna, Austria, Austria; 53.Department of Surgery and Cancer, Imperial College London, Hammersmith Hospital, Du Cane Road, W120HS, United Kingdom; 54.APHP, France; 55.Centre de recherche sur l’inflammation, INSERM1149, Université Paris Cité, Paris, France, France; 56.Department of Gastroenterology, Hepatology and Endocrinology, Hannover Medical School, Hannover, Germany, Germany; 57.Department of Biomedical Sciences, Humanitas University, Via Riva Levi Montalcini 4, Pieve Emanuele, Milano 20002, Italy, Italy; 58.Pathology Unit, IRCCS Humanitas Research Hospital, Via Manzoni 56, Rozzano, MI, Italy, Italy; 59.Department of Gastroenterology, Hepatology and Endocrinology, Hannover Medical School, Germany, Germany; 60.Angers University Hospital, France; 61.Institut d’Informatique Paris Descartes (LIPADE), Université Paris Cité, Paris, France, France; 62.Hôpital Jean-Vertier, France Email: juliencalderaro@gmail.com

Background and aims: Atezolizumab-bevacizumab combination therapy is the standard of care for advanced hepatocellular carcinoma (HCC). Objective responses are however observed only in a minority of patients and the development of predictive biomarkers is critical to improve patient stratification and outcomes. The ABRS gene signature has been previously developed to this aim1, however, molecular profiling techniques remain very challenging to...
implement into clinical practice as they require expertise in molecular biology and bioinformatics. Our goal was to develop a regression based deep-learning model to estimate the ABRS expression value directly from HCC histological digital slides, and determine if this model could predict progression-free survival (PFS) in treated patients.

**Method:** We trained our model (ABRS-P) using the public TCGA dataset (n = 336). Image features extracted from whole-slide images were fed along with ABRS gene signature expression as the label, into a model fit for gene expression prediction/regression analysis. The model was externally validated on two independent datasets: a biopsy series (n = 157, Henri Mondor and Avicenne University Hospitals), which differed significantly from the discovery dataset in gene profiling technology (3' RNA sequencing) and slide staining and encoding formats. The predictive value was then tested on an multicentric series of 122 biopsy samples from patients treated by atezolizumab-bevacizumab. A control series of patients (n = 44) treated by other systemic therapies was also investigated. Finally, to obtain insights into the biological features of areas that significantly impact ABRS-P predictions, we performed spatial transcriptomics on HCC samples and matched prediction heatmaps with in situ gene expression profiles.

**Results:** Using cross-validation, the mean Pearson correlation coefficient (r) of ABRS-P was 0.62 (0.46-0.72), with a median p value of 9.37E-09. The ABRS-P generalised well on the resection external validation series with a r = 0.60, p = 1.81E-23. A small drop in performance (r = 0.53) was observed in the biopsy validation set, but the correlation was still highly significant (p = 1.52E-12). Patients with ABRS-P High tumors showed prolonged PFS (p = 0.014) after initiation of atezolizumab-bevacizumab treatment. No impact of the ABRS-P prediction was observed on PFS in patients treated with other systemic therapies. Spatial transcriptomics showed significantly higher ABRS gene expression, along with upregulation of various other immune effectors, in tumor areas with high ABRS-P predicted values.

**Conclusion:** Our study demonstrates that AI applied on HCC digital slides is able to predict PFS in patients treated by atezolizumab-bevacizumab. These approaches pave the way for the development of inexpensive and fast biomarkers of sensitivity to targeted therapies that could be easily implemented in clinical practice. Finally, we also show that the combination of AI prediction heat maps with spatial transcriptomics provides insights on the molecular features associated with areas with high predictive value. This could be applied to other cancers or diseases and improve our understanding of the biological mechanisms that drive outcomes or responses to treatments.

**LBO-05**

Pegozaefermin for the treatment of non-alcoholic steatohepatitis patients with F2/F3 fibrosis: a multi-center, randomized, double-blind, placebo-controlled Phase 2b trial (ENLIVEN)

Rohit Loomba1, Arun Sanyal2, Kris Kowdley3, Deepak Bhatt4, Naim Alkhouri5, Pierre Bedossa6, Stephen Harrison6, Don Lazas6, Robert Barish7, Millie Gottwald11, Shibao Feng11, Germaine D. Agollah11, Cynthia (Cindy) Hartsfield11, Hank Mansbach11, Maya Margalit12, Manal Abdelmalek13, 1University of California San Diego, NAFLD Research Center, Division of Gastroenterology and Hepatology, Department of Medicine, San Diego, United States; 2Virginia Commonwealth University, Division of Gastroenterology, Hepatology, and Nutrition, Richmond, United States; 3Liver Institute Northwest, Seattle, United States; 4Icahn School of Medicine at Mount Sinai Health System, Dr. Valentin Fuster Professor of Cardiovascular Medicine, New York, United States; 5Arizona Liver Health, Phoenix, United States; 6Velocity Clinical Research, Los Angeles, United States; 7Liverpat, Paris, France; 8Pinnacle Clinical Research, San Antonio, United States; 9ObjectiveHealth, Nashville, United States; 10Ocali AI Research, Ocala, United States; 1189bio, San Francisco, United States; 1289bio, Rehovot, Israel; 13Mayo Clinic, Division of Hepatobiliary Disease, Rochester, United States

Email: cindy.hartsfield@89bio.com

**Background and aims:** Pegozaefermin (PGZ) is a long-acting glycopegylated analog of FGF21. This Phase 2b study evaluated the efficacy and safety of PGZ given weekly (QW) or every two-weeks (Q2W) versus placebo on histologic parameters in NASH patients with biopsy proven F2/F3 fibrosis.

**Method:** This multicenter, randomized, placebo-controlled, double-blind trial randomized patients to PGZ 15 mg QW, 30mg QW and 44mg Q2W or placebo for 24 weeks. Randomization was stratified by T2DM status and fibrosis stage (F2 vs F3). The primary end point was the proportion of patients achieving either: 1) improvement of fibrosis by ≥1 stage with no worsening of NASH or 2) resolution of NASH without worsening of fibrosis. Biopsies were independently interpreted by 3 readers, blinded to timing, with a pre-specified algorithm used to generate an objective consensus score. If the 3 readers did not agree, the mode score was used; if that failed, then the median score was used. Key secondary end points included additional liver histology measures, changes in liver fat content (LFC) by magnetic resonance imaging proton density fat fraction (MRI-PDFF), fibrosis and inflammatory markers, metabolic effects, safety and tolerability.

**Results:** In the full analysis population (F2 or F3 and NAS ≥4) 192 patients were randomized to PGZ 15mg QW (n = 14), 30mg QW (n = 66), 44 mg Q2W (n = 51) or placebo (n = 61). Mean baseline characteristics for the randomized analysis population (n = 222) were age 56 years, 61% female, BMI 37 kg/m2, 66% T2D and 60% with F3 fibrosis. Full agreement or mode determined ≥95% of histology scores. A significant proportion of patients treated with high dose PGZ achieved the dual primary end point (s) for at least one stage of fibrosis improvement without worsening of NAS and/or NAS resolution without worsening of fibrosis (Table 1). PGZ treatment significantly improved NAS score by ≥2 points, LFC, non-invasive markers of hepatic inflammation and fibrosis with meaningful
changes in lipids and HbA1c. PGZ was generally safe and well tolerated with the most common treatment emergent adverse events (TEAEs) being mild/moderate nausea and diarrhea. No deaths occurred; six early terminations for TEAEs including one drug-related serious AE occurred.

<table>
<thead>
<tr>
<th></th>
<th>Placebo</th>
<th>PGZ 15mg</th>
<th>PGZ 30mg</th>
<th>PGZ 44mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>n=6</td>
<td></td>
<td>QW n=14</td>
<td>QW n=66</td>
<td>QW n=51</td>
</tr>
</tbody>
</table>

### At least one-stage fibrosis improvement
- Without worsening of NASH (Week 24): 
  - Placebo: 7% (p = 0.10)
  - PGZ 15mg: 22% (p = 0.009)
  - PGZ 30mg: 26% (p = 0.008)

### NASH resolution
- Without worsening of fibrosis (Week 24): 
  - Placebo: 7% (p = 0.0001)
  - PGZ 15mg: 22% (p = 0.0009)
  - PGZ 30mg: 26% (p = 0.0005)

### Conclusion:
PGZ treatment significantly improved NASH and hepatic fibrosis, LFC, and non-invasive markers of liver inflammation and fibrosis in patients with NASH and F2/F3 fibrosis. PGZ is the first therapy to achieve fibrosis regression and NASH resolution with a Q2W dosing regimen. These robust Phase 2b results support advancing PGZ into phase 3 development.

**LBO-06**

**Mycophenolate mofetil is superior to azathioprine for the induction of remission in treatment-naive autoimmune hepatitis [CAMARO trial]**

Romée Snijders1,2, Anna Stoelinga3, Tom Gevers2,4-5, Simon Pape1,2, Maaike Biewenga3, Maarten Tushuizen3, Robert Verdonk6

Henk-Marijn De Jonge7, Jan Maarten Vrolrijk8, Sjoerd Bakker9, Thomas Vanvollehgem2,10, Ynto de Boer7,11, Martine Boven-Pronk12, Ulrich Beuers2,17, Adriaan Van der Meer13, Nicole van Gerven14, Marijn Sijtsma15, Bart Verwer16, Manon van Ijzendoorn17, Manon van Herwaarden18, Floris van den Brand19, Kerim Sebib Korkmaz20, Aad van den Berg21, Maureen Guichelaar22, Amar Levens2, Bart Van Hoek3, Joost P.H. Drenth1,2,1 Radboud University Medical Center; 2European Reference Network on Hepatological Diseases (ERN RARE-LIVER), Germany; 3Leiden University Medical Center, Netherlands; 4Aartsrecht University, Netherlands; 5Aartsrecht University Medical Center, Netherlands; 6St. Antonius Hospital, Netherlands; 7Jeroen Bosch Hospital, Netherlands; 8Rijnstate Hospital, Netherlands; 9Elisabeth-Tweesteden Hospital, Netherlands; 10Antwerp University Hospital, Belgium; 11Amsterdam University Medical Centers, Netherlands; 12Groene Hart Hospital, Netherlands; 13Erasmus University Medical Center, Netherlands; 14Rode Kruis Hospital, Netherlands; 15St. Jansdal Hospital, Netherlands; 16Spaarne Gasthuis, Netherlands; 17Hospital Bernhoven, Netherlands; 18Deventer Hospital, Netherlands; 19OLVG Oost, Netherlands; 20Helseland Hospital, Netherlands; 21University Medical Center Groningen, Netherlands; 22Medisch Spectrum Twente, Netherlands

**Email:** Romees.Snijders@radboudumc.nl

**Background and aims:** In patients with autoimmune hepatitis (AIH) the classical prednisolone/prednisone/azathioprine regimen to induce complete remission is recommended in all present guidelines. Cessation of azathioprine is, however, necessary in approximately 15% of patients due to side effects. In uncontrolled studies, mycophenolate mofetil (MMF) has demonstrated a potent effect in achieving complete remission in the majority of patients with AIH, and seems to have less adverse events. The aim of this study was to compare the potential benefits of first-line MMF over azathioprine, both in combination with prednisolone/prednisone, as induction therapy in patients with treatment-naive AIH.

**Method:** In this 24-week, prospective, randomised, open-label, multicentre superiority trial we enrolled 70 patients with AIH. Treatment was started with prednisolone/prednisone at 40 or 60 mg daily (depending on weight) and subsequently tapered to a minimum of 5 mg daily according to a dosing scheme. After 4 weeks, patients were randomly allocated (1:1) to either MMF (max. daily dose 2000 mg) or azathioprine (max. daily dose 100 mg). The primary end point was biochemical remission at 24 weeks, defined as serum levels of alanine aminotransferase and immunoglobulin G below the upper limit of normal (intention-to-treat population). Secondary end points included safety and tolerability of MMF and azathioprine, time to remission, and adverse events. Safety was assessed in all patients having taken at least one dose of the study drug. The trial was registered with ClinicalTrials.gov, #NCT02900443.

**Results:** 70 patients (mean 57.9 years (standard deviation (SD) 14.0); 72.9% female) were randomly assigned to MMF plus prednisolone (n=39) or azathioprine plus prednisolone (n=31). The primary end point was met in 55.3% of patients assigned to MMF and in 25.8% assigned to azathioprine (difference, 29.5 percentage points; 95% confidence interval, 6.1 to 48.5; p = 0.014). Treatment-related severe adverse events were absent with MMF and occurred in 3 patients in the azathioprine group (9.7%) (p = 0.082). In the azathioprine group there was a higher discontinuation rate due to adverse events compared to MMF (25.8% vs. 5.1%, resp., p = 0.018). There was no difference in the mean cumulative prednisolone/prednisone (n=1 dose between the azathioprine group and MMF group (1834 mg (SD 544) vs.1944 mg (SD 475), resp., p = 0.369).

**Conclusion:** In this prospective, randomised trial, MMF was superior to azathioprine for induction of remission in treatment-naive patients with AIH. Adverse events led to cessation of the immunomodulator more often with azathioprine than with MMF.

**Figure:**

**Conclusion:**

**OS-001**

**Refractory ascites in cirrhosis is associated with a major psychological burden in patients with cirrhosis and caregivers**

Ana Belen Rubio Garcia1,2, Rebeca Moreira3, Marta Carol1,2, Martina Perez2,3, Marta Cervera2,3, Ruth Nadal1, Jordi Gratacós3, Ana Arslanow2, Adria Juanola3, Anna Soria3, Elisa Pose3, Isabel Grauera3, Pere Ginés3,4, Núria Fabrellas4.

**Hospital Clinic of
Background and aims: Refractory ascites is common in patients with cirrhosis and represents a major challenge for nurses caring for patients with liver diseases. The management of refractory ascites has been investigated extensively. However, there is very little information on the psychological impact of this condition in patients and the burden for their caregivers. The aim of this study was to investigate the psychological burden of refractory ascites in patients and effects on caregivers.

Method: Qualitative phenomenological study, the study population included outpatients with cirrhosis and refractory ascites. Sociodemographic and clinical data was collected from all patients. Psychological experiences were collected through semi-structured individual interviews to patients and caregivers. The analysis of the interviews was carried out by transcription and subsequent reading and re-reading of the description of the interpretative experiences. Subsequently, the content was analyzed to code the obtained information and grouped into categories. The sample was determined by data saturation. In patients, overall quality of life (QoL) was assessed by the short form survey 36 (SF-36) and liver specific QoL by the Chronic Liver Disease Questionnaire (CLDQ). Caregivers were asked to complete the SF-36 as well as the Zarit Burden Interview to measure caregiving burden.

Results: A total of 26 patients were included in the study (13 patients and 13 main caregivers). The mean age of the patients was 65 years. Nine patients (69%) were male and the main etiologic factor was alcohol consumption. Patients had a marked impairment in QoL in both physical and mental components. Main clinical symptoms were related to loss of appetite and weight loss, exhaustion, and insomnia. Patients reported a marked psychological impact mainly due to their decreased ability to move and reduced social activity ("I am very tired, I am always very tired"). Patients frequently reported mood swings ("I can open the window and disappear and that's it...”) and symptoms of depression, yet some patients also expressed feelings of acceptance and resilience. The psychological impact was also very high in caregivers who had a major burden, as assessed by a median Zarit score of 57 (SD ± 12).

Conclusion: Refractory ascites has a profound psychological impact on patients and their informal caregivers. This psychological impact should be evaluated and treated to help improve patients and caregivers wellbeing.

OS-002
Pharmacist led telemonitoring and titration of carvedilol for ambulatory patients with compensated cirrhosis and clinically significant portal hypertension
Sheridan Rodda1,2, Chloe McAinch1,2, Aparna Morgan2,3, Eliza Flanagan2,4, Edward Saxby2,1, Jo Hunter1,2, Sue Kirs1,2, Sally Bell1,2, Suong Le2,3,5, 1Monash Health, Pharmacy Department, Melbourne, Australia;2Monash University, Monash Digital Therapeutics and Innovation Laboratory, Melbourne, Australia;3Monash Health, Department of Gastroenterology and Hepatology, Melbourne, Australia; 4Monash University, Department of Medicine, Melbourne, Australia; 5Monash University, School of Clinical Sciences, Melbourne, Australia
Email: roths2@hotmail.com

Background and aims: Carvedilol is frequently under-prescribed and under-dosed in patients with compensated cirrhosis and clinically significant portal hypertension (CSPH), despite significant mortality benefits. We aimed to investigate the feasibility, safety, and patient acceptability of a novel pharmacist led telemonitoring and titration service for achieving guideline directed carvedilol therapy (GDCT).

Method: We conducted a mixed methods study to prospectively evaluate the Optimising One Medication for Patients with Cirrhosis (OOMPa-C) clinic. A new model of care and GDCT titration protocol was developed by Pharmacy, Hospital in the Home and the Department of Gastroenterology and Hepatology at Monash Health Australia. During April to December 2022, 22 ambulatory adult patients with compensated cirrhosis and CSPH were trained to self-record daily blood pressure (BP) using a Bluetooth machine paired to a smartphone application. Pharmacists reviewed the results on a web-based platform and conducted twice weekly video consultations with patients. Doses were titrated per GDCT up to 12.5 mg daily as tolerated. Semi-structured interviews were conducted by the OOMPa-C pharmacist at the final consult.

Results: Of 22 participants, 20 (91%) were successfully titrated over a median of 14 days (interquartile range (IQR): 12.5–17) with a median of 4 (IQR:3–5) pharmacist consults. Overall 18 (82%) participants took 12.5 mg per day at completion and 20 (91%) adhered to monitoring on at least 90% of enrolled days. One participant (4.5%) experienced respiratory adverse effects requiring treatment cessation. The figure summarises the themes identified from the 21 participants that completed interviews. The BP machine and app were reported as easy to use. Convenience was the most cited benefit; saving time, money and effort by receiving care in the privacy and comfort of home. Participants were happy to use the service again and recommend it to others. Clinical safety and data security were not a concern.

Table:

<table>
<thead>
<tr>
<th>Theme</th>
<th>Barriers</th>
<th>Facilitators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived ease of use</td>
<td>Issues with app, phone, BP machine</td>
<td>Regular routines, Alerts/reminders, Family/carers</td>
</tr>
<tr>
<td>Perceived usefulness</td>
<td>Little perceptible benefit (preventive medication)</td>
<td>More information and visibility for BP and pulse</td>
</tr>
<tr>
<td>Intention to use the service</td>
<td>Medication adverse effects</td>
<td>Referring doctor, Altruism (research setting), Perceived trustworthiness of staff</td>
</tr>
<tr>
<td>Perceptions of technology</td>
<td>Low self-esteem</td>
<td>Family/carers</td>
</tr>
</tbody>
</table>

Conclusion: A virtual carvedilol dose titration service (telemonitoring combined with pharmacist telehealth reviews) achieved GDCT and was feasible, safe and acceptable to patients with compensated cirrhosis and CSPH.

OS-003
Feasibility of a home-based, virtually-delivered, group exercise intervention in older patients with liver cancer (TELEX-Liver Cancer)
Kate Hallsworth1,2, Sam Orange1,2, Misti McCain1,3, Roisin Fallen-bailey1, Helen Louise Reeves1,2,3, 1Faculty of Medical Sciences, Newcastle University, Newcastle upon Tyne, United Kingdom; 2The Liver Unit, Newcastle upon Tyne Hospitals NHS Foundation Trust, Newcastle upon Tyne, United Kingdom; 3Northern Institute for Cancer Research, Newcastle University, Newcastle upon Tyne, United Kingdom
Email: kate.hallsworth@ncl.ac.uk

Background and aims: Hepatocellular carcinoma (HCC) is often diagnosed at an intermediate/advanced stage; less than a third of patients are offered potentially curative treatments. For many,
maintaining quality-of-life (QoL) and independence throughout cancer treatment (s) and beyond is a core objective of clinical care. Strong evidence supports supervised exercise as an effective way to improve QoL in older adults with cancer and age-related comorbidities. Multiple barriers to the implementation of system-wide exercise programmes exist on both an organisational and individual patient level. The aim of the study was to investigate whether it is feasible and safe to deliver supervised group exercise via videoconferencing to patients with HCC in their own home.

**Method:** TELEX-Liver Cancer was a non-randomised feasibility study for patients with HCC aged ≥60 years. Primary outcomes focussed on recruitment, retention, exercise adherence, and safety. Patients were asked to attend exercise classes, twice-weekly for ~45 minutes via online videoconferencing for 10 weeks in their own home. Each class included both aerobic and resistance training. Physical function was assessed pre-/post-intervention and patient-reported outcomes were collected via postal questionnaire.

**Results:** From November 2021 to September 2022, 45 patients were invited to participate and 19 provided consent (recruitment rate 42%). Participants had a mean age of 74 years, were on average 22 months post-diagnosis and 11 months post-treatment. Participants completed 76% of planned exercise sessions. 15/19 (79%) patients returned study questionnaires. Hand grip strength (p = 0.002), Liver Frailty Index (p < 0.001) and 5-times chair stand ability (p = 0.002) significantly improved from pre- to post-intervention. No adverse events occurred during exercise sessions.

**Conclusion:** It is feasible and safe to deliver supervised group exercise via videoconferencing to patients with HCC in their own home. Patients also benefited from improvements in physical function. These findings will inform the design of a future, adequately-powered randomised controlled trial to evaluate the efficacy of the intervention.

**OS-004-YI**

**Community dispensed hepatitis C virus treatment for ‘hard to reach’ opiate substitution treatment service users in Dublin: an intervention to address HCV infection eradication**

Gillian Farrell1, Kieran Harkin2, Miriam Coghlan1, Nessa Quinn1, Colm Bergin1. 1St. James's Hospital, GUIDe Clinic, Dublin, Ireland; 2Merchants Quay Ireland, Ireland

Email: gilfarrell@stjames.ie

**Background and aims:** The GUIDe Clinic is Ireland’s largest hospital-based infectious diseases’ clinic. We run a very successful HCV treatment clinic; however, a number of our target patient group were regularly failing to attend clinic appointments, of which a disproportionate number were homeless. With the ambition of becoming ‘HCV Free by 2023’ we developed an alternative ‘linkage to treatment’ pathway. In September 2020 we established a partnership with Merchants Quay Ireland (MQI)-a not for profit organisation that provides services for people who are homeless and those with addiction issues. The aim of the programme was to link otherwise ‘hard to reach’ populations to HCV DAA curative treatment.

**Method:** GUIDe Nurse and MQI General Practitioner (GP) set up and ran a fortnightly HCV clinic for patients who attended the opiate substitution treatment (OST) clinic based in MQI. This service offered a ‘one-stop-shop’ service where patients with HCV were assessed, educated, baseline bloods collected, fibroscan performed, drug-drug-interaction (DDI) checked and registered for treatment all within one clinical visit-as they attended for their OST review. DAA’s were prescribed within this clinic and patients received their DAA’s from the community pharmacy. Data was retrospectively collected using Electronic Patient Record (EPR) and Excel spreadsheet.

**Results:** 283 patients were registered to GP in MQI for OST (Opiate Substitution Treatment), of whom 239 (84%) had blood borne viral (BBV) screening. 89 (37%) of these patients were HCV Ag or PCR positive and were referred for DAA workup.

Of this patient group (N = 89):
- 40 were linked to our community dispensed DAA treatment
- 21 were linked to DAA treatment elsewhere (e.g. hospital based clinic, drug treatment centre or prison HCV treatment programme)
- 15 disengaged from MQI service
- 11 subsequently tested HCV RNA negative
- 3 died.

40 patients were treated in our programme and eligible for inclusion for analysis. All were HIV negative, fibroscan score <12 KPa.
- 40 patients (7 (17.5%) female, 33 (88.5%) male) received 42 courses of DAA treatment.
- 6 patients received >1 DAA course, having been previously treated elsewhere, or else requiring re-treatment.
- Regimens Prescribed: SOF/VLP (Epcclusa) 26; G/P (Maviret) 14, SOF/VLP/VOX (Vosevi) 1, SOF/GP 1.

**DAA Treatment Outcome Data (N = 42):**

**On Treatment Analysis:**
- 24 (57%) SVR12 achieved
- 10 (24%) Failed to attend for SVR bloods: either lost to follow-up (LTFU) or declining bloods
- 3 (7%) treatment failure (2 successfully re-treated, 1 early discontinuation and now LTFU)
- 4 (10%) Re-infection (1 patient successfully re-treated, 1 linked to re-treatment elsewhere, 1 in prison and listed for DAA re-treatment with Prison in-reach service, 1 still actively trying to link with re-treatment 1 (2%) RIP

**Conclusion:** This model of care and treatment delivery programme has proved to be very successful to date, with many patients that failed to be treated in standard clinics, now successfully treated and cured. Many other patients were successfully linked to alternative treatment programmes. Although absolute numbers are small the high re-infection rate is concerning, and highlights the need for ongoing BBV molecular screening and rapid access to re-treatments in this high risk population group. The next challenge is to offer HCV screening and treatment to persons sleeping rough or living in unstable accommodation in a community based setting to optimise patient engagement and compliance and outcomes.
Alcohol-related liver disease and drug-induced liver injury

**OS-005-YI**

**Clinical course of biopsy-controlled alcohol-related liver disease**

Stine Johansen1,2, Mads Israelsen1, Nikolaj Torp1,2, Katrine Thorhauge1,2, Johanne Kragh Hansen1,2, Katrine Prier Lindvig1,2, Peter Andersen1, Emil Deleuran Hansen1,2, Camilla Dalby Hansen1,2, Ida Ziegler Spedtsberg1,2, Ida Villesen1,2, Katrine Bech1, Sønke Detelesen1,2, Helene Baek Juul1, Ditlev Rasmussen1, Torben Hansen1, Aleksander Krag1,2, Maja Thiele1,2. 1Odense University Hospital, Fibrosis, fatty liver and steatohepatitis research center Odense (FLASH), Denmark; 2University of Southern Denmark, Department of Clinical Research, Faculty of Health Sciences, Denmark; 3Odense University Hospital, Department of Pathology, Denmark; 4University of Copenhagen, Novo Nordisk Foundation Center for Basic Metabolic Research, Denmark

**Background and aims:** Alcohol-related liver disease (ArLD) is associated with high morbidity and mortality but there is a lack of good prospective studies characterising the natural history of ArLD in more detail than epidemiological studies. We aimed to investigate the clinical course of biopsy-controlled ArLD according to baseline fibrosis stage including the risk of progression to decompensation and death.

**Method:** We prospectively followed a cohort of patients with a history of excessive alcohol intake (≥36 g/day for men and ≥24 g/day for women) and no prior decompensation. At baseline, we performed liver biopsies, genotyping of four single nucleotide polymorphisms in PNPLA3, MBOAT7, TM6SF2, HSD17B13, and clinical investigations. During follow-up, we manually reviewed patients’ medical health records for all hospital contacts, new diagnoses/complications, reports of alcohol intake and all-cause mortality. First and further decompensation were defined according to the Baveno VII recommendations.

**Results:** We followed a total of 459 ArLD patients for a median of 5.9 years (IQR 4.5–7.8). Mean age at baseline was 57 ± 10 years, 76% male, fibrosis stage F0-1/F2/F3-4 = 57%/23%/20%. Patients reported a median of 15.5 years of excessive drinking. During follow-up, 67 patients compensated of whom 46 developed at least one further decompensation, and 101 patients died (figure). All-cause mortality increased with higher fibrosis stage from 1.4 deaths per 100 person-years for stage F0-1, to 5.0 deaths per 100 person-years for stage F2, and 9.3 deaths per 100 person-years for stage F3-4. The cause of death was hepatic in 38%, non-hepatic in 43% and unknown in 20% of cases. The most frequent type of first decompensation was ascites (60%) followed by hepatic encephalopathy (25%) and variceal bleeding (15%). The incidence of decompensations during follow-up increased with baseline fibrosis stage: 5 out of 260 = 1.9% for stage F0-1, 17 out of 107 = 15.9% for stage F2, and 45 out of 91 = 49.5% for stage F3-4. Baseline fibrosis stage (hazard ratio, HR = 3.11, 95%CI 1.54–6.30) and excessive drinking during follow-up (HR = 4.80; 95%CI 3.28–7.02) were independent predictors of a first decompensation. PNPLA3 and TM6SF2 were predictors of decompensation in univariable regression but did not exhibit independent prognostic information.

**Conclusion:** In this prospective cohort with 5.9 years of follow-up, patients with alcohol-related liver disease experienced a high 5-year risk of decompensation and death, even in patients with only moderate fibrosis (F2) at baseline. Continuous excessive drinking predicted decompensation independent of fibrosis stage.
Urobilinogen predicted non-response \( [AUC = 0.94] \) with a hazard ratio of 1.5 (1.2–1.6) and cut-off >0.07 mg/ml segregated non-survivors \( (p < 0.01, \text{log}-\text{rank}) \) and showed >98% accuracy using ML. Plasma urobilinogen expression correlated with circulating bacterial peptide known for converting bilirubin to urobilinogen \( (r^2 > 0.7; p < 0.05) \). A significant increase in neutrophil activation marker \((CXC\_1, NGAL)\), oxidative stress \((NOX1, NOX1A, NOX1, \text{and} NOX4)\), and pro-inflammatory cytokine genes \((IL15, IL7, TNF\_x, IL6, IL8, \text{and} IL11)\) was observed post-treatment of primary healthy neutrophils with urobilinogen. Additionally, urobilinogen promoted corticosteroid resistance by enhancing the expression of GR\(^\alpha\), trans-repression genes \((GR\beta)\), and transactivation \((anti-\text{inflammatory genes-}\ NFKB-\text{IkB})\) genes. Urobilinogen also dysregulated intestinal membrane junction proteins \((\text{gap junction protein} 1, \text{ocludin and desmoglein})\) which promoted leaky gut.

**Method:** The demographics, clinical, biochemical and outcome information of patients included in the Spanish DILI Registry was analyzed, and the previous history of DPA was carefully examined. Cases of non-drug allergies, other types of adverse drug reactions, or insufficiently documented allergies were not considered PDA. Drugs were classified according to the Anatomical Therapeutic Chemical \((\text{ATC})\) Classification System. Differences between groups were tested with the Mann-Whitney U test, or the chi-square test or Fisher’s exact test, as appropriate.

**Results:** Of 913 cases with a first episode of DILI 62 (6.8%) patients presented with well-documented PDA (6.8%). Patients with PDA exhibited an older age \((60 \text{ vs. 54 years, respectively; } p = 0.011)\). Although hepatocellular injury predominated in both groups, compared to patients with no history of drug allergies, cases with PDA showed significantly lower median values of alkaline phosphatase \((1.6 \text{ vs. } 1.4 \times \text{ULN}; p = 0.027)\) and platelet count \((226 \text{ vs. } 189 \times 103/\text{ml}; p = 0.011)\), while aspartate aminotransferase \((\text{AST})\) showed a trend towards increased levels in patients with PDA \((6.2 \text{ vs. } 8.7 \times \text{ULN}; p = 0.049)\). Fatal outcome was more common in patients with PDA \((15\% \text{ vs. } 3.1\%; p < 0.001)\). Indeed, seven cases \((11\%)\) developed a liver-related death compared to 1.6% who did not suffer from drug allergy \((p < 0.001)\). Fatal cases with PDA were predominantly women \((78\% \text{ vs. } 55\% \text{ in non-fatal cases}; p = 0.282)\), and all of them presented with hepatocellular injury, jaundice, and required hospitalization. Moreover, fatal cases with PDA had increased total bilirubin levels \((14 \text{ vs. } 4.1 \times \text{ULN in non-fatal cases}; p < 0.001\)), but lower platelet count \((189 \text{ vs. } 226 \times 103/\text{ml in non-fatal cases}; p = 0.013)\). The most common pharmacological groups implicated in PDA were anti-infectives \((53\%)\), central nervous system agents and musculoskeletal system drugs \((14\% \text{ each})\). The most frequent drugs implicated in PDA were penicillin \((31\%)\), acetylsalicylic acid and codeine \((4\% \text{ each})\). In 16 patients with PDA \((26\%)\), the drugs that caused the allergy and the DILI belonged to the same ATC group, and in five cases \((8.1\%)\), they belonged to the same drug class.

**Conclusion:** Our findings support the hypothesis that a previous history of an immunological reaction related to drugs is associated with a worse outcome in patients with DILI. Patients with PDA presenting with hepatocellular damage, jaundice and lower platelet count were more likely to develop a fatal outcome.

**OS-008-YI**

**Tumor necrosis factor-inducible gene 6 protein suppresses release of cluster of differentiation 44 intracellular domain, and attenuates alcohol-induced liver damages and activation of hepatic stellate cells**

**Jinsol Han**, Chanbin Lee, Youngmi Jung.*1 PuSan National University, Department of Integrated Biological Science, Pusan, Korea, Rep. of South;* 2Pusan National University, Institute of Systems Biology, Pusan, Korea, Rep. of South;* 3Pusan National University, Department of Biological Sciences, Pusan, Korea, Rep. of South

**Email:** yjung@pusan.ac.kr

**Background and aims:** Alcohol-related liver disease \((\text{ALD})\) is global prevalent chronic liver disease caused by excessive and/or habitual alcohol consumption. However, the effective and practical treatment against ALD has not been developed. Previously, we have demonstrated that tumor necrosis factor-inducible gene 6 protein \((\text{TSG-6})\), one of cytokines released from mesenchymal stem cells, reduces liver fibrosis and induces successful liver repair in mice with chronically damaged liver. TSG-6 was also shown to attenuate activation of hepatic stellate cells \((\text{HSCs})\), a main player in liver fibrosis, by interacting with cluster of differentiation 44 \((\text{CD44})\). CD44 is cleaved and releases its intracellular domain \((\text{ICD})\) fragment, which translocates into the nuclear and turn on fibrotic genes, contributing to liver fibrosis. However, it remains unclear whether and how TSG-6 has protective function in ALD. Hence, we investigated therapeutic effect of TSG-6 and its underlying mechanism in mice with ALD.

**Method:** The demographics, clinical, biochemical and outcome information of patients included in the Spanish DILI Registry was analyzed, and the previous history of DPA was carefully examined.

**Results:** Of 913 cases with a first episode of DILI 62 (6.8%) patients presented with well-documented PDA (6.8%). Patients with PDA exhibited an older age \((60 \text{ vs. 54 years, respectively; } p = 0.011)\). Although hepatocellular injury predominated in both groups, compared to patients with no history of drug allergies, cases with PDA showed significantly lower median values of alkaline phosphatase \((1.6 \text{ vs. } 1.4 \times \text{ULN}; p = 0.027)\) and platelet count \((226 \text{ vs. } 189 \times 103/\text{ml}; p = 0.011)\), while aspartate aminotransferase \((\text{AST})\) showed a trend towards increased levels in patients with PDA \((6.2 \text{ vs. } 8.7 \times \text{ULN}; p = 0.049)\). Fatal outcome was more common in patients with PDA \((15\% \text{ vs. } 3.1\%; p < 0.001)\). Indeed, seven cases \((11\%)\) developed a liver-related death compared to 1.6% who did not suffer from drug allergy \((p < 0.001)\). Fatal cases with PDA were predominantly women \((78\% \text{ vs. } 55\% \text{ in non-fatal cases}; p = 0.282)\), and all of them presented with hepatocellular injury, jaundice, and required hospitalization. Moreover, fatal cases with PDA had increased total bilirubin levels \((14 \text{ vs. } 4.1 \times \text{ULN in non-fatal cases}; p < 0.001\)), but lower platelet count \((189 \text{ vs. } 226 \times 103/\text{ml in non-fatal cases}; p = 0.013)\). The most common pharmacological groups implicated in PDA were anti-infectives \((53\%)\), central nervous system agents and musculoskeletal system drugs \((14\% \text{ each})\). The most frequent drugs implicated in PDA were penicillin \((31\%)\), acetylsalicylic acid and codeine \((4\% \text{ each})\). In 16 patients with PDA \((26\%)\), the drugs that caused the allergy and the DILI belonged to the same ATC group, and in five cases \((8.1\%)\), they belonged to the same drug class.

**Conclusion:** Our findings support the hypothesis that a previous history of an immunological reaction related to drugs is associated with a worse outcome in patients with DILI. Patients with PDA presenting with hepatocellular damage, jaundice and lower platelet count were more likely to develop a fatal outcome.
OS-009
Efficacy of N-acetylcysteine to prevent anti-tuberculosis drug-induced liver injury: a randomized controlled trial
Supot Nimanong1, Kittichai Samaithongcharoen1, Watcharasak Chotiypayutta1, Suppareark Disayabutr2, Phunchai Charatcharowenwithaya1, Siwaporn Chanuvati1, Tawesak Tanwandee1, Cholpat Kongsangarn1, Sirima Saenphimphong2, Thiti Kaewkhamin1
1Division of Gastroenterology, Department of Medicine, Siriraj Hospital, Mahidol University, Bangkok, Thailand; 2Division of Respiratory Disease and Tuberculosis, Department of Medicine, Siriraj Hospital, Mahidol University, Bangkok, Thailand
Email: supotgi@gmail.com

Background and aims: Hepatitis is a common complication of anti-tuberculosis therapy, especially from isoniazid. Slow acetylator status in the N-acetyltransferase 2 (NAT2) genotype is a significant risk factor of anti-tuberculosis drug-induced liver injury (AT-DILI). There is scanty data of N-acetylcysteine (NAC) to prevent AT-DILI. This study was aimed to explore the efficacy of NAC to prevent clinically significant AT-DILI.

Method: We conducted a randomized, open-labeled, controlled trial in patients with newly diagnosed tuberculosis (TB) who received standard anti-TB regimen. Patients with HIV infection or chronic liver disease were excluded. The enrolled patients were randomized to using NAC 1,200 mg/day for 2 months (NAC group) or anti-TB drugs alone (control group). Acetylator status of NAT2 was determined and liver function tests were assessed at baseline, 2 weeks, 2 and 6 months. Clinically significant hepatitis was defined as elevated aspartate aminotransferase (AST) or alanine aminotransferase (ALT) more than 5 times of baseline levels.

Results: Among 82 enrolled patients, the mean age was 54 years, 53.7% were male, 30% were NAT2 slow acetylator, mean AST was 25 IU/ml, mean ALT was 22 IU/ml which were not significantly different between NAC (n = 40) and control group (n = 42). The prevalence of clinically significant hepatitis was 19.5%. All events occurred within 2 months and 50% occurred within 2 weeks. The number of patients in NAC group who had clinically significant hepatitis was 5% and 15% at 2 weeks and 2 months respectively, compared with 14.3% and 23.8% in control group, which were not significantly different. Among NAT2 slow acetylator patients (n = 24), there was no hepatitis in NAC group, whereas 50% of control group had hepatitis at 2 months, which was significantly different (p = 0.02). No adverse effect of NAC was observed. Multivariate analysis revealed NAT2 slow acetylator was the only predictor of AT-DILI (hazard ratio 3.60 [1.07–12.15]; p = 0.039).

Conclusion: Hepatitis is a common complication within 2 months of anti-TB therapy. NAC is safe and can prevent AT-DILI in patients with NAT2 slow acetylator.

Cirrhosis Experimental

OS-010-Y1
Dysregulation of the FXR-FGF19 pathway indicates impaired gut-liver axis signalling in patients with cirrhosis
Benedikt Simbrunner1, Benedikt Hofer1, Philipp Schwabl1, Kerstin Zinober1, Olexands Petrenko1, Claudia Fuchs1, Georg Semmler1, Rodrigo Marquescu2, Mattias Mandorfer1, Christian Datz1, Michael Trauner1, Thomas Reiberger1, 1Division of Gastroenterology and Hepatology, Department of Medicine III, Medical University of Vienna, Vienna, Austria; 2Department of Laboratory Medicine, Medical University of Vienna, Austria, Austria; 3Department of Internal Medicine, General Hospital Oberndorf, Teaching Hospital of the Paracelsus Medical University Salzburg, Salzburg, Austria
Email: thomas.reiberger@meduniwien.ac.at

Background and aims: Experimental studies demonstrated impaired Farnesoid X receptor (FXR)-fibroblast growth factor 19 (FGF19) signalling in liver disease. This study aimed to characterize the FXR-FGF19 pathway along the gut-liver axis in patients with cirrhosis and investigate associations with disease severity.

Method: Patients with cirrhosis undergoing hepatic venous pressure gradient measurement with or without transjugular liver biopsy (n = 107, n = 53 liver biopsy; n = 5 control livers without background disease) or colonoscopy with ileum biopsy (n = 37, n = 6 liver-healthy controls) were included. Expression of genes reflecting hepatic and intestinal FXR activation and intestinal barrier integrity was assessed by qPCR. Bile acid (BA) and FGF19 levels in the systemic circulation were measured.

Results: Systemic BA correlated with FGF19 levels (r = 0.461; p < 0.001) and were significantly higher in patients with decompensated vs. compensated cirrhosis. Hepatic SHP expression was significantly lower in patients with cirrhosis than in controls (p < 0.001), reflecting reduced hepatic FXR activation. FGF19 (r = 0.512, p < 0.001) and BA (r = −0.487, p < 0.001) levels in the systemic circulation correlated negatively with CYP7A1 expression in the liver, but not with hepatic SHP or CYP8B1, indicating dysfunctional FXR-dependent BA feedback signalling in the liver. Furthermore, decreased expression of FXR, SHP and FGF19 was observed in the ileum of patients with cirrhosis. Surprisingly, intestinal FGF19 gene expression was not linked to systemic FGF19 levels. The expression of intestinal barrier proteins...
zonula occludens-1, occludin, and alpha-5-defensin correlated with SHP and decreased in patients with decompensated cirrhosis as compared to controls.

Conclusion: FXR signalling is dysregulated at key intersections of the gut-liver axis in patients with cirrhosis. Decreased FXR activation in the ileum was associated with reduced expression of intestinal barrier proteins in patients with cirrhosis. These translational data are highly relevant for ongoing efforts investigating whether targeting the FXR-FGF19 pathway in the gut-liver axis may ameliorate bacterial translocation in cirrhosis.

OS-011-YI
Restoration of epithelial and vascular intestinal barriers and splanchnic macrophage function mediates the halting of bacterial translocation by propranolol in cirrhotic rats with ascites
Elisa Castillo1,2, Lorena Paule1,2, Leticia Munoz2,2, Manuel Ponce-Alonso3,4, Rosa del Campo3,4, Oscar Pastor4, Miguel A Ortega1,5, Melchor Álvarez-Mon1,2,6, Agustin Albillos1,2,4.
1Universidad de Alcalá: Facultad de Medicina y Ciencias de la Salud, Alcalá de Henares, Spain; 2CIBERehd-Liver and Digestive Diseases Networking Biomedical Research Centre, Spain; 3CIBERinfect- Center for Biomedical Research Network of Infectious Diseases, Spain; 4Hospital Universitario Ramón y Cajal IRYCIS, Madrid, Spain; 5CIBER-Center for Biomedical Research Network, Spain; 6Hospital Universitario Príncipe de Asturias, Alcalá de Henares, Spain
Email: elisa.castillo@uah.es

Background and aims: It has been hypothesized, but not proven, that restoration of the intestinal barrier damaged in cirrhosis could mediate the non-hemodynamic effects of propranolol (Prop). Prop has also been suggested to be associated with improved survival in acute-on-chronic liver failure (ACLF). We aimed to i) study the effects of Prop on the epithelial and vascular intestinal barriers, microbiota, and immune system of cirrhotic rats with ascites, and ii) explore whether any effect is also present in cirrhotic rats with ACLF.

Method: Cirrhosis was induced in Wistar rats by CCl4 gavage or bile duct ligation (BDL). Prop (Prop) (30 mg/kg/d, p.o.) or vehicle (Veh) was administered for 2 weeks from ascites development (Cirrhosis group, n = 40). ACLF was induced by LPS (6 microg/kg, i.p., 7 and 3 days before sacrifice) in rats already on Prop or Veh (ACLF group, n = 37). In the ileum, we evaluated the epithelial and vascular intestinal barriers, the microbiota adhering to the mucosa, bacterial translocation (BT), and peritoneal macrophage activation and function.

Results: Prop normalized the ileal microbiota of CCl4-cirrhotic rats by reducing the elevated proportions of Gammaproteobacteria, Verrucomicrobium, and Bacteroidota. BT was reduced 2.5-fold by Prop (Table). Compared to Veh, Prop increased ileal mucus thickness and ZO-1 and occludin expression and reduced the expression of TNF-alpha, IFN-gamma, and IL-23. Prop improved the ileal vascular barrier, as shown by reductions in the PV1/CD34 ratio and liver detection of dextran in an intestinal loop assay. Prop exerted similar effects in BDL cirrhotic rats. In peritoneal macrophages, Prop ameliorated the increased RT1B expression (mean ± SD: from 33.8% ± 5.4% to 18.5% ± 3.2%, p < 0.01) and TNF-alpha production (from 24.4% ± 6.9% to 5.8% ± 2.7%, p < 0.01) and restored the phagocytosis (from 8.3% ± 2.4% to 29.9% ± 5.3%, p < 0.01). BT (89% vs. 91%), ileal mucus thickness (9.5 ± 3.4 vs. 10.1 ± 4.6 µm), ZO-1 expression (0.09 vs. 0.11 R.E.), and PV1/CD34 (0.83 ± 0.13 vs. 0.75 ± 0.17) were similar in ACLF rats on Prop or Veh.
**ORAL PRESENTATIONS**

**Table:**

<table>
<thead>
<tr>
<th>Cell marker</th>
<th>Controls n = 5</th>
<th>Vehicle n = 7</th>
<th>Propranolol n = 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small intestine (ileum)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mucous thickness (micrometer)</td>
<td>87 ± 6</td>
<td>13 ± 7*</td>
<td>40 ± 15*</td>
</tr>
<tr>
<td>ZO-1 (R.E.)</td>
<td>1</td>
<td>0.15*</td>
<td>0.65*</td>
</tr>
<tr>
<td>Occludin (R.E.)</td>
<td>1</td>
<td>0.22*</td>
<td>0.59*</td>
</tr>
<tr>
<td>TNF-alpha (R.E.)</td>
<td>1</td>
<td>121.6 ± 3.3*</td>
<td>73.8 ± 1.3*</td>
</tr>
<tr>
<td>IFN-gamma (R.E.)</td>
<td>1</td>
<td>3.6*</td>
<td>1.9*</td>
</tr>
<tr>
<td>IL-23 (R.E.)</td>
<td>1</td>
<td>2.2*</td>
<td>1.6*</td>
</tr>
<tr>
<td>PV1/CD34</td>
<td>0.04 ± 0.03</td>
<td>0.81 ± 0.11*</td>
<td>0.52 ± 0.09*</td>
</tr>
<tr>
<td>Occludin (R.E.)</td>
<td>0</td>
<td>11 ± 3</td>
<td>3 ± 1*</td>
</tr>
<tr>
<td>Bacterial translocation</td>
<td>0</td>
<td>86%</td>
<td>33%</td>
</tr>
</tbody>
</table>

*†p < 0.001 vs. healthy controls; †p < 0.05 vs. vehicle; R.E., relative expression.

**Conclusion:** Prop halts gut and hepatic BT in cirrhotic rats with ascites, but not in those with ACLF. Prop mediates these effects by restoring the integrity of the epithelial and vascular intestinal barriers and the activity of the splanchnic innate immune system.

**OS-012-YI**

Novel insights on liver endothelial mechanobiology in cirrhosis:

role of calcium integrin-binding protein 1

Cong Wang1, Sonia Selcean1, Eric Felli1, Yeldos Nulan1, Sergi Guixe-Muntet2, Juanjo Lozano2, Jaime Bosch1, Annalisa Berzigotti1, Jordi Gracia-Sancho1,2, 1University of Berne and Inselspital, Department of Visceral Surgery and Medicine, Berne, Switzerland; 2IDIBAPS-Hospital Clinic Barcelona-CIBEREHD, Liver Vascular Biology, Barcelona, Spain

Email: jgracia@recercaclinic.cat

**Background and aims:** Liver microcirculatory malfunction is a key event in liver cirrhosis and portal hypertension, being liver sinusoidal endothelial cells (LSECs) central players in this pathological situation. We previously delineated how increased liver stiffness per se dysregulates sinusoidal cells phenotype by altering cells nuclear morphology. Reversing this mechanism may open novel therapeutic approaches based on targeting stiffness-modulated molecular factors (SMMFs). A possible SMMFs is calcium and integrin-binding protein-1 (CIB1), a small, ubiquitously expressed protein involved in many mechanotransduction and dysfunction in liver cirrhosis. The reversibility of the effects of CIB1 makes it, or its downstream molecular pathways, potential tool for therapy. The present work aimed at investigating the mechanotransduction mechanisms promoting endothelial dedifferentiation in cirrhosis, with a particular focus on CIB1 mechanobiology.

**Method:** Primary LSECs were cultured 48 h on tunable stiffness polyacrylamide gels (healthy, soft stiffness: 0.5 kPa vs. pathologic: 30 kPa). RNAseq was performed and dysregulated pathways were determined by Ingenuity Pathway Analysis. CIB1 expression and cellular localization was measured in healthy and cirrhotic human and rat liver tissues and cells. The effects of depleting CIB1 using siRNA were investigated in endothelial cells cultured at pathologic stiffness.

**Results:** Pathologic stiffness (30 kPa) induced significant changes in LSECs transcriptome as demonstrated by the dysregulation of 224 genes in comparison to soft substrate (p < 0.05; FC 1.5). Top dysregulated pathways were related to CIB1 functions, involving integrin, sirtuin, hepatic fibrosis, actin cytoskeleton and mTOR signaling. Immunofluorescence on healthy LSECs and HUVECs cultured at 0.5 and 30 kPa confirmed that CIB1 significantly translocates to the cytoplasm on a stiff substrate (+46.7% and +93.3% respectively), which was prevented using nuclear mechanotransduction inhibitors (cytochalasin D plus nocodazole). Importantly, overexpression and translocation of CIB1 were confirmed in human cirrhotic liver (+20%) and primary cirrhotic LSEC (+40.8%). Cirrhotic rat LSECs showed significant real-translocation into the nucleus when cultured on healthy-like substrate (−231.6%) (all p < 0.05). Finally, CIB1 knock-down reversed LSECs nuclear morphology to a healthy spherical shape on 30 kPa, which was associated with improved LSECs phenotype as demonstrated by the amelioration of profiles related to LSECs dysfunction such as inflammation, DNA damage and repair, nitric oxide signal transduction, ROS scavenging activity, as well as a reduced nuclear membrane trafficking.

**Conclusion:** We demonstrate that CIB1 is a key regulator of LSECs mechanotransduction and dysfunction in liver cirrhosis. The reversibility of the effects of CIB1 makes it, or its downstream molecular pathways, potential novel therapeutic targets for chronic liver disease and portal hypertension.

**OS-013**

ETS2 alleviates HMGB1 and LPS triggered excessive inflammation in acute-on-chronic liver failure

Lulu He1, Xi Liang2, Jiaojiao Xin3, Dongyan Shi3, Jinjin Luo1, Jiaqi Li1, Jing Jiang1, Jun Li1, 1The First Affiliated Hospital, Zhejiang University School of Medicine, State Key Laboratory for Diagnosis and Treatment of Infectious Diseases, Collaborative Innovation Center for Diagnosis and Treatment of Infectious Diseases, Hangzhou, China; 2Taizhou Central Hospital (Taizhou University Hospital), Precision Medicine Center, Taizhou, China

Email: lijun2009@zju.edu.cn

**Background and aims:** Hepatitis B virus-related acute-on-chronic liver failure (HBV-ACLF) is characterized by rapid deterioration of liver function with pre-existing chronic liver diseases (CLDs), and shows high short-term mortality. This study aims to identify potential biomarkers in ACLF pathogenesis and clarify the potential mechanisms.

**Method:** Peripheral blood mononuclear cells from patients with HBV-ACLF (n = 50), patients with chronic liver disease (n = 19) and healthy subjects (n = 14) were subjected to transcriptome analysis. The potential biomarkers ETS2 were subsequently validated in vivo and in vitro with myeloid-specific ETS2 deficiency mice and ETS2 deficient macrophages.

**Results:** Transcriptome analysis identified ETS2 as the top differentially expressed genes. ETS2 expression levels were significantly higher in ACLF patients than patients with chronic liver disease and normal controls (all p < 0.001). High accuracy of ETS2 for ACLF short-term mortality (28%-90-day) prediction were observed (AUC value: 0.9083/0.7725) (all p < 0.001). The activation of innate immune and the suppression of adaptive immune were observed in ACLF patients with high ETS2 expression. In vivo studies showed that myeloid-specific ETS2 deficiency aggravates the impairment of liver function, promotes the induction of pro-inflammatory cytokines and hepatocyte apoptosis. Ablation of ETS2 in macrophages increased the levels of high-mobility group box 1 (HMGB1) and LPS-induced IL-6 and IL-1 beta significantly (p < 0.05), and nuclear factor-kappa B inhibitor abolished the suppressive effect of ETS2.
Conclusion: Our study describes the role of ETS2 as a prognostic biomarker of ACLF patients. ETS2 protect mice from liver failure via alleviation of HMGB1-/lipopolysaccharide-triggered inflammation response in macrophages, and serve as a potential therapeutic target for ACLF.

OS-014-YI
Longitudinal change in the plasma metabotype indicates therapeutic plasma exchange in acute-on chronic liver failure patients should be done every 12 hours
Jaswinder Maras1, Gaurav Tripathi1, Vasundhra Bindal1, Babu Mathew1, Manisha Yadav1, Nupur Sharma1, Sadam H Bhat1, Neha Sharma1, Sushmita Pandey1, Abhishak Gupta1, Meenu Baijai2, Shiv Kumar Sarin3, Rakhi Maiwall3.
1Institute of Liver and Biliary Sciences, Department of molecular and cellular medicines, New Delhi, India; 2Institute of Liver and Biliary Sciences, Department of Transfusion Medicine, Institute of Liver and Biliary Sciences, New Delhi, India; 3Institute of Liver and Biliary Sciences, Department of hepatology, New Delhi, India
Email: jassi2param@gmail.com

Background and aims: Therapeutic plasma exchange (TPE) has shown some benefits in ACLF patients as it reduces inflammatory cytokines, albumin/water-bound toxins and improves the survival of ACLF patients. Analogous changes in the plasma metabolic landscape post-TPE in ACLF patients are unknown and could predict non-survival or TPE requirements.

Method: In this study, TPE was performed on ACLF patients (N = 42), and plasma samples of patients were collected at pre-therapy (baseline), mid-therapy, post-therapy, and at 6hrs and 12hrs post-therapy, respectively. A total of 250 plasma samples were subjected to untargeted metabolomics using HRMS. Temporal change in the plasma metabolic profile of non-survivors was compared to survivors.

Figure: (abstract: OS-014-YI).
Gut microbiome/organ crosstalk

OS-015 Unexpected function of the cell cycle kinase Cyclin E/CDK2 for control of intestinal barrier: implications for gut-liver communication, liver fibrosis and liver cancer

Anna Verwaayen1, Julia Hennings1, Christian Penners1, Adrien Guillo2, Tobias Otto3, Nicole Treichel3, Thomas Clavel3, Christian Trautwein1, Yulia Nevzorova4, Christian Liedtke1.

1. Institute of Medical Microbiology, Universitätsmedizin Berlin, Department of Hepatology and of Organ Failure Research, Guangdong Provincial Key Laboratory of Viral Hepatitis Research, Department of Infectious Diseases, Nanfang Hospital, Southern Medical University, China

Email: cliedtke@ukaachen.de

Background and aims: E-type Cyclins (i.e. CCNE1, CCNE2) and their associated Cyclin-dependent kinase 2 (CDK2) control the transition from quiescence to the S-phase of the cell cycle. In addition, recent data point to several non-canonical functions of E-cyclins. In previous work, we demonstrated that constitutive deletion of the Cyclin E1 gene (Ccne1) in mice protected from liver fibrosis and hepatocellular carcinoma (HCC), while the underlying mechanisms are incompletely understood. In the present study, we tested the hypothesis that Ccne1 expression contributes to liver fibrosis and hepatocarcinogenesis through modulation of the gut-liver axis and activation of Hepatic Stellate Cells (HSCs).

Method: We generated mice deficient for the whole Cyclin E/CDK2 complex in intestinal epithelial cells (i.e. Ccne1, Ccne2, and Cd2, referred to as TKO mice). TKO mice at the age of twelve weeks were analysed for intestinal proliferation, gut barrier function, microbiota profiles and liver phenotypes. We also generated mice with deletion of Ccne1 in Lecithin retinol acyltransferase (Lrat)-expressing cells (Ccne1Lrat) targeting HSCs. Ccne1Lrat mice were either subjected to the Carbon tetrachloride/Diethylnitrosamine (DEN/CCl4) model to induce liver fibrosis and HCC, or fed with the Lieber-DeCarli alcohol liquid diet to challenge the intestinal barrier. Identification of Lrat-expressing cells in the gut was performed using Lrat-cre reporter mice and multiplex immunostaining.

Results: Unexpectedly, TKO mice were characterized by enhanced gut barrier and up-regulation of Tight junction protein 1 (Tjpl), which was associated with reduced gene expression of Toll-like receptor 4 (Tlr4) in the liver. Additionally, TKO mice showed changes in microbial composition. Ccne1Lrat mice had significantly reduced liver fibrosis and HCC burden after DEN/CCl4 treatment, which was related to impaired HSC activation and reduced hepatic Tlr4 signaling. Importantly, Lrat-cre driven gene deletion did not only target HSCs, but also intestinal myofibroblasts and subpopulations of epithelial cells in the gut. Accordingly, Ccne1Lrat mice had reduced intestinal permeability and improved liver injury after chronic ethanol feeding.

Conclusion: Cyclin E1 is an important driver of liver fibrosis and HCC. These functions are mediated at least in part through HSC activation. We provide unexpected evidence that the Cyclin E/CDK2 complex is involved in the control of intestinal permeability. Thus, reduced liver fibrosis and HCC as found in Ccne1Lrat mice might be supported by enhanced intestinal barrier and modulation of the gut-liver crosstalk.

OS-016 Association of gut microbiome with prospective risk of hepatocellular carcinoma in chronic hepatitis B patients: a prospective nested case-control study

Zhihian Lan1, Qiuhong You1, Kaifeng Wang1, Rong Fan1, Xieer Liang1, Dekai Zheng1, Jinlin Hou1, Jian Sun1.

1. State Key Laboratory of Organ Failure Research, Guangdong Provincial Key Laboratory of Viral Hepatitis Research, Department of Infectious Diseases, Nanfang Hospital, Southern Medical University, China

Email: doctorsunjian@qq.com

Background and aims: Case-control studies showed a possible relationship between gut microbiome and hepatocellular carcinoma (HCC), but longitudinal study was lacking. Here, we aimed to prospectively investigate the association of gut microbiome with subsequent risk of HCC in chronic hepatitis B (CHB) patient.

Method: SEARCH-B Study (NCT02167503) was conducted to evaluate the effect of anti-viral treatment on long-term outcome on patients with CHB, which have included 3798 patients so far. Fecal samples have been collected when patients were enrolled in this cohort. A total of 70 incident HCC cases were ascertained after a median follow-up of 2.9 years. Using a prospective nested case-control design, 70 incident HCC cases and 280 controls were selected at a ratio of 1:4 by propensity score matching. 16S rRNA gene sequencing was performed to characterize the composition of gut microbiota. Cox proportional hazards models were used for the association of different taxonomies as well as KEGG pathways with overall HCC risk adjusted for age, gender, albumin, platelet and body mass index (BMI). Spearman correlation analysis was performed on different taxonomies and KEGG pathways to assess their correlations. The significant threshold is p < 0.05.

Results: At the order level, we found that Gemellales was associated with an increased risk of HCC with an HR (95% CI) of 1.22 (1.05–1.42). At the family level, a higher risk of HCC was also linked to greater richness of Gemellaceae and Peptostreptococcaceae with HR (95% CI) of 1.19 (1.02–1.37) and 1.18 (1.03–1.35) respectively. At the genus level, Blautia was significantly associated with higher risk of HCC (HR (95% CI) of 1.35 (1.08–1.70)) and was also associated with a reduced risk of HCC (HR (95% CI) of 0.70 (0.49–1.00)).
OS-017-YI
Serum villin-1 level—a tell-tale sign of gut barrier failure in patients with cirrhosis and acute decompensation
David Tornai1, Boglárka Balogh1, Aniko Csillag1, Budai András2, András Kiss3, Péter Antal-Szalmás3, Gábor Méhes4, Lukács Baráth4, Tamás Tornai1, Istvan Tornai1, Zsuzsanna Vitalis1, Nóra Sipeki1, Patricia Kovats1, Jonel Trebicka7,8, Maria Papp1. 
1University of Debrecen, Division of Gastroenterology, Department of Internal Medicine, Faculty of Medicine, Debrecen, Hungary; 2Semmelweis University, Department of Pathology, Forensic and Insurance Medicine, Faculty of Medicine, Budapest, Hungary; 3University of Debrecen, Department of Laboratory Medicine, Faculty of Medicine, Debrecen, Hungary; 4University of Debrecen, Department of Gastroenterology, Department of Internal Medicine, Faculty of Medicine, Debrecen, Hungary; 5Semmelweis University, Institute of Pathology, Forensic Medicine, Faculty of Medicine, Budapest, Hungary; 6University of Debrecen, Department of Gastroenterology, Department of Internal Medicine, Debrecen, Hungary; 7University of Geneva, Departement of rhumatology, Geneve, Switzerland; 8University of Geneva, Department of rheumatology, Geneve, Switzerland
Email: papp.maria@med.unideb.hu

Background and aims: Dysfunctional and leaky gut barrier are characteristics of cirrhosis and associated with disease progression and mortality. Utility of biomarkers, indicating the presence and extent of intestinal barrier dysfunction, remains a controversial issue in the prognosis and risk stratification of decompensated cirrhosis. Villin-1 (VIL1) is an actin-bundling protein, present in the intestinal, renal and biliary brush border. VIL1 is downregulated in response to chronic injury and diverse cellular stressors, including the microbiome, while during acute stress it is redistributed from the brush border to the basolateral membrane, which facilitates its release into the blood. We investigated clinical significance of serum VIL1 levels in patients with cirrhosis and acute decompensation (AD).

Method: Patients (n = 86) and healthy controls (HC; n = 50) from the MICROB-PREDICT cohort were tested for serum VIL1 by ELISA. Four patient severity sub-groups were defined according to the PREDICT study (stable AD (SDC), unstable AD (UDC), pre-ACLF and ACLF [acute-on-chronic liver failure]). VIL1 immunohistochemistry (IHC) evaluation of duodenum biopsy was performed in a sub-cohort of the patients (n = 13) and controls (n = 11).

Results: Serum VIL1 levels were decreased in SDC patients (median [IQR]: 6.5 [4.9–10.4] vs 12 [8.4–14.9] ng/ml, p < 0.001) compared to controls and increased in more severe disease. This difference was confirmed in duodenum tissue by IHC. Significantly higher serum VIL1 levels were detected in pre-ACLF patients compared to those who did not develop ACLF (10.7 [7.8–22.9] vs 6.9 [5.0–10.5] ng/ml, p = 0.004), while in ACLF survivors decreased VIL1 levels were observed on day-7 compared to day-0 (9.8 [7.3–14.6] vs 12.7 [9.7–18.1] ng/ml, p = 0.010). High serum VIL1 levels (≥16.17 ng/ml) predicted 90-day mortality (AUROC:0.73, 95%CI: 0.563–0.888, p = 0.013) and in combination with high (≥50) CLIF-C AD score the prediction accuracy was excellent (both is high: 75%; all other together: 8% mortality, LogRank p < 0.001). High serum VIL1 level was able to predict mortality both in the presence (20% vs 62% LogRank p = 0.030) and absence (14% vs 40% LogRank p = 0.008) of renal failure.

Conclusion: Besides the six organ failures included in CLIF-SOFa, patients with cirrhosis and AD may also develop intestinal failure, as an additional organ failure. Serum VIL1 level could reliably indicate this organ failure and made the mortality risk stratification performed by CLIF–C OF score more accurate. The MICROB-PREDICT project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 825694. This abstract reflects only the author’s view, and the European Commission is not responsible for any use that may be made of the information it contains.

OS-018-YI
Offspring of obese mothers have a higher risk for hepatocellular carcinoma through the transmission of an altered gut microbiome
Beat Moeckli1,2, Valeire Daulea1, Benoît Gilbert1, Andrea Pelosi1, Graziano Oldani1, Sofia El Hajji2, Florence Slits2, Quentin Gex2, Stéphanie Lacotte2, Christian Tosò1,2, 1Geneva University Hospitals, Department of Surgery, Geneva, Switzerland; 2University of Geneva, Transplantation and hepatology laboratory, Geneve, Switzerland; 3University of Geneva, Departement of rhumatology, Geneve, Switzerland
Email: beat.moeckli@gmail.com

Background and aims: The obesity pandemic leads to rising number of obese women of reproductive age. Emerging evidence suggests that maternal obesity has a negative impact on the long-term health of offspring. Additionally, obesity is an independent risk factor for malignancies and particularly hepatocellular carcinoma (HCC). The aim of our study is to investigate the impact of maternal obesity on the risk for HCC in the offspring and identify potential mechanisms of transmission.

Method: Female mice were fed either a high fat (HFD) or a normal diet (ND) before mating. Offspring received ND throughout life. In the offspring we studied the gut microbiome, liver histology, inflammatory patterns and tumor load in a diethylnitosamine induced HCC mouse model. To normalize the gut microbiome, we co-housed offspring of HFD and ND mothers after weaning. The composition of the gut microbiota was assessed through 16S rRNA sequencing.

Results: Maternal obesity induced a distinguishable shift in the microbial composition towards decreased microbial diversity (2.56 vs. 2.92, p = 0.0089), increased proportions of Firmicutes and decreased abundance of Bacteroidota. Only at 40 weeks female HFD offspring developed steatosis (9.43 vs 3.09%, p = 0.0023) and a higher
number of inflammatory infiltrates (4.8 vs 1.0, p = 0.018) compared to ND offspring. Additionally inflammatory markers such as TLR4, MHCII, INOS and CXCL16 were overexpressed in offspring of obese mothers. A higher proportion of female HFD offspring developed liver tumors after DEN induction (79.8 vs 37.5%, p = 0.0084) with a higher total tumor volume at 36 weeks (234 vs 3 µm³, p = 0.0041). Co-housing offspring of obese and lean mothers corrected the gut microbiome composition and co-housing normalized the tumor number and volume to the level of ND offspring. Abundance of Erysipelotrichaceae was positively (R = 0.46, p = 0.003) and Lachnospiraceae negatively (R = −0.35, p = 0.029) correlated with tumor load.

**Conclusion:** Maternal obesity increases the susceptibility for chronic liver disease and HCC in the offspring. The transmission of an altered gut microbiome appears to play an important role in this increased risk profile.

**OS-019**

**Lactobacillus protects against leaky gut, future decompensation, and hepatic encephalopathy in patients with cirrhosis**

Patricia Bloom1, Vincent B. Young1, Anna Lok1. 1University of Michigan, United States

Email: ppbloom@med.umich.edu

**Background and aims:** Several complications of cirrhosis result from the translocation of bacteria or their products across a leaky gut; however, little is known about how mucosal bacteria (lining the intestinal epithelia) influence intestinal permeability and clinical cirrhosis outcomes. We aimed to assess if mucosal bacteria associate with intestinal permeability and predict future hospitalization for hepatic decompensation.

**Method:** We obtained duodenum, ileum, and colon tissue biopsies from patients with cirrhosis. Patients were excluded if they recently used non-rifaximin antibiotics or immunosuppression. Composition of the mucosal microbiota was determined via 16S rRNA gene sequencing and epithelial permeability assessed by measuring transepithelial electrical resistance (TEER). Patients were followed until they met the primary outcome of hospitalization for cirrhosis decompensation or were censored at last visit, liver transplantation, or death. Associations between microbiota relative abundance and clinical outcomes were assessed in a beta binomial model with a false discovery rate of 0.05.

**Results:** We studied 58 patients with cirrhosis and obtained biopsies from 49 duodenums, 16 ileums, and 20 colons. Patients had median MELD 8 (IQR 7, 10), 62% were male, 16 (28%) had a history of hepatic encephalopathy (HE) and 28 (49%) had a history of ascites. In follow-up of median 192 days (IQR 79, 548), 14 were hospitalized for cirrhosis decompensation after median 90 days (IQR 50, 173), 7 of which were due to overt HE (2 of these patients had prior HE, 5 did not).

Including all gut segments, a beta binomial model found 37 mucosal bacteria were associated with future hospitalization for decompensation (5 positively associated, 32 protective) and 28 were associated with future overt HE episodes (5 positively associated, 23 protective). Of the taxa identified in these models, a Lactobacillus was significantly correlated with higher TEER (less leaky gut; r² = 0.23, p = 0.05), and protective of future overt HE and hospitalization for decompensation (Figure).

Sensitivity analyses were performed on duodenal samples only, the gut segment with the largest number of samples. A beta binomial model found 17 mucosal bacteria were associated with hospitalization for decompensation and 15 with future overt HE. Duodenal *Lactobacillus* was protective of future overt HE and decompensation.

**Conclusion:** Certain mucosal bacteria are associated with future cirrhosis decompensation hospitalizations and overt HE. *Lactobacillus*, a known probiotic, was associated with intact epithelial permeability and protected against HE and cirrhosis decompensation. Targeting mucosal microbiota and intestinal permeability may prevent HE and hospitalization among patients with cirrhosis.

**Figure:** (abstract: OS-019): (A) Proposed causative pathway to cirrhosis decompensation; (B) Top 10 taxa that predicted hospitalization for decompensation; (C) Top 10 taxa that predicted overt hepatic encephalopathy
Liver tumours – Basic

OS-020-YI
Multiplatform single cell spatial dissection of the invasive front of hepatocellular carcinoma (HCC) reveals molecular insights into tumor progression
Josephine Zhang1, Nia Adeniji2, Akanksha Suresh3, Lea Lemaître1, Vivek Charu4, Brendan Visser5, C. Andrew Bonham6, Reumathy Dhanasekaran1. 1Stanford University School of Medicine, Medicine- Division of Gastroenterology and Hepatology, Stanford, United States; 2UCSF School of Medicine, Medicine, San Francisco, United States; 3The Johns Hopkins University School of Medicine, Medicine, Baltimore, United States; 4Stanford University School of Medicine, Pathology, Stanford, United States; 5Stanford University School of Medicine, Surgery- General Surgery, Stanford, United States; 6Stanford University School of Medicine, Surgery- Multi-Organ Transplantation, Stanford, United States
Email: dhanaser@stanford.edu

Background and aims: Cells at the invasive edge of a tumor evade immune surveillance and drive tumor progression. However, characterization of HCC cells along the tumor edge has remained elusive. Here, we used three powerful spatial technologies to perform multiregional profiling of primary HCC lesions and identify how heterogeneous tumor evolution from the central core to the invasive edge drives disease progression.

Method: We prospectively obtained 30 tissue samples from HCC tumor specimens of 7 patients undergoing surgical resection, under appropriate IRB approval. We generated a tissue microarray of these samples to analyze 48,458 cells from three distinct regions: tumor core (7 samples, 15,668 cells), invasive edge (14 samples, 23,234 cells), and uninvolved liver (10 samples, 9,556 cells). We used CODEX, a 42-plex immunofluorescent imaging approach, to identify cell

Figure 1. A) Study design: Multi-region sampling of HCC tissue followed by single cell spatial analysis. We use three powerful technologies: CODEX, a 42-plex immunofluorescent imaging approach Nanostring GeoX a spatial transcriptomic platform and RNAscope, an mRNA FISH assay B) CODEX reveals enrichment of CK19+ cancer stem-like cells at the invasive edge and their interaction with exhausted CD8+ T cells. C) Spatial transcriptomics determines gene expression in the CK tumor compartment and CK/-CD45+ TME. PCA plot indicates separate clusters between tumor core and invasive edge. The TGFβ pathway is the most upregulated pathway along the edge. D) mRNA FISH validates TGFβ upregulation, showing that TGFβ1 transcripts are more abundant at the invasive edge than in the tumor core.

Figure: (abstract: OS-020-YI).
populations and interactions. A spatial transcriptomic platform, Nanostring GeoMx, determined gene expression and molecular pathway involvement of 1,812 genes in regions of interest classified into tumor (CK+), and microenvironment (TME) (CK-CD45+). We used fluorescent RNA in situ hybridization (mRNA FISH) to validate gene expression at the single-cell level (Fig. 1A).

**Results:** We identified 20 unique tumor, immune, and stromal cell types in our samples with CODEX. The invasive edge had a higher proportion of endothelial cells (p = 0.003), CD4+ T cells (p = 0.01), exhausted CD8+ T cells (p = 0.04), and fibroblasts (p = 0.04) than the uninvolved liver. Moreover, the edge had a higher proportion of CK19+ cancer stem-like cells (p = 0.03) than the tumor core. The CK19+ cancer stem-like cells interacted with exhausted CD8+ T cells (p = 0.01), CD4+ T cells (p = 0.02), and fibroblasts (p = 0.04) more frequently at the invasive edge than at the core (Fig. 1B). We also observed more frequent interactions between CD206+ and CDL1+ M2-like macrophages and CD8+ T cells (p = 0.02). Spatially resolved transcriptomics identified 141 genes that were differentially expressed in the CK+ tumor compartment of invasive edge vs the core, including upregulation of several genes which promote pro-tumoral inflammation (SERPING1, IL6ST, CD81, NCR1, PSEN1). The TME of the invasive edge vs the core showed differential expression of 38 genes including upregulation of immune modulating genes (CD164, ST6GAL1, ITCH) (Fig. 1C). Enrichment analysis revealed that TGF-beta pathway was the top upregulated pathway in the invasive edge vs the core, including upregulation of several genes which promote pro-tumoral inflammation. The frequency of CD14+CD11b+HLA-DR+ and CD11b+Ly6C+Ly6C+ macrophages was elevated in blood and liver tissues of clinical and DEN-induced HCC, respectively, whereas the frequency of hepatic CD8+ T cells was decreased compared to healthy controls. From the adoptive transfer of eGFP+ BM cells, we found that CD11b+Ly6C+Ly6C+ macrophages were located particularly near the aHSCs in the peritumour area, expressing high level of CX3CR1, Arg1, and iNOS. In CX3CR1-depleted HCC-bearing mice, the expression of Arg1, iNOS and IL-10 was reduced in hepatic immune cells along with markedly reduced interaction of Ly6C+ cells with CX3CL1+ aHSCs. Ly6C+ BM cells co-cultured with aHSCs revealed that immature Ly6C+ BM cells highly expressed Arg1 while the expression of genes related to retinoid metabolism (Raldh1, RARαβ, RXRαβ) was elevated in aHSCs, indicating that Arg1 expression in immature macrophages may have been induced by retinoids produced from aHSCs. In fact, co-incubation of CD8+ T cells with Ly6C+ BM cells pre-co-cultured with aHSCs exhibited suppressed proliferation of CD8+ T cells, supporting the acceleration of HCC. These findings in vitro were further confirmed by reduced hepatic tumorigenesis in Ly6C+Arg1− mice compared to controls.

**Conclusion:** We showed that CX3CR1-expressing CD11b+Ly6C+Ly6C+ cells migrate and interact with aHSCs in the peritumour region. Retinoids produced from the aHSCs induce Arg1 expression in the migrated immature macrophages, subsequently depriving CD8+ T cells of arginine to be used for proliferation and promoting the progression of HCC. By proposing the abovementioned mechanism, we suggest CX3CR1 and Arg1 as potential therapeutic targets of HCC.

**OS-022**

**In vivo cancer-associated fibroblast specific gene silencing for anti-stromal therapy in primary liver cancer using novel siRNA loaded polypeptide nanoparticles**

Paul Schneider1, Leon Capelaö1, Heyang Zhang2, Matthias Barz2, Barbara Schoers2, Oezlem Akilli-Oeztuerk1, Mustafa Diken3, Karina Benderski4, Alexandros Marios Sofias3, Twan Lammers4, Markus Möhler4, Peter Galle4, Matthias Bros6, Leonard Kaps5.

1University medicine at the Johannes Gutenberg University in Mainz, 1st Medical Unit, Mainz, Germany; 2Leiden Academic Center for Drug Research, Netherlands; 3TRON-Translational Oncology, Germany; 4Institute for Experimental Molecular Imaging, RWTH University Hospital Aachen, Department of Nanomedicine and Theranostics, Germany; 5University Medical Center Mainz, First Department of Medicine, Germany; 6University Medical Center Mainz, Department of Dermatology, Germany

Email: leonardkaps@gmail.com

**Background and aims:** Cancer associated fibroblasts (CAF) support tumor growth and metastasis in the tumor microenvironment (TME) and are therefore promising target cells for anti-stromal therapy in solid tumors [Kaps, Schuppan; Cells 2020]. We have designed a novel polypeptide nanoparticle (NP) with improved endosomal escape for small interfering RNA (siRNA) delivery into stroma cells of hepatocellular carcinoma (HCC) [Birke et al., Proc. Polym. Sci. 2018]. NPs loaded with CAF targeting siRNA were tested in a murine model of primary liver cancer.

**Method:** In vitro screening for CAF relevant target genes revealed that the CAF derived microfibrillar-associated protein 5 (MFAP-5) was highly upregulated in fibroblasts (3T3 fibroblasts and MHSC-SV40 hepatic stellate cells) when co-cultured with HCC cells (DB1HepaI-6). NPs have been designed utilizing the triblock copolymer polysarcosine-b-poly(benzyl glutamic acid)-b-polysilane, which enables co-loading of siRNA and desloratadin, an antihistamine that triggers endosomal release of siRNA after cell

**Conclusion:** We showed that CX3CR1-expressing CD11b+Ly6C+Ly6C+ cells migrate and interact with aHSCs in the peritumour region. Retinoids produced from the aHSCs induce Arg1 expression in the migrated immature macrophages, subsequently depriving CD8+ T cells of arginine to be used for proliferation and promoting the progression of HCC. By proposing the abovementioned mechanism, we suggest CX3CR1 and Arg1 as potential therapeutic targets of HCC.

**OS-021-Y1**

**Myeloid-derived cells suppress CD8+ T cells by arginase-1 through interaction with stellate cells in the microenvironment of hepatocellular carcinoma**

Sun Hong Choi1, Jong-Min Jeong1, Kyurea Kim1, Won-il Jeong1, 2.

1Korea Advanced Institute of Science and Technology (KAIST), Graduate School of Medical Science and Engineering (GSMSE), Daejeon, Korea, Rep. of South; 2Center for the Hepatic Glutamate and Its Function, KAIST, Daejeon, Korea, Rep. of South

Email: wijeong@kaist.ac.kr

**Background and aims:** Hepatocellular carcinoma (HCC) is one of the leading causes of deaths worldwide and its occurrence relies heavily on the onset of liver cirrhosis. Various hepatic and immune cells, namely hepatic stellate cells and macrophages, are reported to be activated near the tumour area during HCC development, and yet their mechanisms of migration or intercellular interaction have not been fully elucidated. Here, we aim to investigate the mechanism regulating the migration of pro-tumorigenic immature macrophages and their interaction with activated HSCs (aHSCs) in the HCC microenvironment.

**Method:** 2-week-old male mice were intraperitoneally injected with 20 mg/kg diethylnitrosamine (DEN) for HCC induction and bred for 40 weeks for tumour formation. eGFP−, CX3CR1GFP/GFP, or Arg1−VFP Ly6C− bone marrow (BM) cells were adoptive transferred to observe the migration of immature macrophages and their interaction with aHSCs via arginase-1 (Arg1) expression. Mice with myeloid-specific depletion of Arg1 (Lyz2CreArg1−) were utilised to observe the changes in CD8+ T cell proliferation and HCC progression. In vitro co-culture system was adopted to further confirm the findings in vivo.

**Results:** The frequency of CD14+CD11bHLA-DR− and CD11b+Ly6C+Ly6C+ macrophages was elevated in blood and liver tissues of clinical and DEN-induced HCC, respectively, whereas the frequency of hepatic CD8+ T cells was decreased compared to healthy controls. From the adoptive transfer of eGFP+ BM cells, we found that CD11b+Ly6C+Ly6C+ macrophages were located particularly near the aHSCs in the peritumour area, expressing high level of CX3CR1, Arg1, and iNOS. In CX3CR1-depleted HCC-bearing mice, the expression of Arg1, iNOS and IL-10 was reduced in hepatic immune cells along with markedly reduced interaction of Ly6C+ cells with CX3CL1+ aHSCs. Ly6C+ BM cells co-cultured with aHSCs revealed that immature Ly6C+ BM cells highly expressed Arg1 while the expression of genes related to retinoid metabolism (Raldh1, RARαβ, RXRαβ) was elevated in aHSCs, indicating that Arg1 expression in immature macrophages may have been induced by retinoids produced from aHSCs. In fact, co-incubation of CD8+ T cells with Ly6C+ BM cells pre-co-cultured with aHSCs exhibited suppressed proliferation of CD8+ T cells, supporting the acceleration of HCC. These findings in vitro were further confirmed by reduced hepatic tumorigenesis in Ly6C+Arg1− mice compared to controls.

**Conclusion:** We showed that CX3CR1-expressing CD11b+Ly6C+Ly6C+ cells migrate and interact with aHSCs in the peritumour region. Retinoids produced from the aHSCs induce Arg1 expression in the migrated immature macrophages, subsequently depriving CD8+ T cells of arginine to be used for proliferation and promoting the progression of HCC. By proposing the abovementioned mechanism, we suggest CX3CR1 and Arg1 as potential therapeutic targets of HCC.
uptake. NPs loaded with Cy-5.5 labeled control siRNA were efficiently taken up by fibroblasts and induced a robust knockdown (~98%) at low siRNA concentrations (~5 nM) in these cell lines as assessed by FACS and qPCR analysis, respectively. For the HCC model, B6 mice were intrasplenically injected with 500,000 HCC cells to develop macroscopic tumor lesions exclusively in their livers after 28 days. In vivo studies using NPs loaded with Cy5.5 labeled control siRNA were performed in healthy and HCC mice. After intravenous injection, NPs distributed preferentially to the liver (>80%), while biodistribution did not differ between healthy versus tumor mice. Ex vivo FACS analysis of digested livers confirmed a cellular uptake of NPs in CAF (FAP+) >macrophages (CD45+, F4/80+, CD11b+) >dendritic cells (CD45+, F4/80+, CD11c+) For in vivo anti-stromal therapy, tumor mouse (n = 5) received three intravenous injections of NPs loaded with anti-MFAP-5 siRNA (corresponding to 0.5 or 1 mg/kg siRNA) in week four, while controls received equal concentrations of NPs loaded with non-targeting scrambled siRNA (scsiRNA).

Results: Liver weights of mice treated with anti-MFAP-5 siRNA were significantly (*p < 0.05) lower compared to mice treated with encapsulated scsiRNA, indicating less hepatic tumor burden. Efficient vivo knockdown of MFAP-5 was confirmed on RNA and protein level by qPCR and FACS analysis, respectively, while controls had similar MFAP-5 levels like healthy mice. The treatment was well tolerated by the mice and serum parameters for liver- and nephrotoxicity were in the normal range. Histological analysis of liver sections revealed that markers of tumor vascularization (e.g. CD34, CD105) were downregulated by the siRNA treatment in the liver sections and tumors. We additionally highlighted that non-coding RNAs (ncRNAs) produced from the Dlk1/Dio3 locus, a positive target of the Wnt/beta-catenin pathway. The impairment of the Dlk1/Dio3 locus by CRISPR/Cas9 leads to an activation of this pathway at distance in emKCs and monocytes. More strikingly, the expression of the immune check-point inhibitor PD-L1 on both cells is induced in both preneoplastic hepatocytes and NPCs activated for the beta-catenin pathway. The impairment of the Dlk1/Dio3 locus by CRISPR/Cas9 significantly impaired the proportions of monocytes in tumors and non-tumor tissues as well as PD-L1 expression.

Conclusion: Liver targeting NPs loaded with siRNA induced a gene specific knockdown of CAF derived MFAP-5 and demonstrated a convincing antitumor effect by interference with angiogenesis in the TME of HCC.

OS-023-YI
Remodeling of myeloid cells during hepatocellular carcinoma driven by beta-catenin activation
Camille Joubel1,2, Lucie Poupel1, Julie Sanceau1, Sabine Colnot1, Angélique Gougelet1, INSERM UMRS 1138 Cordeliers Research Center, Team “Oncogenic functions of beta-catenin in the liver”, Paris, France; 2Université Paris Cité, Doctoral School 561 HOB, Paris, France
Email: camille.joubel@inserm.fr

Background and aims: Hepatocellular Carcinoma (HCC) is the paradigm of inflammation-associated tumors and is one of the deadliest cancers in the world. Recently, immunotherapies (IT) give promising results in almost 30% of HCC, while mutations in beta-catenin signaling detected in 30% of HCCs appear to be associated with resistance to IT. In the liver, coexist resident Kupffer cells (emKCs), able to self-renew, and inflammatory monocyte-derived macrophages (mKCs) recruited and differentiated from circulating monocytes upon liver injuries. Our work aims at exploring how an oncogenic beta-catenin signal in hepatocytes gives rise to a switch from protective emKCs to inflammatory mKCs permissive to HCC progression driven by beta-catenin and how it affects response to IT.

Method: We have created relevant murine models, targeted Apc or Ctnnb1, that closely recapitulate human HCC features and enables kinetic studies from early pre-neoplastic states to advanced tumors (Loesch et al, JHep, 2022; Gougelet et al. Gastroenterology, 2019). Non-parenchymal cells (NPCs) are freshly isolated together with preneoplastic hepatocytes by liver perfusion or from murine tumors. They are either analyzed by flow cytometry or cultured, alone or with hepatocytes, for further analyses. In parallel, cell supernatants were collected to study exosome content after their purification by ultracentrifugation.

Results: Tumorigenesis driven by beta-catenin is associated with a strong infiltration of monocytes and a gradual replacement of emKCs by mKCs in both tumors and adjacent non-tumor tissues. We showed that beta-catenin activation in pre-neoplastic hepatocytes leads to an activation of this pathway at distance in emKCs and monocytes. More strikingly, the expression of the immune check-point inhibitor PD-L1 on both cells is induced in both preneoplastic livers and tumors. We additionally highlighted that non-coding RNAs (ncRNAs) produced from the Dlk1/Dio3 locus, a positive target of the beta-catenin that we recently found to be involved in liver tumorigenesis, are encapsulated into exosomes and oversecreted by preneoplastic hepatocytes and NPCs activated for the beta-catenin pathway. The impairment of the Dlk1/Dio3 locus by CRISPR/Cas9 significantly impaired the proportions of monocytes in tumors and non-tumors tissues as well as PD-L1 expression.

Conclusion: During early stages of liver tumorigenesis, pre-neoplastic hepatocytes with beta-catenin overactivation educate surrounding myeloid cells through their subsequent activation for beta-catenin signaling and the downstream induction of ncRNAs produced from the Dlk1/Dio3 locus in favor of HCC progression. These ncRNAs seems to participate to myeloid cell education, in part through exosomal transfer communication and PD-L1 dysregulation. We are now exploring their potential implication in the resistance to IT of this group of HCC.

Figure: (abstract: OS-023-YI): Beta-catenin overactivated hepatocytes reprogram myeloid cells during HCC progression.
OS-024-YI
Scavenger receptor MARCO is associated with an immunosuppressive microenvironment and tumor progression in intrahepatic cholangiocarcinoma
Aloha Agire Lizado1, Maidor Huici Izagirre1, Colm O Rourke2, Ekataterina Zhuravleva2, Ana Korosec3,4, Mikel Aizkargorta5,6, Felix Elortza5,6, Sumeria L. Ilyas7, Gregory Gores8, Jesper Andersen9, Gernot Schabbauer3,4, Luis Buja2,5, Pedro Miguel Rodrigues1,5,8, Omar Sharifi4,9, Jesus Maria Banales1,5,8,9, Maria Jesus Perugorria1,5,10.

1Department of Liver and Gastrointestinal Diseases, Biodonostia Health Research Institute-Donostia University Hospital - University of the Basque Country (UPV/EHU), San Sebastian, Spain; 2Biotech Research and Innovation Centre (BRIC), Department of Health and Medical Sciences, University of Copenhagen, Copenhagen, Denmark; 3Institute for Vascular Biology, Centre for Physiology and Pharmacology, Medical University Vienna, Vienna, Austria; 4Christian Doppler Laboratory for Arginine Metabolism in Rheumatoid Arthritis and Multiple Sclerosis, Vienna, Austria; 5CIBERehd, Instituto de Salud Carlos III (ISCIII), Madrid, Spain; 6Proteomics Platform, CIC biGUNE, ProteoRed-ISCIII, Bzkaiia Science and Technology Park, Derio, Spain; 7Division of Gastroenterology and Hepatology, Mayo Clinic, Rochester, United States; 8IKERBASQUE, Basque Foundation for Science, Bilbao, Spain; 9Department of Biochemistry and Genetics, School of Sciences, University of Navarra, Pamplona, Spain; 10Department of Medicine, Faculty of Medicine and Nursing, University of the Basque Country (UPV/EHU), Leioa, Spain

Background and aims: Cholangiocarcinoma (CCA) comprises a heterogeneous group of malignant tumours with dismal prognosis. During the last years, different studies have highlighted the key role of the immune system in the development of intrahepatic CCA (iCCA) and several combinational therapies targeting the tumour micro-environment (TME) have shown promising results for anti-cancer therapy. In this regard, the macrophage receptor with collagenous structure (MARCO) is a class A scavenger receptor found on particular subsets of macrophages that has been described to play a determinant role in macrophage polarization and consequently in adaptive immune responses in many solid tumours. However, its role in iCCA is still unknown. This study aims to unravel the role of MARCO in iCCA development and progression.

Method: The cell-type specific MARCO expression was examined in iCCA human tumours by using publicly available single-cell RNA sequencing data from different studies and MARCO-expressing tumour-associated macrophages (TAMs) were phenotypically characterized. MARCO mRNA expression was analyzed in human control and iCCA liver tissue samples and associated to different immune cell types and immune-functionality scores employing state-of-the-art generalised. We aimed to test the hypothesis that automated fibrosis score calculation and electronic reminder messages could increase the detection of advanced liver disease in patients with type 2 diabetes.

Results: Single-cell RNA sequencing data indicate that MARCO is expressed in a specific subtype of TAMs in patients with iCCA. Besides, high MARCO expression levels in the liver samples of patients with iCCA are linked with worse clinical outcome. In line with this, MARCO expression in human iCCA tumours is associated to cell types involved in tumour progression such as M2 macrophages, and related with T cell dysfunction. Regarding the potential role of MARCO in human iCCA models, MARCO+/- mice show a trend to be protected from iCCA development, the mechanisms behind this effect being likely associated to a reduction of the innate immune cells such as CD8+Ly6C- F4/80+ resident macrophages and type-2 innate lymphoid cells (ILC2). Noteworthy, in a context of a syngeneic orthotopic experimental model, MARCO+/- mice exhibit a reduced presence of immune checkpoint molecules in innate and adaptive immune cells, including a lower percentage of PD-1+ and CTLA-4+ cytotoxic CD8+ T cells in comparison to WT mice. In addition, MARCO deficiency significantly improves the overall survival of mice subjected to the orthotopic injection of syngeneic CCA cells into the liver. This was associated with a reduction of the tumour metastasis in the lungs.

Conclusion: High MARCO expression is associated to a worse outcome in patients with iCCA and is associated to an immunosuppressive TME. Importantly, Marco+/- mice display a reduced presence of immunosuppressive cell populations and present an increased overall survival. Therefore, MARCO arises as a novel therapeutic target for iCCA.

NAFLD: Diagnostics and non-invasive assessment

OS-025
A clinical care pathway to detect advanced liver disease in patients with type 2 diabetes through automated fibrosis score calculation and electronic reminder messages: a randomised controlled trial
Xinrong Zhang1, Terry Cheuk-Fung Yip1, Grace Lai-Hung Wong1, Wei-Xuan Leow2, Yan Liang1, Lee-Ling Lim2, Guanlin Li3, Luqman Ibrahim3, Huapeng Lin1, Che To Lai1, Henry LY Chan1, Felix Elortza2,3,4, Jesus Maria Banales1,5,8,9, María Jesús Perugorria1,5,10, Omar Sharifi4,9, Felix Elortza5,6, Jesus Maria Banales1,5,8,9, María Jesús Perugorria1,5,10

1The Chinese University of Hong Kong, Department of Medicine and Therapeutics, Hong Kong; 2University of Malaya, Gastroenterology and Hepatology Unit, Malaysia; 3University of Malaya, Endocrinology Unit, Malaysia

Background and aims: The majority of patients with non-alcoholic fatty liver disease (NAFLD) are seen at primary care and non-hepatology settings. Although several studies have demonstrated the successful implementation of clinical care pathways with the involvement of highly motivated clinicians, the findings may not be generalised. We aimed to test the hypothesis that automated fibrosis score calculation and electronic reminder messages could increase the detection of advanced liver disease in patients with type 2 diabetes.

Method: In this pragmatic, single-blind, randomised controlled trial at 5 general medical or diabetes clinics in Hong Kong and Malaysia, we randomly assigned patients in a 1:1 ratio to the intervention group with Fibrosis-4 index and aspartate aminotransferase-to-platelet ratio index automatically calculated based on routine blood tests followed by electronic reminder messages to alert clinicians of abnormal results, or the control group with usual care. The primary outcome was the proportion of patients with increased fibrosis scores who received appropriate care (referred for hepatology care or specific fibrosis assessment) within 1 year. This trial is registered with ClinicalTrials.gov, number NCT04241575.

Results: Between May 19, 2020, and Oct 14, 2021, 1379 patients were screened, of whom 533 and 528 were assigned to the intervention and control groups, respectively. A total of 55 out of 165 (33.3%) patients with increased fibrosis scores in the intervention group received appropriate care, compared with 4 of 131 (3.1%) patients in the control group (p < 0.001) (Table). Overall, 11 of 533 (2.1%) patients in the intervention group and 1 of 528 (0.2%) patients in the control group were confirmed to have advanced liver disease (liver stiffness ≥10 kPa and/or cirrhotic complications) (p = 0.006). Among patients attending hepatology care, 33 had NAFLD, and 22 had no liver disease identified.
Performance of the AGA clinical care pathway in identifying patients with at-risk non-alcoholic steatohepatitis: combined data from multiple therapeutic clinical trials including more than 5,000 patients (in collaboration with NAIL-NIT consortium)

Naim Alkhouri1, Julie Dubourg2, Stephen Harrison3, Sophie Jeannin Megnien4, Vlad Ratziu5, Michael Charlton6, Mazen Noureddin7, Sophie Jeannin Megnien2, Mazen Noureddin7, Naim Alkhouri6, Jörn Schattenberg7.

Objective: The American Gastroenterological Association (AGA) has released guidelines in 2021 to identify non-alcoholic steatohepatitis (NASH) patients with at least stage 2 fibrosis (at-risk NASH) that will benefit from referral to hepatology and potential use of pharmacologic agents. We aimed to assess the utility of the recommended score-based parts of these algorithms (FIB-4 and Vibration Controlled Transient Elastography (VCTE)) in the setting of non-cirrhotic NASH clinical trials in the United States.

Methods: We combined screening data from 6 ongoing biopsy-proven NASH clinical trials. High screening failure (SF) rate on biopsy has slowed down enrollment and drug development. Subsequently non-invasive tests (NITs) have been developed to reduce SF rate on biopsy. We aim to assess composite scores related to vibration-controlled transient elastography (VCTE), namely FAST and Agile 3+ and compare them to traditional VCTE cut offs to identify NASH patients with F2-F3 in clinical trial settings.

Results: 2,119 patients with histology results were included for final analysis, with 2,119 (100%) of those having FIB-4 data and with 1,105 (52%) of those having LSM data. The table shows the proportion of patients in each risk-category meeting AGA target population as well included, with a fibrosis prevalence of: 92 (9%) for F0, 231 (22%) for F1, 1,048 patients with liver histology and NIT data were included, with a fibrosis prevalence of: 92 (9%) for F0, 231 (22%) for F1, 290 (28%) for F2, and 435 (42%) for F3. The average age was 54.7 years, 644 (61%) were females and 439 (42%) were Hispanics. The Se, Sp, NPV, PPV and CC are shown in the table. Overall, FAST had better Se, Sp, NPV, PPV and CC than the traditional LSM value of 8.2 kPa for LSM) to identify NASH patients with F2-F3. Patients with F4 were excluded.

Conclusions: We also assessed the diagnostic accuracy of Agile 3+ and LSM on VCTE, using published cut-offs (0.6 for Agile 3+ and 9.7 kPa for LSM) to identify NASH patients with F2-F3. We also assessed the diagnostic accuracy of Agile 3+ and LSM on VCTE, using published cut-offs (0.6 for Agile 3+ and 9.7 kPa for LSM) to identify NASH patients with F2-F3. Patients with F4 were excluded. We calculated the following diagnostic performance indices: sensitivity (Se), specificity (Sp), negative predictive value (NPV), positive predictive value (PPV), positive likelihood ratio (LR+), negative likelihood ratio (LR-) and the correct classification (CC).

Background and aims: Non-alcoholic steatohepatitis (NASH) with Fibrosis (F) F2-F3 patients is the target population for phase 2b/3 NASH clinical trials. High screening failure (SF) rate on biopsy has slowed down enrollment and drug development. Subsequently non-invasive tests (NITs) have been developed to reduce SF rate on biopsy. We aim to assess composite scores related to vibration-controlled transient elastography (VCTE), namely FAST and Agile 3+ and compare them to traditional VCTE cut offs to identify NASH patients with F2 and F3 in clinical trial settings.

Method: We combined screening data from 6 ongoing biopsy-proven therapeutic NASH trials (>5,000 patients). Liver histology data were read centrally. We assessed the diagnostic accuracy of FAST and liver stiffness measurements (LSM) on VCTE, using published cut-offs (0.5 for FAST and 8.2 kPa for LSM) to identify NASH patients with F2-F3. We also assessed the diagnostic accuracy of Agile 3+ and LSM on VCTE, using published cut-offs (0.6 for Agile 3+ and 9.7 kPa for LSM) to identify NASH patients with F2-F3. Patients with F4 were excluded.

Results: 1,048 patients with liver histology and NIT data were included, with a fibrosis prevalence of: 92 (9%) for F0, 231 (22%) for F1, 290 (28%) for F2, and 435 (42%) for F3. The average age was 54.7 years, 644 (61%) were females and 439 (42%) were Hispanics. The Se, Sp, NPV, PPV and CC are shown in the table. Overall, FAST had better Sp, NPV, PPV, LR+ and CC than the traditional LSM value of 8.2 kPa for patients with NASH F2-F3. Agile 3+ had better Sp, PPV, LR+, PPV and CC than the traditional LSM value of 9.7 kPa for patients with NASH F3.

Conclusion: Using the AGA clinical care pathway in the setting of clinical trial may lead to missing patients with biopsy-proven at-risk NASH. In patients considered high-risk based on the pathway, two thirds have at-risk NASH and will potentially benefit from clinical trial and future pharmacologic treatments.

OS-027 Performance of vibration controlled transient elastography and related scores to identify at-risk non-alcoholic steatohepatitis patients: combined data from multiple trials including more than 5,000 patients (in collaboration with NAIL-NIT consortium)

Mazen Noureddin1, Julie Dubourg2, Stephen Harrison3, Sophie Jeannin Megnien4, Vlad Ratziu5, Michael Charlton6, Naim Alkhouri6, Jörn Schattenberg7, Jörn Schattenberg2, Sophie Jeannin Megnien2, Mazen Noureddin7.

Objective: The American Gastroenterological Association (AGA) has released guidelines in 2021 to identify non-alcoholic steatohepatitis (NASH) patients with at least stage 2 fibrosis (at-risk NASH) that will benefit from referral to hepatology and potential use of pharmacologic agents. We aimed to assess the utility of the recommended score-based parts of these algorithms (FIB-4 and Vibration Controlled Transient Elastography (VCTE)) in the setting of non-cirrhotic NASH clinical trials in the United States.

Methods: We combined screening data from 6 ongoing non-cirrhotic NASH phase 2 trials (>5,000 patients). We assessed the proportion of NASH patients with at least stage 2 fibrosis for each risk-category based on FIB-4 and liver stiffness measurement (LSM) by VCTE. We also assessed the proportion of at-risk NASH with a non-alcoholic fatty liver disease activity score (NAS) of at least 4 and excluding fibrosis 4.

Results: 2,119 patients with histology results were included for final analysis, with 2,119 (100%) of those having FIB-4 data and with 1,105 (52%) of those having LSM data. The table shows the proportion of patients in each risk-category meeting AGA target population as well included, with a fibrosis prevalence of: 92 (9%) for F0, 231 (22%) for F1, 290 (28%) for F2, and 435 (42%) for F3. The average age was 54.7 years, 644 (61%) were females and 439 (42%) were Hispanics. The Se, Sp, NPV, PPV and CC are shown in the table. Overall, FAST had better Sp, NPV, PPV, LR+ and CC than the traditional LSM value of 8.2 kPa for patients with NASH F2-F3. Agile 3+ had better Sp, PPV, LR+, PPV and CC than the traditional LSM value of 9.7 kPa for patients with NASH F3.

Conclusion: Using the AGA clinical care pathway in the setting of clinical trial may lead to missing patients with biopsy-proven at-risk NASH. In patients considered high-risk based on the pathway, two thirds have at-risk NASH and will potentially benefit from clinical trial and future pharmacologic treatments.

Figure: Conclusion: Automated fibrosis score calculation and electronic reminders can increase identification of advanced liver disease in patients with type 2 diabetes at non-hepatology settings. However, over half of patients with increased fibrosis scores did not receive appropriate care, and a minority of referred patients actually had advanced liver disease. The findings of this trial serve as the basis to further refine the clinical care pathway.
Conclusion: In a pooled data analysis from a large cohort of NASH patients enrolled in Phase 2 clinical trials we showed that FAST and Agile 3+ are better screening tests than liver stiffness alone for patients with NASH F2-F3 and, NASH F3, respectively. We recommend using these scores as screening criteria in phase 2b/3 NASH trials.

OS-028
Prediction of outcomes in patients with non-alcoholic fatty liver disease by initial measurements and subsequent changes in magnetic resonance elastography
Takashi Kobayashi1, Michihiro Iwaki1, Asako Nogami1, Masato Yoneda1, Satoru Saito1, Atsushi Nakajima1. 1Yokohama city university graduate school of medicine, Department of gastroenterology and hepatology, Japan
Email: yoneda@yokohama-cu.ac.jp

Background and aims: Liver fibrosis is strongly correlated with prognosis in non-alcoholic fatty liver disease (NAFLD). We investigated whether liver stiffness measured (LSM) by magnetic resonance elastography (MRE) and its changes can predict clinical outcomes in patients with NAFLD.

Method: A retrospective analysis of 405 NAFLD patients who had undergone at least two magnetic resonance elastography (MRE) was conducted. The patients were divided into five groups corresponding to fibrosis stages 0 – 4 based on their initial LSM. Additionally, based on the difference between two LSMs (ΔLSM), the patients were classified as progressors (ΔLSM ≥ +19%) and non-progressors (ΔLSM < +19%). Cumulative outcomes were calculated using Kaplan-Meier analysis and compared by log-rank test.

Results: The mean duration from the initial MRE to the end of follow-up was 72.64 ± 25.80 months. In the interval between serial MREs (mean: 23.51 ± 0.47 months), 52 (12.8%) were progressors and 353 (87.2%) were non-progressors. According to the groups based on initial LSM, there were significant differences in the cumulative incidence of decompensated cirrhosis (p < 0.001), hepatocellular carcinoma (HCC) (p < 0.001), liver-related events (p < 0.001), extrahepatic malignancies (p = 0.049) and overall mortality (p < 0.001), but no significant differences in cardiovascular disease (p = 0.203). Hazard ratios (HRs) for progressors to non-progressors were significantly higher for decompensated cirrhosis (HR = 12.08, p = 0.009), HCC (HR = 25.02, p = 0.008), and liver-related events (HR = 12.79, p = 0.012), but not for extrahepatic malignancies (HR = 2.66, p = 0.179), cardiovascular disease (HR = 5.396, p = 0.317), or overall mortality (HR = 1.207, p = 0.821) (Figure A–F). Among patients with no clinical evidence of cirrhosis (n = 385), the HR of cirrhosis development for progressors versus non-progressors was 60.15 (p < 0.001), which was significant. Even within the subgroup with low initial LSM (n = 296), corresponding to fibrosis stages 0–2, which has been considered a good prognosis, the HR for progressors versus non-progressors was significantly high for liver-related events (HR = 77.45, p = 0.009) and overall clinical events (HR = 10.32, p = 0.012).

Conclusion: In addition to initial LSM, ΔLSM can predict liver-related events in patients with NAFLD, even for low initial LSM. Their integrated evaluation can provide more detailed risk stratification and sort out high-risk patients with NAFLD from those previously considered low-risk.

OS-029
Analytical and clinical validation of AIM-NASH: a digital pathology tool for artificial intelligence-based measurement of non-alcoholic steatohepatitis histology
Stephen Harrison1, Hanna Pulaski2, Marlena Vitali2, Laryssa Manigat2, Stephanie Kaufman2, Hypatia Hou2, Susan Madasu2, Sara Hoffman2, Adam Stanford-Moore2, Robert Egger2, Janani Iyer2, Jonathan Glickman2, Murray Resnick3, Neel Patel4, Cristin Taylor2, Shraddha Mehta2, Robert Myers5, Chuhan Chung6, Scott Patterson2, Anne-Sophie Sejling7, Anne Minnich7, Vipul Baxi7, Mani Subramanian6, Arun Sanjay8, Quentin Anstee9, Rohit Loomba10, Vlad Ratziu11, Katy Wack2. 1Pinnacle Clinical Research, United States; 2PathAI, United States; 3OrsoBio, Inc, United States; 4Inipharm, Inc, United States; 5Gilead Sciences, Inc., United States; 6Novo Nordisk, Denmark; 7Bristol Myers Squibb, United States; 8PathAI, United States; 9OroBio, Inc, United States; 10Inipharm, Inc, United States; 11Virginia Commonwealth University, United States; 12Newcastle University, United Kingdom; 13UCSD School of Medicine, United States; 14Sorbonne Université, France
Email: stephenharrison87@gmail.com

Background and aims: The gold standard for participant enrollment and end point assessment in NASH clinical trials is manual histologic...
assessment of a liver biopsy. The NASH CRN scoring system has suboptimal reproducibility, even amongst expert hepatopathologists (HPs). High variability limits assessment of change over time and therapeutic response. Here, we describe the validation of AIM-NASH (AI-based Measurement of NASH Histology) (PathAI, v1.1.0), an AI-powered, assistive digital pathology tool that detects and scores the key histologic features of NASH (steatosis (ST), lobular inflammation (LI), hepatocellular ballooning (HB), and fibrosis). Analytical Validation (AV), Overlay Validation (OV) and Clinical Validation (CV) studies were conducted to determine the accuracy and precision of AIM-NASH as an aid to HPs in NASH scoring.

Method: Ground Truth: (GT) NASH CRN scores for AV/CV were determined via consensus by a panel of 3 experts. AV: The AIM-NASH algorithm alone was evaluated for non-inferior accuracy to HPs manual reads (MRs) (Figure 1). Algorithm repeatability (at one site) and reproducibility (at 3 sites) with Leica AT2 scanners was evaluated against a target agreement of >85%. OV: Assessed the accuracy of AI-derived heatmap overlays, per visual feature, with target true positive and false positive success (TPS/FPS) rates of ≥85%. CV: HPs’ AI-assisted performance was assessed for non-inferior accuracy to MRs within a NASH clinical trial workflow, totaling 1501 anonymized biopsies from 3 trials.

Results: AV: [Accuracy] AIM-NASH was superior to MRs for HB (weighted kappa (κw) difference 0.17; p < 0.0001) and non-inferior (margin of 0.1) for ST, LI, and fibrosis ((κw) differences 0.05, 0.01, and 0.02; all p < 0.02). [Repeatability] Mean intra-scanner overall percent agreement (OPA) rates for ST, LI, HB, and fibrosis were 0.93, 0.96, 0.96, and 0.93 (all p < 0.0001). [Reproducibility]: Mean inter-site OPAs between scans for ST, LI, HB, and fibrosis were 0.86, 0.85, 0.91, and 0.87 (p = 0.002-0.53). OV: All overlays met TPS/FPS criteria of ≥85%. CV: AI-assisted reads were superior to MRs for LI and HB (κw improvements 0.12 and 0.15; both p < 0.0001) and non-inferior for ST and fibrosis (κw differences 0.003 and -0.009). The AI-assist workflow also showed superior accuracy over MRs when evaluating for NASH.

Table 1: Agreement of AIM-NASH-assisted reads and GT versus MR and GT in CV with literature comparison

<table>
<thead>
<tr>
<th>Clinical Validation feature</th>
<th>n</th>
<th>Weighted kappa, (95% CI)</th>
<th>Difference, (95% CI)</th>
<th>P-value for non-inferiority</th>
<th>P-value for superiority</th>
<th>Average manual Inter-reader Weighted Kappa from literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steatosis: Al-assist</td>
<td>1467</td>
<td>0.677, (0.652,0.703)</td>
<td>0.003, (-0.028, 0.037)</td>
<td>&lt;0.001</td>
<td>0.3365</td>
<td>0.609</td>
</tr>
<tr>
<td>Steatosis: MR</td>
<td>1481</td>
<td>0.674, (0.651, 0.695)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LI: Al-assist</td>
<td>1465</td>
<td>0.419, (0.361, 0.46)</td>
<td>0.123, (0.069, 0.173)</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
<td>0.328</td>
</tr>
<tr>
<td>LI: MR</td>
<td>1478</td>
<td>0.297, (0.264, 0.328)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HB: Al-assist</td>
<td>1465</td>
<td>0.563, (0.519, 0.601)</td>
<td>0.150, (0.108, 0.195)</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
<td>0.517</td>
</tr>
<tr>
<td>HB: MR</td>
<td>1476</td>
<td>0.414, (0.385, 0.441)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fibrosis: Al-assist</td>
<td>1429</td>
<td>0.653, (0.627, 0.676)</td>
<td>-0.009, (-0.042, 0.022)</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
<td>0.7445</td>
</tr>
<tr>
<td>Fibrosis: MR</td>
<td>1453</td>
<td>0.683, (0.642, 0.683)</td>
<td></td>
<td></td>
<td></td>
<td>0.484</td>
</tr>
<tr>
<td>NASH Assessment*: Al-assist</td>
<td>1463</td>
<td>0.632, (0.593, 0.67)</td>
<td>0.12, (0.064, 0.166)</td>
<td>&lt;0.0001</td>
<td>0.399**</td>
<td></td>
</tr>
<tr>
<td>NASH Assessment*: MR</td>
<td>1474</td>
<td>0.512, (0.477, 0.547)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NASH Resolution: Al-assist</td>
<td>1463</td>
<td>0.532, (0.47, 0.542)</td>
<td>0.162, (0.093, 0.205)</td>
<td>Not reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NASH Resolution: MR</td>
<td>1474</td>
<td>0.370, (0.324, 0.413)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


*NASH Assessment defined as NAS ≥4 and each H&E component ≥1
**NASH Resolution defined as ballooning=0, inflammation of 0 or 1, and any steatosis
***Unweighted kappa, all others reported are weighted.
resolution (HB = 0, LI = 0, 1) with a \( \kappa_p \) difference 0.16 (p < 0.01) (Table 1).

**Conclusion:** AIM-NASH is highly repeatable and reproducible, with accuracy ranging from comparable to superior relative to HPs. AIM-NASH-assisted HPs are superior to unaided HPs in assessing NASH resolution, HB, and LI. These results are notable given high HP disagreement in HB and LI evaluation. The data suggest AIM-NASH may reduce the impact of rater variability on NASH clinical trial end points and subsequently allow for a more consistent and reliable assessment of therapeutics being developed in the field.

---

**Viral hepatitis B/D - New treatments**

**OS-030**

**Treatment with siRNA JNJ-73763989 plus nucleos (i)de analogue (NA) decreases HBAg and HDV RNA levels in patients with chronic hepatitis D (CHD): part 1 of the REEF-D study**

Heiner Wedemeyer1, Edward J. Gane2, Kosh Agarwal3, Fehmi Tabak4, Xavier Forns5, Ulus Akarca6, Morozov Viacheslav7, Soo Aleman8, Maria Buti9, §Gurdal Yilmaz10, Pietro Lampertico11,12,13,14, Julia Niewczas15, John Jerzorowski15, Thomas Kakuda15, Isabelle Benoît16, Nonko Pehlivanov17, Oliver Lenz18, Michael Bierner19, 20, §Dept. of Gastroenterology, Hepatology and Endocrinology, Hannover Medical School, Hannover, Germany;
2 New Zealand Liver Transplant Unit, University of Auckland, Auckland, New Zealand; 3 Institute of Liver Studies, King’s College Hospital, London, United Kingdom; 4 Istanbul University, Istanbul, Turkey; 5 Liver Unit, Hospital Clinic Barcelona, IDIBAPS, University of Barcelona, Barcelona, Spain; 6 Division of Gastroenterology, Department of Internal Medicine, University of Ege School of Medicine, Izmir, Turkey; 7 Medical Company Hepatolog, Samara, Russian Federation; 8 Department of Infectious Diseases, Karolinska University Hospital/Karolinska Institutet, Stockholm, Sweden; 9 Hospital General Universitari Valle Hebron and CIBER-EHD del Instituto Carlos III, Barcelona, Spain; 10 Trabzon Karadeniz Technical University Farabi Hospital, Trabzon, Turkey;
11 Foundation IRCCS Ca’ Granda Ospedale Maggiore Policlinico, Division of Gastroenterology and Hepatology, Milan, Italy; 12 CRC “A. M. and A. Migliavacca” Center for Liver Disease, Department of Pathophysiology and Transplantation, University of Milan, Milan, Italy; 13 Janssen-Cilag, Solna, Sweden; 14 Janssen Research and Development, LLC, Titusville, United States; 15 Janssen Research and Development, LLC, Brisbane, United States; 16 Janssen Pharmaceutica NV, Beerse, Belgium; 17 Janssen Research and Development, LLC, Raritan, United States.

**Email:** wedemeyer.heiner@mh-hannover.de

**Background and aims:** Hepatitis D virus (HDV) requires hepatitis B surface antigen (HBsAg) to form infectious viral particles. The siRNA JNJ-73763989 (JNJ-3989) has been shown to profoundly reduce HBsAg in chronic hepatitis B patients. In the REEF-D study, the antiviral effect of JNJ-3989 was evaluated for the first time in patients with CHD to investigate whether reduction of HBsAg would lead to reduction of HDV replication, resulting in a therapeutic benefit of JNJ-3989 for patients with CHD.

**Method:** REEF-D, a 2-part, phase 2, multicenter, randomized, double-blind, placebo-controlled study, included adults with CHD, including compensated cirrhosis. Patients were randomized 4:1 to receive JNJ-3989 (100 mg subcutaneously every 4 weeks) + NA for 144 weeks (active arm) or placebo + NA for 52 weeks followed by JNJ-3989 + NA for 96 weeks (deferred treatment arm) with 48 weeks of off-treatment follow-up. Changes in serum viral markers (HBsAg and HDV RNA) and safety (alanine aminotransferase [ALT] levels) were assessed. The primary composite end point was the proportion of patients with HDV RNA decline from baseline of ≥ 2 \( \log_{10} \) IU/ml (or undetectable) and normal ALT at Week 48. Antiviral activity in Part 1 was used to expand the study (Part 2). Data from Part 1, Week 48 interim analysis are reported here.

**Results:** Of 22 patients enrolled in REEF-D Part 1, 17 and 5 were randomized to the active and deferred treatment arms, respectively. Treatment with JNJ-3989 led to robust reductions in HBsAg, and subsequently, HDV RNA. Twelve of 17 (70.6%) patients in the active arm had treatment-emergent ALT elevations (≥ 3 × upper limit of normal [ULN] and ≥ 2 × nadir) between Weeks 8 and 20, which were associated with HDV RNA rebound, limited transient HBV DNA increase in most patients, but no clear impact on HBsAg decline, and resulted in early treatment discontinuation in 8 patients. Grade 3/4 ALT elevations were observed, with no cases of decompensation. In general, ALT levels returned to baseline values after treatment discontinuation in those patients. Among the 9 JNJ-3989-treated patients still on-treatment at Week 48, mean (standard error [SE]) HBsAg change from baseline was −1.75 (0.29) \( \log_{10} \) IU/ml in the active arm vs −0.07 (0.04) \( \log_{10} \) IU/ml for the 5 patients in the deferred treatment arm. Mean (SE) change from baseline in HDV RNA was −1.52 (0.38) \( \log_{10} \) IU/ml and −0.23 (0.15) \( \log_{10} \) IU/ml in the active and deferred treatment arms, respectively. Four of 17 (23.5%) patients in the active arm achieved the primary composite end point vs none from the deferred treatment arm. Among the 5 patients without ALT elevations, 4 (80.0%) achieved the primary composite end point, 2 (40.0%) of whom had HDV RNA < lower limit of quantification of the assay. Aside from ALT elevations, safety outcomes were unremarkable. Predefined antiviral criteria to initiate Part 2 of the study were met and the observation of ALT flares predominantly in patients with high HBsAg and HDV RNA levels at baseline led to exclusion of patients with cirrhosis or HBsAg > 10,000 IU/ml and HDV RNA > 100,000 IU/ml.

**Conclusion:** This is the first proof-of-concept study showing that an HBsAg-targeting agent leads to simultaneous reduction of HBsAg and HDV RNA in patients with CHD. Clinically relevant ALT elevations were frequent and associated with increases in HDV RNA and led to treatment discontinuation. However, patients without ALT elevations generally had a continuous reduction of HDV RNA, 4/5 of whom met the primary efficacy end point.

**OS-031**

**Safety and antiviral activity of short-duration combinations of the investigational small interfering ribonucleic acid VIR-2218 with the neutralizing, vaccinal monoclonal antibody VIR-3434: post-treatment follow-up from the Phase 2 MARCH trial**

Edward J. Gane1, Alina Iacob2,3, Marta Dobryanska4,5, Ki Tae yoon6, Tien Huey Lim7, Andre Aripe8, Daniel Cloutiers9, Michael Chattergeon9, Shenghua Mao9, Snehla V. Gupta9, Gregory Camus9, Carey Hwang9, Young-Suk Lim9,10, Faculty of Medicine, University of Auckland, Auckland, New Zealand; 11 Aresnia Exploratory Medicine GmbH, Düsseldorf, Germany; 12 Aresnia Exploratory Medicine University of Medicine and Pharmacy, Chișinău, Moldova; 13 Medical Center of Limited Liability Company “Harmoniya kras}}, Kyiv, Ukraine; 14 Aresnia Exploratory Medicine, Kyiv, Ukraine; 15 Pusan National University Yangsan Hospital, Pusan National University College of Medicine, Yangsan, Korea, Rep. of South; 16 Department of Gastroenterology, Middlemore Hospital, Auckland, New Zealand; 17 Vir Biotechnology, Inc., San Francisco, United States; 18 Asan Medical Center, University of Ulsan College of Medicine, Seoul, Korea, Rep. of South.

**Email:** edgane@adhb.govt.nz

**Background and aims:** There is an unmet need for a finite, curative, and well-tolerated treatment regimen for chronic hepatitis B virus (HBV) infection. VIR-2218 is an investigational small interfering RNA targeting the HBx region of HBV genome, and VIR-3434 is an investigational fragment crystallizable (Fc)-engineered human monoclonal antibody targeting the conserved antigenic loop of HBsAg. This phase 2 open-label trial (MARCH) evaluated the safety, tolerability, and antiviral activity of short-duration combination regimens of VIR-2218 and VIR-3434 for the...
Background and aims: Antigen-specific CD8 T cell immunity is crucial for clearance of viral liver infections such as Hepatitis B virus (HBV) infection. During persistent HBV infection, however, a functional CD8 T cell response is missing and to date cannot be induced by immune therapies. We aimed at determining the mechanisms determining the functional inhibition of CD8 T cells during persistent viral infection of the liver.

Method: We used a preclinical model system with adenoviral gene transfer of the HBV genome or ovalbumin to investigate virus-specific immunity during persistent or acute-resolving viral liver infection. Antigen-specific CD8 T cells from liver and spleen were analyzed by flow cytometry, RNAseq and tissue sections by confocal microscopy.

Results: Hepatic CXCR6⁺CD69⁺ virus-specific CD8 T cells during persistent viral liver infection had a liver-resident phenotype in transcriptorne and flow cytometry analysis. However, T cells did not respond to cognate stimulation with cytokine production and cytotoxicity. Transcriptional network analysis of dysfunctional compared to cytotoxic CXCR6⁺CD8T cells revealed elevated cAMP signaling indicated by increased Crem (cAMP response element modulator) activity as single differentiating transcription factor in persistent infection. We did not observe a rescue of anti-viral T cell immunity in mice lacking the inhibitory Crem isofom ICER in T cells, and therefore searched for post-translational mechanisms influencing T cell immunity. Strikingly, PKA phosphorylation at S114 was elevated in dysfunctional CXCR6⁺CD8T cells confirming increased cAMP signaling. Pharmacologically induced CAMP signaling caused loss of functionality in previously highly cytotoxic CXCR6⁺CD8T cells isolated after resolved infection. Importantly, increased cAMP signaling curbed T cell receptor signaling shown by reduced phosphorylation of Lck, Akt and Erk rendering virus-specific CXCR6⁺CD8T cells unable to respond to cognate stimulation. Confocal microscopy revealed increased contact between prosta-noid-producing liver sinusoidal endothelial cells (LSECs) and dysfunctional CXCR6⁺CD8T cells recognizing peptide presented on infected hepatocytes, and coculture with LSECs led to increased cAMP-signaling in T cells pointing at spatially regulated cAMP signaling in persistent viral infection.

Conclusion: We identify a liver-tissue rheostat enforced by LSECs increasing cAMP-signaling in virus-specific CXCR6⁺CD8T cells during persistent hepatotropic infection that renders T cells non-responsive to stimulation through TCR signaling. Our results further identify molecular markers for identification of T cells influenced by the liver tissue rheostat and allow to explore novel targeted immune therapies to reconstitute virus-specific immunity in chronic hepatitis B.

OS-033 Novel, high accuracy prediction models of hepatocellular carcinoma based on longitudinal data and cell-free DNA signatures

Rong Fan1, Lei Chen2, Hao Yang3, Siru Zhao4, Zhengmiao Li5, Yunsong Qian4, Hong Ma6, Jingfeng Liu6, Junqi Niu6, Chuaxun Wang7, Jian Bai7, Jianping Xie8, Xiaotang Fan9, Qing Xie10, Chunyang Wang11, Song Yang12, Honglian Bai13, Xiaoguang Dou14, Lin Wu15, Guoqing Jiang16, Qi Xia17, Dan Zheng18, Yali Liu19, Aimin Sun20, Song Yang21, Hongbo Gao22, Yongfeng Yang23, Hongbo Gao24, Xinyu Liu25, Aimin Sun26, Jinlin Hou27, Guangdong Provincial Key Laboratory of Viral Hepatitis Research, Guangdong Provincial Clinical Research Center For Viral Hepatitis, Department of Infectious Diseases, Nanfang Hospital, Southern Medical University, Guangzhou, China; 1Department of Hepatobiliary Medicine, Shanghai Eastern Hepatobiliary Surgery
Results:

We developed and externally validated two novel HCC prediction models with greater accuracy called aMAP-2 and aMAP-2 Plus scores. The aMAP-2 score, calculated with longitudinal data of aMAP score, AFP and ALT during up to 8-year follow-up, performed superbly in the Search-B training (N = 3,706, AUC: 0.84) and external validation (N = 5,796, AUC: 0.85) CHB cohorts, and performed moderately in PreCar cirrhotic cohort (N = 4,226; AUC: 0.73). In Search-B training cohort, aMAP-2 score could clearly divide patients into low-risk (3191, 86.1%), and high-risk (514, 13.9%), with 5-year cumulative incidences of 1.4% and 15.7% (p < 0.0001), respectively. The significant difference of future HCC incidence between aMAP-2 score identified low-and high-risk groups were also demonstrated in Search-B validation and PreCar cohorts. The aMAP-2 Plus score, developed by incorporating cfDNA signatures (Nucleosome, Fragment and Motif scores) based on aMAP-2 score, could further optimize the performance in predicting HCC development, especially for cirrhotic patients (AUC: 0.86–0.89). These two HCC prediction models both exhibited broadly better performance than the other existing HCC risk scores. Moreover, the aMAP-2 Plus score also played a potential role in very-early diagnosis of HCC, by alarming HCC models both exhibited broadly better performance than the other existing HCC risk scores. Therefore, we aimed to develop and validate novel prediction models by using multivariate longitudinal data with or without incorporating cell-free DNA (cfDNA) signatures.

Method:

A total of 13,728 patients from 2 nationwide multicentre prospective cohorts (Search-B CHB cohort and PreCar cirrhotic cohort) were enrolled in the study. aMAP HCC risk score [J Hepatol, 2020], calculated by age, sex, platelets, albumin and total bilirubin, was evaluated for each patient using baseline data. Low-pass whole genome sequencing was used to derive multi-modal cfDNA fragmentomics features for PreCar cirrhotic patients. Longitudinal Discriminant Analysis algorithm was used to estimate the risk of HCC development.

Background and aims:

Current hepatocellular carcinoma (HCC) risk scores do not reflect changes in the risk assessment of HCC resulting from liver disease progression/regression over time. Therefore, majority of HCC risk scores perform unsatisfactorily among cirrhotic patients. Therefore, we aimed to develop and validate novel prediction models by using multivariate longitudinal data with or without incorporating cell-free DNA (cfDNA) signatures.
OS-034
A gene editing approach for chronic hepatitis B: elimination of hepatitis B virus in vivo by targeting cccDNA and integrated viral genomes with a sequence-specific ARCUS nuclease
Cassandra Gorsuch1, Paige Nemecek1, Mei Yu2, Simin Xu2, Dong Han2, Jeff Smith1, Janel Lape1, Nicholas Van Buuren2, Ricardo Ramirez2, Robert Muench3, Meghan Holdorf4, Becket Feierbach5, Greg Falls6, Jason Holt7, Wendy Shoop8, Emma Sevigny1, Forrest Karriker2, Robert Brown1, Amod Joshi1, Tyler Goodwin1, Ying Tam9, Paulo Lin9, Sean Semple1, Neil Leatherbury1, William E. Delaney2, Derek Jantz1, Emily Harrison1, Amy Rhoden Smith1, Cassandra Gorsuch1, Paige Nemec1, Mei Yu2, Simin Xu2, Dong Han2, genomes with a sequence-specific ARCUS nuclease
hepatitis B virus in vivo by targeting cccDNA and integrated viral genomes. The stepwise application of aMAP scores (aMAP -> aMAP-2 Plus) provides an improved enrichment strategy of super high-risk HCC patients, which could effectively guide nationwide individualized HCC surveillance.

Background and aims: ARCUS nucleases can be engineered to recognize conserved DNA sequences in the Hepatitis B virus (HBV) genome and provide a strategy for chronic hepatitis B (CHB) treatment. Persistence of CHB is attributed to maintenance of the intrahepatic pool of viral covalently closed circular DNA (cccDNA) and expression of immunosuppressive Hepatitis B surface antigen (HBsAg) from integrated HBV. Current therapies have no direct impact on cccDNA or expression of HBsAg from integrated virus. ARCUS nucleases expressed in hepatocytes can cut both cccDNA and integrated viral genomes leading to removal of cccDNA and inhibition of viral gene expression. We describe a potential curative approach for CHB using a highly specific engineered ARCUS nuclease (ARCUS-POL) targeting the HBV genome.

Method: Through iterative rounds of protein engineering, ARCUS-POL nucleases were optimized to exhibit high levels of on-target editing with minimal off-target activity. Efficacy and specificity were then tested in vitro in primary human hepatocytes (PHHs) infected with HBV and a HepG2 cell line with an integrated partial HBV genome. To evaluate ARCUS-POL in vivo, novel episomal adeno-associated virus (AAV) mouse and non-human primate (NHP) models were developed containing a portion of the HBV genome serving as a surrogate for cccDNA. Clinically relevant delivery was achieved through systemic administration of lipid nanoparticles (LNPs) containing ARCUS-POL mRNA.

Results: ARCUS-POL mRNA was transfected into HBV-infected PHHS, resulting in >75% reductions of both cccDNA and HBsAg. Importantly, ARCUS-POL produced no detectable translocations in PHHs using hybrid capture followed by long-read sequencing. After transient delivery of ARCUS-POL into cells containing integrated HBV DNA, >80% on-target editing was achieved with subsequent HBsAg reductions. In both mouse and NHP AAV models, a significant decrease in total AAV copy number and high on-target indel frequency was observed after LNP delivery of ARCUS-POL mRNA. In the case of the mouse model, which supports HBsAg expression, circulating surface antigen was durably reduced by 96%.

Conclusion: ARCUS-POL nucleases were able to eliminate cccDNA and reduce HBsAg expression from integrated HBV without inducing translocations. Together, these data support a potential gene editing approach and cure for CHB.

OS-035-YI
Development and validation of the AMMON-OHE model to risk stratify cirrhotic outpatients for occurrence of overt hepatic encephalopathy
María Pilar Ballester1,2, Thomas Tranah3, Lorenz Balcar4, Alessandra Fiorillo5, Javier Ampuero6, Annarein Kerber7, Karen Louise Thomsen8,9, Desamparados Escudero-Garcia10, Mattias Mandorfer11, Thomas Reiberger11, Debbie L. Shawcross3, Manuel Romero Gomez12, Carmina Montoliu13, Juan Antonio Carbonell-Asins4, Rajiv Jalan1, ‘Hosital Clinico Universitario de Valencia, Digestive Disease, Spain; 2INCLIVA Biomedical Research Institute, Spain; 3King’s College London, Institute for Liver Studies, United Kingdom; 4Medical University of Vienna, Vienna Hepatic Hemodynamic Laboratory, Austria; 5Virgen del Rocio University Hospital, Digestive Disease Department, Spain; 6Aarhus University Hospital, Denmark; 7University College London, Liver Failure Group, United Kingdom

Background and aims: Neuropsychological and psychophysical tests are recommended for the risk assessment for overt hepatic encephalopathy (OHE), but their accuracy is limited. Hyperammonaemia is central in the pathogenesis of OHE, but its predictive utility is unknown. This study aimed to determine the role of neuropsychological or psychophysical tests and ammonia and to develop the AMMON-OHE model for risk stratification regarding subsequent OHE development in outpatients with liver cirrhosis.

Method: This observational, prospective study included 426 outpatients without previous OHE from 3 liver units followed for a median of 2.5 years. Psychometric hepatic encephalopathy score (PHES) <−4 or critical flicker frequency (CFF) <39 was considered abnormal. Ammonia was normalized to upper limit of normal (AMM-
Results: Significant differences were found in time-to-OHE (log-rank p < 0.001) according to PHES and CFF tests and ammonia, with the highest risk in patients with abnormal PHES plus high AMM-ULN (HR: 4.4; 95% CI: 2.4–8.1, p < 0.001 compared with normal PHES and AMM-ULN) (Figure 1). On multivariable analysis, AMM-ULN but not PHES or CFF was an independent predictor for development of OHE (HR: 1.4; 95% CI: 1.1–1.9; p = 0.015). The AMMON-OHE model included sex, diabetes, albumin, creatinine and AMM-ULN, and showed a C-index of 0.844 and 0.728 in the two validation cohorts, respectively.

Conclusion: This study developed and validated the AMMON-OHE model, comprising readily available clinical and biochemical variables that can be used to identify outpatients with cirrhosis at highest risk for developing a first episode of OHE.

OS-036
Efficacy and safety of lusutrombopag in a real-world Italian series of cirrhotic patients with severe thrombocytopenia undergoing invasive procedures: the Reality study
Paolo Gallo1, Antonio De Vincentis1, Valeria Pace Palitti2, Maurizio Tortora6, Marco Biolato7, Maurizio Pompili7, Enrico Ragone15, Rodolfo Sacco10, Pierluigi Cacciatore2, Umberto Vespasiani Gentilucci1, Fondazione Policlinico Campus Biomedico Rome, Italy; 2ASL Pescara, Italy; 3Arnas Garibaldi Catania, Italy; 4Sapienza University of Rome, Italy; 5Policlinico Umberto I, Rome, Italy; 6S. Anna and S. Sebastiano Hospital Caserta, Italy; 7Monaldi Hospital Naples, Italy; 12'S de Bellis' Research Hospital, Castellana Grotte (Bari), Italy; 13Umberto I Hospital Siracusa, Italy; 14S. Anna and S. Sebastiano Hospital Caserta, Italy; 15Monaldi Hospital Naples, Italy; 16San Filippo Neri Hospital Rome, Italy

Background and aims: Severe thrombocytopenia (platelet count less than 50,000/μL) complicates the management of patients with chronic liver disease by increasing the risk of bleeding for invasive procedures and sometimes delaying lifesaving treatments. In the last years, thrombopoietin (TPO) receptor agonists such as lusutrombopag have been developed in order to avoid platelet transfusion and associated concerns. Real-world data on the efficacy and safety of the drug are limited to sparse reports or administrative databases. We aimed to evaluate the first post-marketing European cohort of cirrhotic patients treated with lusutrombopag in order to verify efficacy and safety of the drug in a real-world setting.

Method: In the REAL-world Lusutrombopag treatment in Italy (REALITY) study, we collected data of consecutive cirrhotic patients receiving lusutrombopag before invasive procedures between March 2021 and November 2022 from 15 Italian hepatologic centers, mostly belonging to the “Club Epatologi Ospedalieri” (CLEO). Efficacy, i.e., the capability of lusutrombopag to raise platelet count to ≥50,000/μL and avoid transfusions, as well as treatment-related adverse events, were captured and analyzed.

Results: Fifty patients were enrolled (median age 66 years, female 30%, Child-Pugh A/B/C 67/27/6%). Ten patients (20%) had a previous medical history of portal vein thrombosis. Chronic viral hepatitis was the most common cause of liver disease (42%), followed by the non-alcoholic fatty liver disease (28%). Interventional radiology (44%) and endoscopic (32%) were the most common procedures involved: thermal ablation (14%) and transarterial chemoembolization (14%) of liver cancer, liver biopsy (15%), endoscopic band ligation (18%), other endoscopic operative procedures (14%). Lusutrombopag induced a significant increase in platelet count [from 36,500 (33,000–43,000)/μL] to 61,500 (52,000–80,750), p < 0.01. The efficacy of lusutrombopag was 78%, while 11 patients (22%) did not reach the platelet threshold of 50,000/μL and required platelet transfusions before the invasive procedure. Notably, the efficacy of lusutrombopag was significantly lower in the 9 patients with a baseline platelet count ≤30,000/μL compared to the 41 patients with a baseline count >30,000/μL (4% Vs 85%, respectively, p < 0.01). There were no hemorrhagic events in this series. De novo portal vein thrombosis was observed in 2 patients.

Conclusion: In this first real-world European series of cirrhotic patients with severe thrombocytopenia treated with lusutrombopag before invasive procedures, the drug confirmed efficacy and safety profiles in line with those observed in registrative trials. According to our results, patients with baseline platelets ≤30,000/μL are unlikely to respond to the drug.

OS-037
Pregnancy outcomes in women with liver cirrhosis: a prospective UK obstetric surveillance system national cohort study
Melanie Nana1, Agata Majewska1, Mussarat Rahim2, Victoria Geenes1, Paul Seed1, Caroline Ovadia1, Marian Knight3, Michael Heneghan2, Catherine Williamson1, King’s College London, Women’s Health, London, United Kingdom; 2Institute of Hepatology, King’s College London, United Kingdom; 3National Perinatal Epidemiology Unit, United Kingdom

Background and aims: The number of women entering pregnancy with cirrhosis is increasing, yet there is a paucity of data to inform
evidence-based management and counselling of these patients. In the first prospective study of cirrhosis in pregnancy we aimed to determine its national incidence and management, and to describe maternal and fetal outcomes in this group.

**Method:** A prospective, national cohort study was performed using the UK Obstetric Surveillance System between 2017 and 2020. Rates of adverse perinatal outcomes were compared with published rates of adverse perinatal outcomes in uncomplicated pregnancies or at population level using logistic regression, and prediction of adverse pregnancy outcomes by ALBI score was determined by calculating the area under the receiver operating characteristic curve (AUROC) (Stata 17.0 and GraphPad Prism v9).

**Results:** In total, 52 eligible cases were reported (denominators were determined by available data for specific adverse outcomes. The causes of cirrhosis are illustrated in Figure 1.

![Figure: Underlying causes of cirrhosis. Abbreviations: NASH-non-alcoholic steatohepatitis; MDR3-multidrug resistance protein 3.](image)

Only 17/42 (40.5%) of women received pre-pregnancy counselling. In total, 49/52 (94.2%) conceived spontaneously; three miscarried. Maternal decompensation occurred in seven women, defined by jaundice (n = 2), ascites (n = 3) and encephalopathy (n = 1). The worst ALBI score in pregnancy predicted maternal decompensation AUROC 0.80 (p = 0.03). During the pregnancy 26/49 (53.0%) had an endoscopy, of which 34.6% had uncomplicated variceal banding. Untreated varices were associated with increased rates of variceal bleed (p = 0.01). In total, 9/52 (17.3%) women developed cholestasis. Four women required intensive care unit (ICU) admission, none required liver transplant, and none died. There were 42 live births; 51.2% were preterm, 44.2% had low-birth-weight; there was one stillbirth; and two neonatal deaths (both a consequence of extreme prematurity). The worst ALBI score in pregnancy predicted pre-term birth AUROC 0.74 (p = 0.03). When compared to a healthy reference population, cirrhotic women were at increased risk of cholestasis in pregnancy (OR 29.4, 95% CI 13.8–61.6, p < 0.001), ICU admission (OR 42.5, 95% CI 15.2–118.8, p < 0.001), pre-term birth (OR 13.2, 95% CI 71.2–24.4, p < 0.001), low-birth-weight (OR 12.0, 95% CI 6.5–22.0, p < 0.001), neonatal intensive care unit admission (OR 4.4, 95% CI 2.4–8.2, p < 0.001) and neonatal death (OR 31.795% CI 7.6–131.4, p < 0.001).

**Conclusion:** High numbers of women with cirrhosis in pregnancy conceive spontaneously. Pre-pregnancy counselling is paramount to ensuring that women are optimised for pregnancy, including having screening and appropriate management of varices and being counselled regarding the increased rates of maternal and neonatal complications. The ALBI score predicts maternal decompensation and pre-term birth.

**OS-038 Substitution of even one non-vegetarian meal with plant-based alternatives associate with lower ammoniagenesis in patients with cirrhosis who follow a western diet: a randomized clinical trial**

Andrew Fagan1, Bryan Badal1, Victoria Tate1, Travis Mousel1, Mary Leslie Gallagher1, Puneet Puri1, Michael Fuchs1, Brian Davis1, Jennifer Miller1, Jasmohan S Bajaj1. 1Virginia Commonwealth University and Richmond VAMC, United States

Email: jasmohan.bajaj@vcuhealth.org

**Background and aims:** Dietary preferences (Vegetarian, vegan, meat) could differentially influence ammoniagenesis in cirrhosis and hepatic encephalopathy (HE). Most Western populations follow meat-based diets but the impact of intermittent diet substitution on ammoniagenesis is unclear. Aim: Determine impact of substituting one meal with equicaloric and protein containing vegan, vegetarian or meat on ammonia levels in outpatients with cirrhosis on a Western non-vegetarian diet.

**Method:** Outpatients with cirrhosis with/without prior HE (on stable lactulose/rifaximin) on a stable Western meat-based diet were enrolled. We excluded those with MELD>23, unclear cirrhosis diagnosis, BMI (<18.5 or >40), prior TIPS, recent antibiotic/probiotic use, HE treatment<2 months, or valproate/steroid use.

Subjects were randomized 1:1:1 into the 3 meals which had equivalent protein (20 gm) and calories. Meals were freshly prepared by our dietician. These consisted of a burger (meat substitute patty for vegan, bean-burger for vegetarian and pork/beef patty for meat) with bun and low-salt potato chips and water. Baseline dietary history, cirrhosis details, MELD-Na were collected, after overnight fasting, all patients ate the entire meal under observation. They remained fasting for the remaining 3 hours, where they were kept under observation. Venous ammonia levels were drawn at baseline and hourly for 3 hours post-meal (Fig 1A). Baseline characteristics and changes in ammonia levels were compared within and between groups.

**Results:** We enrolled 30 men; ten each were randomized per meal group. All subjects finished the meals and none developed HE symptoms or confusion during the observation period. There were no baseline differences in age, MELD-Na, prior HE, lactulose, rifaximin, PPI and ascites (Fig 1B) between the groups.

**Ammonia levels:** At baseline, no significant differences in ammonia levels were observed (Figure 1B). However, the ammonia levels over time increased significantly from baseline (p = 0.007) only in the meat-based group but not the vegan (p = 0.45) or vegetarian (p = 0.84) group. As shown in figure 1C, serum ammonia levels between groups were significantly higher in the meat group compared to the other 2 groups at hours 1, 2 and 3 post-meal. There were no differences between the ammonia level changes at any timepoint between the vegan and vegetarian groups.

**Conclusion:** Substitution of even one meat-based meal with vegan or vegetarian alternatives has the potential to reduce ammoniagenesis in outpatients with cirrhosis regardless of prior HE. Intermittent plant-based options for protein could be considered in patients with cirrhosis who usually follow a Western diet.
Head-to-head comparison of the prognostic performance of the hepatic venous pressure gradient and non-invasive tests in compensated advanced chronic liver disease

Mathias Jachs, Lukas Hartl, Benedikt Simbrunner, Georg Semmler, Lorenz Balcar, Benedikt Hofer, Michael Schwarz, David JM Bauer, Albert Stättermayer, Matthias Pinter, Michael Hofer, Michael Trauner, Thomas Reiberger, Mattias Mandorfer.

1Medical University of Vienna, Austria

Email: mattias.mandorfer@meduniwien.ac.at

Background and aims: Models based on platelet count (PLT) and liver stiffness measurement (LSM; ANTICIPATE) or von Willebrand factor antigen (VWF) to PLT ratio (VITRO) are applied to estimate the probability of/rule in- or rule-out clinically significant portal hypertension (CSPH), and thus, stratify risk and guide NSBB therapy in patients with compensated advanced chronic liver disease (cACLD). However, head-to-head comparisons of their prognostic utility for first hepatic decompensation and comparisons with the minimally invasive hepatic venous pressure gradient (HVPG) are lacking.

Method: Patients with cACLD, defined by LSM ≥10 kPa, who underwent same-day assessment of HVPG, LSM, and VITRO between 2007 and 2022 were included. Patients’ individual ANTICIPATE-derived probability for CSPH was calculated based on PLT and LSM according to the published formula. Long-term follow-up data on first hepatic decompensation was recorded. Time-dependent AUROC analyses and competing risk regressions were performed.

Results: We included 445 cACLD patients: median age: 54.1 years; 66.7% male; etiology: 51.7% viral, 20.8% ALD, 18.9% NAFLD/cryptogenic, while 8.8% other. The median HVPG was 12 (IQR: 8–17) mmHg with a CSPH prevalence of 61.5%. The median PLT, VWF, and VITRO levels were 109 (80–156) G/L, 243 (188–306) %, and 2.24 (1.29–3.52), respectively. The median estimated probability of CSPH based on the ANTICIPATE model was 80.0 (47.0–94.2) %. The cumulative incidences of first hepatic decompensation were 4.4%, 7.6%, and 13.3% at 1, 2, and 3 years of follow-up. HVPG, VITRO, and CSPH-probability according to ANTICIPATE conferred similar time-dependent prognostic value in AUROC analyses (Figure; panel A), with VITRO showing the numerically highest values over time. In competing risk analyses adjusted for model for end-stage liver disease (MELD) score and serum albumin levels, HVPG (adjusted subdistribution hazard ratio [aSHR]: 1.092 [95%CI:1.048–1.140] per mmHg; p < 0.001), VITRO (aSHR: 1.138 [1.066–1.210] per unit; p < 0.001), and ANTICIPATE-CSPH probability (aSHR: 1.022 [1.010–1.034] per %; p < 0.001) all predicted first decompensation during follow-up. When stratifying the cohort by previously proposed decision rules (HVPG ≥10 mmHg vs. <10 mmHg, VITRO ≥2.5 vs. <2.5, and ANTICIPATE-CSPH probability ≥60% vs. <60%), all biomarkers accurately discriminated between patients at negligible risk and those at substantial risk of hepatic decompensation, as shown in the Figure (panels B–D).
Conclusion: Non-invasive CSPH surrogates, i.e., the ANTICIPATE-CSPH probability, and even more, VITRO, have a high prognostic performance that is similar to minimally invasive HVPG-measurement. Thus, they provide clinically meaningful information and accurately identify candidates for medical therapies to prevent first hepatic decompensation.

Experimental liver fibrosis

OS-041-YI
X-box binding protein 1 (XBP1) in hepatic stellate cells (HSC) mitigates liver fibrosis

Hangheng Wu¹, Hui Ye², Juan Francisco Vilchez–Gómez¹, Marcos Fernandez Fondevilla³,⁴, Aveline Filliol⁵, Robert F. Schwabe⁵, Javier Vaquero⁶,⁷,⁸, Rafael Bañares⁶,⁷,⁸, Ruben Nogueiras³,⁴,⁹, Eduardo Martínez-Naves¹, Scott Friedman¹⁰, Yulia Nevzorova¹,¹⁰,¹¹, Karlheinz Fassbender¹¹, Anna Moles¹²,¹³, Francisco Javier Cubero¹,²,³, Complutense University of Madrid, Spain; ²ZhongDa Hospital Southeast University, China; ³University of Santiago de Compostela-Instituto de Investigación Sanitaria, Spain; ⁴CIBER Fisiopatología de la Obesidad y Nutrición (CIBEROBN), Instituto de Salud Carlos III, Spain; ⁵Columbia University, United States; ⁶Hospital General Universitario Gregorio Maranon, Spain; ⁷Instituto de Investigación Sanitaria Gregorio Marañón (ISGM), Spain; ⁸Centro de Investigación Biomédica en Red de Enfermedades Hepáticas y Digestivas (CIBERehd), Spain; ⁹Galician Agency of Innovation (CAIN), Xunta de Galicia, Santiago de Compostela, Spain; ¹⁰Cahn School of Medicine at Mount Sinai, United States

Email: hangwu@ucm.es

Background and aims: Hepatic fibrosis is a pathogenic condition triggered by persistent inflammation, in which hepatic stellate cells (HSC) are the main cell type responsible for the overexpression of extracellular matrix (ECM) proteins. Recently, it was reported that myeloid-specific XBP1 deficiency or pharmacological inhibition of XBP1 protected the liver against fibrosis. In this study, we aimed to investigate the role of XBP1 in HSCs.

Method: Mice harboring a conditional floxed allele of Xbp1 (Xbp1²/²), were crossed with Lrat-Cre mice to obtain a HSC-specific knockout of Xbp1 (Xbp1lox/lox). Overnight-fasted 8–12 week-old male Xbp1²/² and Xbp1lox/lox mice were either fed a MCD diet, challenged with carbon tetrachloride (CCL4) [0.6 ml/kg] or corn oil for 4 weeks, or given a Western diet (WD) in combination with CCL4 [0.2 ml/kg] for 12 weeks- the FAT-NASH model. Upon sacrifice, qRT-PCR, Western blot, cell death (TUNEL, CC3) and compensatory proliferation (Ki-67), increased lipid accumulation (Oil Red O) and steatosis as well as markers of liver damage (ALT, AST) in livers. Reversion was assessed 72 h post-challenge in a 4-week CCl4 administration and bile duct ligation in CtsDΔ/Δ or CtsDΔ/Δ mice and determined by hydroxyproline, Sirius Red, α-SMA, CollA1 and TGF-β RT-PCR. Proteomic profile was determined by LC-MS/MS in fibrotic livers. Reversion was assessed 72 h post-challenge in a 4-week CCL4 model. Collagen degradation in liver was determined by R-CHP staining. Macrophage polarization and proteolytic secretome was assessed by RT-PCR and protease array, respectively. Collagen degradation and endocytosis was determined by FACS in Kupffer cells (KC). Single-cell RNA sequencing analysis was performed using GSE136103 dataset.

Results: Interestingly, Xbp1lox/lox mice exhibited significantly increased lipid accumulation (Oil Red O) and steatosis as well as cell death (TUNEL, CC3) and compensatory proliferation (Ki-67), compared with Xbp1²/² knockout mice, after 4 weeks of MCD diet. Moreover, one month of CCL4 challenge triggered elevated serum markers of liver damage (ALT, AST) in Xbp1lox/lox. These changes were accompanied with aggravated periportal fibrosis (HandE, Sirius red), a robust overexpression of αSMA expression- a marker of HSC activation-, and other ECM components (Vimentin, Desmin), and the production of proinflammatory proteins (Tnfα, Il-6, Tgfb). Finally, the FAT-NASH preclinical model exacerbated liver injury, periportal fibrosis and inflammation in Xbp1lox/lox compared with Xbp1²/² mice. Additionally, LX2 cells challenged with TGFβ exhibited increased markers of the IRE1-XBP1. Finally, enrichment of XBP1 in HSCs was found in fibrotic murine and cirrhotic human livers.

Figure:

Conclusion: Our data highlighted a novel function of Xbp1 specifically in HSCs in NAFLD/NASH models by mitigating NAFLD/NASH-induced injury. Thus ER stress modulation specifically in HSC could potentially be used clinically to satisfy the current lack of effective treatments against hepatic fibrosis.

OS-042-YI
Novel insights on the contribution of collagen degradative macrophages to liver fibrosis resolution

Maria Fernandez-Fernandez¹,², Paloma Ruiz-Blazquez¹,², Valeria Pistorio¹,³,⁴, Celia Martinez-Sanchez²,⁵, Michele Costanzo⁶, Paola Iruzubietá⁶, Susana Nuñez⁷, Ekaterina Zhuravleva⁷, Jesper Andersen⁸, Margherita Ruoppolo⁹, Javier Crespo⁶, M. Carmen Garcia-Ruiz¹,²,³,⁴, Mar Coll²,⁵,⁹, Luigi Pavone⁴, José Fernandez-Checá¹,²,³,⁴, Anna Moles¹²,¹³, Anna Moles.fernandez@gmail.com

Background and aims: Liver fibrosis is caused by an excessive accumulation of extracellular matrix (ECM) proteins. Macrophages are important effectors for ECM remodelling through recycling of the ECM within acidic compartments and can contribute to liver fibrosis resolution. Proteases, such as cathepsins, are essential for lysosomal proteolytic activity; however, their contribution to ECM remodelling within the macrophages is unknown. Thus, the aim of this study was to investigate the proteolytic and degradative signalling pathways associated to macrophages during liver fibrosis.

Method: A novel macrophage-cathepsin D KO mouse strain (CtsDΔ/Δ) was generated by breeding LysMcCre (macrophages) with CtsDΔ/Δmice. Fibrosis was established by chronic CCl4 administration and bile duct ligation in CtsDΔ/Δ or CtsDΔ/Δ mice and determined by hydroxyproline, Sirius Red, α-SMA, CollA1 and TGF-β RT-PCR. Proteomic profile was determined by LC-MS/MS in fibrotic livers. Reversion was assessed 72 h post-challenge in a 4-week CCL4 model. Collagen degradation in liver was determined by R-CHP staining. Macrophage polarization and proteolytic secretome was assessed by RT-PCR and protease array, respectively. Collagen degradation and endocytosis was determined by FACS in Kupffer cells (KC). Single-cell RNA sequencing analysis was performed using GSE136103 dataset.
Results: scRNAseq analysis and CtsD IHP demonstrated high expression of CtsD in liver macrophages from cirrhotic patients. Next, CtsDΔMyel mouse was validated by FACS and WB in KC and dual IHP (F4/80-CtsD) in liver. CtsD deletion in macrophages enhanced liver fibrosis with enriched matrisome proteomic signatures in chronic CCl4 and BDL models. Analysis of KC isolated from 72h-CCl4-treated livers demonstrated significantly lower expression of markers associated with resolutive macrophages (CD206, TREM-2 and TGF-β) and defective proteolytic secretome profile in CtsDΔMyel KC. In addition, CtsDΔMyel KC displayed defective proteolytic processing of collagen I without impairment of the Endo180 receptor-mediated endocytosis demonstrated by FACS. Analysis of CtsD macrophage subclusters in control and cirrhotic human livers, confirmed cirrhotic CtsD-expressing subclusters were differentially enriched in ECM degradation and organization signalling pathways. In addition, it revealed a decrease in the number of CtsD-expressing macrophage subclusters in cirrhotic livers, which could contribute to inadequate ECM recycling, perpetuating fibrosis and hampering resolution. Indeed, CtsDΔMyel mouse was unable to remodel collagen in vivo when subjected to a fibrosis reversion model determined by both percentage of HP and fluorescent intensity of collagen hybridizing peptide (CHP) binding to liver tissue.

Conclusion: CtsD is essential in regulating the collagenolytic activity of macrophages during liver fibrosis and is part of a novel and currently unknown degradome landscape of restorative macrophages.

OS-043
Atypical Chemokine receptors regulate the induction of 'disease-associated' LSEC by modulating Endothelial-to-Mesenchymal transition (EndMT) during liver fibrosis
Christina Gkantsinikoudi1, Antal Rot1, William Alazawi1, Neil Dufton1,
1Queen Mary University of London, United Kingdom
Email: n.dufton@qmul.ac.uk

Background and aims: Single cell RNA sequencing of cirrhosis patients (Ramachandran et al., 2019) and murine models of fibrosis (Su et al., 2020 and Ruan et al., 2021) have revealed the induction of 'disease-associated' Liver Sinusoidal Endothelial Cells (LSEC) correlate with liver fibrosis. Meta-analysis of these datasets shows that loss of endothelial identity and acquisition of mesenchymal characteristics, a process termed endothelial-to-mesenchymal transition (EndMT), are a common trait of 'disease-associated' LSEC. Our research was the first study to establish EndMT correlates with progressive fibrosis in murine models and human end-stage liver disease (Dufton et al., 2017). We aim to determine the contribution of EndMT to ‘disease-associated’ LSEC during fibrogenesis. Secondly, we noted that LSEC undergo a switch in expression of Atypical Chemokine Receptors (ACKRs), from ACKR4 in healthy liver to ACKR1 during injury. Our study assessed the role of ACKRs in the regulation of EndMT during liver injury using ACKR1 and ACKR4-deficient mice.

Method: Carbon tetrachloride (CCl4) was administered for 2, 4 and 8 weeks in ACKR4egfpΔMyel and ACKR1KO mice. To characterise LSEC subtypes we assessed 12 phenotypic markers by spectral flow cytometry. LSEC where gated using live cells, singlets and CD31+ subtypes we assessed 12 phenotypic markers by spectral flow immunofluorescent microscopy (IF).

Results: Healthy LSEC were distributed in four clusters 1: Lyve1hi EMCNhi, 2: CD31hi Thbdhi, 3:CD31lo EMCNlo and 4: CD31lo ICAM1lo (Fig. 1A). 8-weeks CCl4 significantly reduced the number and composition of LSEC in clusters 1–4 and gave rise to three unique populations of EndMT cells 5: Thy-1hi PdgfRαhi CD34ΔMyel 6: TAGLNhi CD34med and 7: Thy-1hi PdgfRαmg CD34hi (Fig. 1B). IF revealed these EndMT populations predominantly arise in peri-central LSEC. ACKR4egfpΔMyel reporter mice revealed ACKR4 expression in peri-central LSEC in healthy tissue. ACKR4 gene expression was significantly downregulated in WT following CCl4. Conversely, ACKR1 expression was absent in healthy LSEC but markedly upregulated in peri-central regions following CCl4. CCl4 treated ACKR1-deficient mice maintained their vascular architecture with reduced collagen deposition and reduced number of cells undergoing EndMT compared to WT. ACKR4-deficient mice displayed augmented fibrogenesis at all time points characterized by increased collagen-deposition, significant disruption of EC identity and increased EndMT.

Conclusion: We observed three distinct ‘disease-associated’ LSEC subtypes arose with characterised features of EndMT. These clusters may represent different stages of EndMT that occur with LSEC transitioning from Cluster 3, to acquire mesenchymal traits in Cluster 6 before reaching complete EndMT (Cluster 5 and 7). ACKR1KO mice were protected from both EndMT and fibrogenesis while ACKR4egfpΔMyel mice displayed an opposite phenotype suggesting regulation of ACKRs during liver injury is a crucial determinant of vascular health and liver fibrosis.

Figure: (abstract: OS-043): tSNEs plots display LSEC from (A) control and (B) 8-week CCl4 WT mice with individual markers for each cluster shown by corresponding colour in the histograms.
OS-044-YI
Single-cell multiomics defines candidate transcription factors regulating pathogenic macrophage differentiation in murine liver fibrosis
Eleni Papachristoforou1, Elena Sutherland1, Neil Henderson1, Prakash Ramachandran1, 1University of Edinburgh, Centre for Inflammation Research, United Kingdom
Email: eleni.papachristoforou@ed.ac.uk

Background and aims: Hepatic macrophages are key regulators of fibrosis progression and regression. Recent work using single-cell RNA-sequencing (scRNAseq) has identified a subpopulation of TREM2+CD9+ scar-associated monocyte-derived macrophages (SAMac) which expand in fibrotic human and murine liver tissue and regulate fibrosis. However, whilst the transcriptome of this macrophage population has now been well defined, the key transcriptional regulators of SAMac differentiation and phenotype remain unknown. To address this, we aimed to apply scRNAseq and single-cell ATAC-seq (scATACseq) in a murine model of liver fibrosis, to study transcription factor (TF) enrichment in monocyte and macrophage subpopulations at single-cell resolution.

Method: Liver injury was induced in C57BL/6J mice by carbon tetrachloride (CCl4) twice weekly for 4 weeks. Age matched uninjured mice were controls. ScRNAseq and scATACseq was performed on FACS-purified immune cells from blood and liver tissue of CCl4 injury (n = 6 scRNAseq; n = 4 scATACseq) and controls (n = 6 scRNAseq; n = 4 scATACseq) using the 10X Genomics Chromium platform. Computational analysis was performed in R.

Results: Unsupervised clustering of scRNAseq data enabled atlassing of populations of immune cells. Mononuclear phagocytes (MP) were reclustered, identifying 17 distinct subpopulations (Fig) including Trem2+CD9+Gpmb+ macrophages which expanded in fibrotic liver tissue and were transcriptionally similar to the corollary SAMac population in human fibrotic livers. Trajectory inference performed using Scvelo, demonstrated that murine SAMac derived from the recruitment and differentiation of circulating Ly-6C<sup>hi</sup> monocytes. Having defined macrophage heterogeneity and differentiation kinetics using the scRNAseq data, scATACseq cell type clusters were then annotated by employing Seurat label transfer methodology (Fig). Differential TF motif enrichment was assessed in annotated scATACseq MP subpopulations using SIGNAC (Fig). We identified enrichment for previously described TFs such as the Cebp family in Ly-6C<sup>hi</sup> blood monocytes, Nr4a1 in Ly-6C<sup>lo</sup> monocytes, Runx1 in dendritic cells and Nr1h3 (Lxra) in resident Kupffer cells. Focussing on SAMac, this population was enriched for AP-1 family members, Nfe2, Batf, Smad2/3 as well as the transcriptional repressor Bach2 and the antioxidant regulator Nfe2l2. Hence, the differentiation of monocytes into SAMac results in a distinct motif profile, suggesting that complex signals within the fibrotic niche are crucial to determining SAMac phenotype.

Conclusion: Single-cell multiomics identifies novel candidate transcriptional regulators of SAMac differentiation and expansion in the fibrotic liver. These data provide a framework for future functional studies aiming to selectively target and modulate SAMac transcription as an antifibrotic strategy for liver disease.

Figure: (abstract: OS-044-YI).
OS-045
Long-term real-world experience with obeticholic acid in primary biliary cholangitis: the Italian recapitulate study
Francesca Terracciani1, Antonio De Vincentis1, Daphne D’Amato2, Anna Morgando2, Ester Vanni3, Mauro Viganò4, Domenico Alvaro4, Rosanna Venere4, Ana Lleo5, Francesca Colapietro5, Elisabetta Degasperi6, Raffaella Viganò7, Edoardo Giovanni Giannini8, Sara Labanca9, Valentina Feletti9, Alessandro Mussetto9, Raffaele Cozzolongo10, Francesco Lusio10, Maurizio Pompei10, Francesca Ponziani11, Grazia Niro12, Rosa Cogutino12, Pietro Pozzoni13, Luchino Chessa14, Giuseppe Cuccorese15, Valeria Pace Palitti15, Maurizio Russello17, Maria Rita Cannavò17, Evelise Frazzetto18, Gaetano Bertino18, Marco Marzini19, Natalla Terreni20, Teresa Zolfino21, Carlo Saitta22, Adriano Pellicelli23, Barbara Coco24, Giacomo Quaglia25, Antonino Castellaneta26, Guido Poggi26, Teresa Zolfino21, Carlo Saitta22, Adriano Pellicelli23, Barbara Coco24, scienza, Turin, Italy, Gastroenterology Unit, Italy; 3San Giuseppe Annamaria Hospital, Syracuse, Italy, Italy; 7Niguarda Hospital, Milan, Italy, Italy; 8University of Genoa, IRCCS Clinical and Research Center IRCCS, Humanitas University, Milan, Italy, Italy; 12Fondazione Casa Sollievo Della Sofferenza IRCCS, San Giovanni Rotondo, Italy, Italy; 29Tor Vergata University Hospital, Rome, Internal Medicine and Hepatology, Italy; 2Città della salute e della salute, Padua, Italy; 26Università di Bologna, Policlinico di Bologna, Italy; 13Alessandro Manzoni Hospital, Lecco, Italy, Italy; 14University Hospital of Cagliari, Cagliari, Italy, Italy; 24University Hospital of Ferrara, Italy, Italy; 15Ospedale Policlinico San Martino, Genova, Italy; 9Santa Maria Delle Croci Hospital, Genova, Italy; 6Foundation IRCCS Ca Granda Ospedale Maggiore Policlinico, Milan, Italy; 10Ospedale SS. Annunziata, Lucca, Italy; 51Ospedale SS. Annunziata, Lucca, Italy; 42Azienda Ospedaliero-Universitaria Maggiore della Carità, Novara, Italy; 17Arnas Ospedale, Barletta, Italy; 16Santo Spirito Hospital, Pescara, Italy, Italy; 17Arnas Ospedale, Barletta, Italy; 19Università Politecnica delle Marche, Ancona, Italy; 20Azienda Ospedaliera S. Andrea, Rome, Italy; 4University of Palermo, Palermo, Italy, Italy; 45Policlinico di Bari Hospital, Bari, Italy; 44University of Palermo, Palermo, Italy, Italy; 42Azienda Ospedaliero-Universitaria Maggiore della Carità, Novara, Italy; 43School of Medicine and Psychology University “Sapienza”, Azienda Ospedaliera S. Andrea, Rome, Italy; 42Azienda Ospedaliero-Universitaria Maggiore della Carità, Novara, Italy; 43,44,45,46,47,48,49,50,51University La Sapienza, Rome, Italy, Italy; 52Spedali Civili, Brescia, Italy, Italy; 50Guido Salvini Hospital, Rho, Italy, Italy; 46Ospedale S. Ammunita Sassari, Italy; 55Spedali Civili, Brescia, Italy, Italy
Email: f.terracciani@unicampus.it

**Background and aims:** Primary biliary cholangitis (PBC) is a chronic inflammatory and autoimmune cholestatic liver disease, which, if left untreated, can lead to cirrhosis and the need for liver transplantation. A variable percentage of patients (25–40%) are non-responder to first-line therapy with ursodeoxycholic acid (UDCA). In 2016, obeticholic acid (OCA) has been approved for patients non-responder or intolerant to UDCA. A number of studies have already reported post-marketing experiences with OCA; however, they are limited by small sample sizes and short follow-up. Aim of the RECAPITULATE study is to provide long-term results concerning real-world treatment with OCA in a large Italian cohort of PBC patients.

**Method:** Centres belonging to the “Italian PBC registry,” the PBC task force of “Club Epatologi Ospedalieri” (CLEO) and “Associazione Italiana Gastroenterologi Ospedalieri” (AIGC), the “Sicilian PBC Network” and the “PBC Project Piemonte-Liguria-Valle D’Aosta” participated to data collection. Data from all patients followed at those centres receiving at least one dose of OCA, and with a follow-up of at least 6 months, were captured. Cumulative incidences of OCA response and discontinuation were evaluated through Aalen-Johansen (taking into account the competing risk of discontinuation) and Kaplan-Meier estimators, respectively.

**Results:** Data on 441 PBC patients (median age 58 years, women 88%), median time on OCA therapy 24 months), enrolled from 50 Italian centres, were analyzed. 153 patients (34%) were cirrhotics and 59 (13%) were PBC/autoimmune hepatitis (AIH) overlap. Observed response probabilities according to POISE criteria at 12/24/36 months were 37.5/43.5/47.2%, respectively. OCA was discontinued in 86 patients (19%). Discontinuation probabilities at 12/24/36 months were 12.8/17.7/22.9%, respectively. Leading causes of discontinuation were pruritus (41 patients, 48%), and hepatic events (19 patients, 21%). Cirrhotics showed lower response probabilities (25.9/27.7/34.8% at 12/24/36 months; p < 0.01 Vs non-cirrhotics), and higher discontinuation probabilities (19.9/27.8/34.6% at 12/24/36 months; p < 0.01 Vs non-cirrhotics). Response and discontinuation probabilities in PBC/AIH overlap were not significantly different to those observed in “pure PBC” (p = 0.20). Liver stiffness measurements (LSM) by vibration-controlled-rectilinear-elasticography (VCET) were available for 309/114/69 patients at 0/12/24 months. LSMs were not different at 12 months compared with baseline either in Poise non-responders or responders. Conversely, at 24 months, LSMs were significantly reduced with respect to baseline in Poise responders [7.5 (5.4–9.5) Vs 7.9 (6.1–11.3), p = 0.01], but not in non-responders (p = 0.96).

**Conclusion:** Results from the Italian RECAPITULATE study confirm in a real-world setting the long-term efficacy and safety of second-line PBC treatment with OCA. These first data concerning LSM variation over time under OCA treatment suggest a reduction only in Poise responders, but need to be verified in a larger sample size.
Background and aims: Bezafibrate (BZF), a pan-agonist of the peroxisome proliferator-activated receptors, benefits patients with primary biliary cholangitis (PBC) who have an inadequate response to ursodeoxycholic acid (UDCA). Obeticholic acid (OCA), a potent farnesoid X receptor agonist, was approved as second-line treatment for PBC in 2016. This planned interim analysis of an ongoing phase 2, randomized, active-controlled trial assessed whether a combination of OCA and BZF may improve serum biomarkers for PBC more than BZF monotherapy, while also monitoring the safety and tolerability of the novel combination.

Method: While continuing their UDCA treatment (if any), subjects with PBC were randomized 1:1:1:1 to receive 12 weeks of once daily oral BZF 200 mg + placebo (B200), BZF 400 mg + placebo (B400), BZF 200 mg + OCA 5 mg titrated to 10 mg at week 4 (OCA/B200), or BZF 400 mg + OCA 5 mg titrated to 10 mg at week 4 (OCA/B400). End points included comparisons of serum biomarker levels of PBC-induced liver damage: alkaline phosphatase (ALP), alanine transaminase (ALT), aspartate aminotransferase (AST), gamma-glutamyl transferase (GGT), and total bilirubin (TB). Safety was assessed by monitoring of adverse events (AEs) and laboratory values.

Results: This planned interim analysis from the first 45 of the anticipated 72 subjects focused on short-term changes in biochemical indicators of improved outcomes in PBC. Relative to baseline values, only subjects receiving OCA/B400 showed a highly significant reduction in ALP to within normal range (60% of subjects) at week 4, which continued to improve through week 12 (Figure). Subjects receiving OCA/B400 also exhibited the greatest reductions in biomarkers and normalized levels of total bilirubin (100%), ALT (100%), and GGT (70%) by week 12. Two events of pruritus (20%) were reported in B200, 3 (25%) in B400, 2 (17%) in OCA/B200, and none in OCA/B400. Five of 23 (22%) subjects who received OCA discontinued the study: 2 withdrew consent (one in each combination group), 2 experienced treatment-emergent AEs (TEAEs; OCA/B400), and 1 violated the inclusion/exclusion criteria (OCA/B200). Four subjects experienced severe or serious TEAEs deemed non-drug related (atrial fibrillation [2 events], breast cancer, and pleural mesothelioma malignant). No deaths occurred in this study.

Conclusion: The results of this planned interim analysis suggest that short-term combination of BZF and OCA was well tolerated and has therapeutic potential in the reduction of biomarkers of PBC-related liver damage.
Conclusion: The results from this European multicentre prospective registry demonstrate a high rate of drug intolerance within the first six months of AIH therapy leading to change of treatment regime in 30.4%. The landscape of AIH-treatment is heterogenous even in expert centres throughout Europe with nearly one third of patients not reaching normalization of serum ALT levels until 12 months-follow-up and less than one third of patients with steroid-free treatment response. Those high rates of failure highlight the unmet needs in the care of people suffering from AIH.

OS-048-YI
Risk of cancer and subsequent mortality in primary biliary cholangitis: a population-based cohort study of 3,052 patients
Axel Wester1, Johanna Schönau2, Jörn Schattenberg3, Charlotte Slooter1, Mohammed Al-Rawi4, Daniel Pavan5, Gerd Bouma1, Rodrigo Liberal9, Charlotte Huddinge, Sweden; 2University Medical Center of the Johannes Gutenberg-University Mainz, Germany; 3Humanitas University, Italy; 4University of Bologna, Italy; 5Golisano Children’s Hospital, University of Rochester Medical Center, United States; 6University Hospital of Larissa, Greece; 7Vírgen de Victoria University Hospital, University of Málaga, Spain; 8University of Alberta Hospital, Edmonton, Canada; 9Centro Hospitalar Sao Joao, Porto, Portugal
Email: axel.wester@ki.se

Background and aims: Primary biliary cholangitis (PBC) is a rare cholestatic liver disease. Incident cancer is a concern. Previous studies have described an increase in hepatocellular carcinoma (HCC), but the risk of non-hepatic cancer and the cancer risk across subgroups is largely unknown.

Method: We used the Swedish National Patient Register to identify all patients who were newly diagnosed with PBC between 2002 and 2019. Patients were matched for age, sex, and municipality with up to ten reference individuals from the general population. Incident cancer was recorded from the National Cancer Register. Cox regression was used to investigate the rates of cancer and post-cancer mortality, adjusted for potential confounders. The cumulative incidence of cancer was calculated while accounting for the competing risk of death.

Results: We identified 3,052 patients with PBC and 26,792 reference individuals and followed them for a median of 5.5 and 7.0 years, respectively. The median age was 64 years and 85% were women. At ten years of follow-up, the cumulative incidence of any cancer in patients with PBC was 14.3% (95% confidence interval [CI] 12.8–15.9), compared to 11.8% (95% CI 11.3–12.2) in the reference population (adjusted hazard ratio [aHR] 1.4, 95% CI 1.2–1.5). Although the rate of HCC was particularly high (aHR 30.9; 95% CI 14.8–64.6), PBC was also associated with non-HCC cancer (aHR 1.2, 95% CI 1.1–1.4), including gastrointestinal (aHR 1.5, 95% CI 1.1–1.9), lung (aHR 1.5, 95% CI 1.1–2.2) and lymphoma (aHR 2.9, 95% CI 1.9–4.6). The cancer rates were similarly increased across age and sex subgroups, but more prominently increased in patients with cirrhosis (aHR 2.1; 95% CI 1.4–3.0). Following a diagnosis of cancer, patients with PBC had higher one-year mortality rates compared to reference individuals (aHR 1.4, 95% CI 1.1–1.8), which was mainly driven by HCC (non-HCC related mortality: aHR 1.2, 95% CI 0.9–1.6).

Figure:
Conclusion: Patients with PBC have a significantly higher risk of cancer compared to the general population. PBC was associated with both HCC and non-hepatic cancers as well as higher mortality following a diagnosis of cancer.

OS-049-YI
Lack of biochemical response after diagnosis is associated with cirrhosis development during follow-up in autoimmune hepatitis
Charlotte Slooter1, Patricia Maisonneuve2, Francesca Colapietro3, Mercedes Robles-Díaz7, Daniel E. Di Zeo-Sánchez2, Raul J. Andrade8, Aldo Montano-Loza8, Ellina Lytvyn4, Gerd Bouma1, Rodrigo Liberal9, Ana Lleo3, Ynto de Boer1.
1Amsterdam University Medical Center, Netherlands; 2European Institute of Oncology, Italy; 3Humanitas University, Italy; 4University of Bologna, Italy; 5Golisano Children’s Hospital, University of Rochester Medical Center, United States; 6University Hospital of Larissa, Greece; 7Virgen de Victoria University Hospital, University of Málaga, Spain; 8University of Alberta Hospital, Edmonton, Canada; 9Centro Hospitalar Sao Joao, Porto, Portugal
Email: y.deboer1@amsterdamumc.nl

Background and aims: The aim of treatment in autoimmune hepatitis (AIH) is the achievement of complete biochemical response defined as normalization of aminotransferases and immunoglobulin G (IgG) in order to prevent further progression of the disease and the development of cirrhosis. Studies with enough power that assess prognostic factors are scarce. The aim of this study is to identify prognostic factors in the worlds’ largest AIH cohort from the International Autoimmune hepatitis (AIH) Group retrospective registry (IAIHG-RR).

Conclusion: The biochemical response at diagnosis is associated with the rate of cirrhosis development during follow-up.
Liver transplantation and hepatobiliary surgery

OS-050-Y1
APRI+ALBI score is superior to Indocyanine Green (ICG) clearance and LiMAx test in the prediction of posthepatectomy liver failure—an international multicenter study of 14581 patients

Jonas Santol1,2, Sarang Kim1, Hubert Hackl1, Lindsey Gregory4, Ruth Baumgartner9, Anastasia Lemeckova1, Emrullah Birgin1, Severin Gloor8, Eva Braunwarth9, Markus Ammann10, Johannes Starlinger11, David Pereyra12, Daphni Ammon12, Marijana Ninkovic9, Anna Kern12, Felix Hube12, Jeremias Weninger12, Yawen Dong1, Cornelius Thiel4, Susanne Warner4, Roly L. Smoot4, Mark Truty4, Michael Kendrick4, David M. Nagorney4, Sean Cleary4, Katrin Hoffmann6, Stefan Gilg13, Alice Assinger2, Thomas Grünberger1, Patrick Starling4.

1HPB Center, Vienna Health Network, Clinic Favoriten, Department of Surgery, Wien, Austria; 2Center for Physiology and Pharmacology, Medical University of Vienna, Institute of Vascular Biology and Thrombosis Research, Vienna, Austria; 3Biocenter, Medical University of Innsbruck, Division of Bioinformatics, Austria; 4Mayo Clinic, Department of Surgery, Division of Hepatobiliary and Pancreatic Surgery, Rochester, United States; 5Karolinska University Hospital, Department of Oncology, Sweden; 6Heidelberg University Hospital, Department of General, Visceral, and Transplantation Surgery, Germany; 7University Medicine Mannheim, Medical Faculty Mannheim, Heidelberg University, Department of Surgery, Germany; 8Inselspital, Bern University Hospital, Department of Surgery, Bern, Department of Visceral Surgery and Medicine, Switzerland; 9Medical University of Innsbruck, Department of Visceral, Transplantation and Thoracic Surgery, Austria; 10State Hospital Wiener Neustadt, Department of Surgery, Austria; 1125binary UG, Berlin, Germany; 12Medical University of Vienna, Department of General Surgery, Division of Visceral Surgery, Austria; 13Karolinska University Hospital, Department of HPB surgery, Sweden

Email: tellsantol@gmail.com

Background and aims: APRI+ALBI, a score calculated using only aspartate aminotransferase, platelet count, albumin and bilirubin, and dynamic liver function tests like ICG clearance and LiMAx have been evaluated for their predictive potential for posthepatectomy liver failure (PHLF). The aim of this study was to compare the predictive potential of these parameters for PHLF grade B + C and validate our findings using an international multicenter cohort and a logistic regression-based prediction model.

Method: 622 patients undergoing major and minor liver resection with preoperative ICG clearance measurement and 192 patients undergoing hepatic surgery, with preoperative LiMAx test assessment were included from a prospectively maintained database. PHLF grade B + C was defined according to the ISGLS criteria. To form a validation cohort 1906 patients with available preoperative APRI +ALBI score from 8 different international institutions were included. Finally, 12056 patients from the NSQIP database, who underwent hepatic surgery and where a preoperative APRI+ALBI score could be calculated, were included to generate a logistic regression-based prediction model along with generalized additive models to capture non-linearities.

Results: Predictive potential of the APRI+ALBI score for PHLF grade B + C was superior to ICG clearance and LiMAx, when comparing areas under the curve (AUC) (ICG cohort: APRI+ALBI AUC = 0.785, ICG-R15 AUC = 0.643, ICG-PDR AUC = 0.643; LiMAx cohort: APRI+ALBI AUC = 0.868, LiMAx AUC = 0.536). We then defined two cutoffs for APRI +ALBI. A low-risk cutoff of ≥−2.43, to assess which patients could safely be resected (negative predictive value (NPV) = 98%, p < 0.001) and a high-risk cut-off of ≥−0.86, to identify which patients were most likely to develop PHLF B + C (positive predictive value (PPV)) = 56%, p < 0.001). Both cutoffs proved independent of other parameters and confounders in two multivariable models (low-risk multivariable
model: low-risk cutoff, \( p < 0.001 \), odds ratio (OR), 5.751, 95% confidence interval (CI), 2.193–15.082; high-risk multivariable model: high-risk cutoff, \( p < 0.001 \), OR, 20.534, CI, 4.946–85.252. The cutoffs showed similar results in the validation cohort (≥−2.43 NPV = 93%, \( p < 0.001 \); ≥−0.86 PPV = 29%, \( p < 0.001 \); ≥−0.98 PPV = 33%, \( p < 0.001 \)). To evaluate dynamic risk increase more precisely, in a next step, we developed a logistic regression based dynamic risk assessment model (Fig. 1). We were able to demonstrate and validate that with a rising APRI+ALBI score a concomitant exponential increase in risk can be observed.

Figure 1: Logistic regression based dynamic risk assessment model, calculated for the whole cohort (A) and for major resections only (B).

**Conclusion:** APRI+ALBI can be calculated using only routine preoperative laboratory parameters. We can demonstrate that APRI+ALBI is superior to ICG clearance and LiMAx testing, as two frequently used dynamic liver function tests, in the prediction of PHLF grade B + C. Using high- and low-risk cutoffs, we were able to assess which patients could safely undergo surgery and which patients had the highest postoperative risk to develop PHLF B + C. We were able to validate our findings, using an international multicenter validation cohort. Importantly, we could ultimately develop and validate a dynamic risk assessment model for clinically significant PHLF based on simple APRI/ALBI scoring to increase predictive accuracy for the individual patient.

**OS-051-YI**

**MicroRNA based prediction of posthepatectomy liver failure and mortality outperforms established markers of preoperative risk assessment**

Anna Kern1, David Pereyra2, Hubert Hackl3, Susanna Skalicky4, Jonas Santol5,6, Jeremias Weninger2, Sarah Brunner2, Valerie Lafert2, Yannic Herrmann2, Thomas Grünberger3, Matthias Hackl4, Alice Assinger5, Patrick Starlinger2, 1General Hospital of Vienna, Department of General Surgery, Division of Visceral Surgery, Medical University of Vienna, Vienna, Austria; 2General Hospital of Vienna, Department of General Surgery, Division of Visceral Surgery, Medical University of Vienna, Austria; 3Medical University of Innsbruck, Division of Bioinformatics, Austria; 4General Hospital of Vienna, Department of General Surgery, Division of Visceral Surgery, Medical University of Vienna, Austria; 5Medical University of Innsbruck, Division of Bioinformatics, Austria; 6Institute of Vascular Biology and Thrombosis Research, Center for Physiology and Pharmacology, Medical University of Vienna, Austria; 7Institute of Vascular Biology and Thrombosis Research, Center for Physiology and Pharmacology, Medical University of Vienna, Austria; 8Mayo Clinic, Rochester, Department of Surgery, Division of Hepatobiliary and Pancreatic Surgery, Rochester, United States

**Background and aims:** Posthepatectomy liver failure (PHLF) continues to be the most significant factor determining outcomes after hepatic resection, accounting for nearly half of postoperative mortality. In this study, we evaluated if the simple assessment of circulating microRNAs (miRs) can predict PHLF, and could outperform other liver function tests, such as indocyanine green (ICG) clearance, hepatic venous pressure gradient (HVPG) and liver maximum capacity (LiMAx) test.

**Method:** A total of 329 patients, all undergoing liver resection in 3 different hospitals in Vienna, Austria, were included and postoperative outcome was assessed. Our previously described miR-Score (HepatomiR) was assessed preoperatively, as well as other well-established predictors of PHLF.

**Results:** HepatomiR was superior to all other analyzed liver function tests in the prediction of PHLF and PHLF grades B and C (PHLF: HepatomiR: area under the curve (AUC) = 0.770, Fig. 1A) (PHLF: plasma disappearance rate (PDR): AUC = 0.569; retention rate at 15 minutes (R15): AUC = 0.618; HVPG: AUC = 0.530; LiMAx: AUC = 0.540, Fig. 1B) (PHLF B+C: HepatomiR: AUC = 0.755, Fig. 1C) (PHLF B+C: PDR: AUC = 0.634; R15: AUC = 0.653; HVPG: AUC = 0.530; LiMAx: AUC = 0.593). Also, strong predictive potential for PHLF was observed when analyzing HepatomiR in the respective tumor subgroups (colorectal cancer liver metastases (mCRC): AUC = 0.799; hepatocellular carcinoma (HCC): AUC = 0.723; cholangiocellular carcinoma (CCA): AUC = 0.701; other: AUC = 0.949, Fig. 1D). We could validate the previously published low-risk cut-off P > 0.59 (negative predictive value = 91.5%) and high-risk cut-off P > 0.68 (positive predictive value = 77%) for PHLF and document a close association with postoperative overall survival. Economic analyses demonstrated a significant reduction of health care costs utilizing improved patient risk-stratification.

**OS-052**

**Prehabilitation intervention to maximize early recovery (PRIMER) in liver transplantation: a randomized, controlled trial**

Marina Serper1, Lauren Jones1, Thomas Clement1, Kristen Dwinnells2, Derek Zaleski2, Peter Reese1, 1University of Pennsylvania, United States; 2Hospital of the University of Pennsylvania, United States

**Background and aims:** Frailty and impaired functional status are associated with adverse outcomes on the liver transplant (LT) waitlist and after transplantation. Prehabilitation prior to LT has rarely been tested. We conducted a two-arm patient randomized trial to evaluate the efficacy of a behavioral intervention to promote exercise and physical activity prior to LT.

**Method:** This was a 12-week, prospective study comparing enhanced usual care to a home-based, remote monitoring behavioral intervention. A total of 30 patients were randomized 2:1 to intervention (n-
The intervention arm included financial incentives and text-based nudges that were linked to personal fitness trackers (Nokia Go) to gradually increase daily steps by 15% in 2-week intervals (6 in total). Weekly check-ins with study staff were incentivized to promote adherence and assess barriers to physical activity. Both arms received personalized dietary and physical activity recommendations based on a nutrition assessment, short physical performance battery (SPPB), and frailty. The primary outcomes were feasibility and acceptability. Secondary outcomes included mean end-of-study (week 11–12) step counts, SPPB, grip strength, and body composition (PhA). We fit regression models for secondary outcomes with arm as the exposure adjusting for baseline performance using robust standard errors.

**Results:** Mean age was 61, 47% were female, median MELD-Na was 13. One third were frail or pre-frail by the liver frailty index (LFI), 40% had impaired mobility by SPPB, nearly 40% had sarcopenia by bioimpedance PhA, 23% had prior falls, and 53% had diabetes. Study retention was 27/30 (90%; 2 unenrolled from intervention, 1 lost to follow-up in control arm). Self-reported adherence to exercise during weekly check-ins was about 50%; most common barriers were fatigue, weather, liver-related symptoms. Figure 1 shows mean step counts by arm (Panel A) and % adherence to daily step targets (Panel B) by each 2-week interval. Mean baseline daily steps counts were: overall: M 2186 SD (1166); control: M 2632 SD (1599); intervention: M 1924 SD:758). End of study step counts were nearly 1000 steps higher for intervention (Panel A) and % adherence to daily step targets (Panel B) by each arm (Panel A) and % adherence to daily step targets (Panel B) by each arm (Panel A) and % adherence to daily step targets (Panel B) by each arm.

**Conclusion:** A home-based intervention with financial incentives and text-based nudges increased walking by one third over baseline in LT candidates with functional impairment and malnutrition. Adherence to physical activity was three-fold higher than reported in recent studies. Home-based prehabilitation is feasible and holds promise for larger trials.

**OS-053-YI**
**Type of calcineurin inhibitor versus long-term outcome following liver transplantation for primary biliary cholangitis-an ELTR study**

Maria van Hooff1, Rozanne de Veer1, Vincent Karam2, René Adam2, Wojciech Polak3, Hasina Pashtoun1, Sarwa Darwish Murad1, Christophe Corpechot4, Darius E. Mirza5, Michael Heneghan6, Herold Metselaar1, Caroline den Hoed1, Adriaan Van der Meer1.

1Erasmus MC Transplant Institute, University Medical Center Rotterdam, Department of Gastroenterology and Hepatology, Netherlands; 2Hôpital Paul Brousse, Université Paris-Saclay Villejuif, European Liver Transplant Registry, Department of Hepatobiliary and Pancreatic Surgery and Liver Transplantation AP-H, France; 3Erasmus MC Transplant Institute, University Medical Center Rotterdam, Division of HPB and Transplant Surgery, Netherlands; 4Saint-Antonie Hospital, Assistance Publique-Hôpitaux de Paris; Inserm UMR_938, Saint-Antoine Research Center, Sorbonne University, Paris, Reference Center for Inflammatory Biliary Diseases and Autoimmune Hepatitis, European Reference Network on Hepatological Diseases (ERN Rare-Liver), France; 5Queen Elizabeth Hospital, Birmingham, Department of HPB Surgery, Liver Unit, United Kingdom; 6King’s College Hospital, London, Institute of Liver Studies, United Kingdom; 7The Leeds Teaching Hospitals NHS Trust, United Kingdom; 8Edinburgh Transplant Centre, Royal Infirmary of Edinburgh, United Kingdom; 9Royal Free Hospital, London, Department of Hepatology and Liver Transplantation, United Kingdom; 10Cambridge University Hospitals NHS Foundation Trust, Cambridge NIHR Biomedical Research Centre, Cambridge, Liver Unit, United Kingdom

Email: m.vanhooff@erasmusmc.nl

**Background and aims:** Tacrolimus is the preferred calcineurin inhibitor (CNI) following liver transplantation (LT). As compared to cyclosporine, however, tacrolimus has been linked to a more frequent recurrence of Primary Biliary Cholangitis (PBC), which was recently shown to negatively impact graft and patient survival. Therefore, the aim of this study was to assess the relation between the type of CNI and long-term graft and patient survival following LT for PBC.

**Method:** Cox proportional hazard analyses were used to assess the association between the type of CNI and graft or recipient survival among adult patients with PBC in the European Liver Transplant Registry (ELTR) who received a DBD graft between 1990 and 2021. Graft failure was defined as re-transplantation irrespective of the cause, as ELTR contained no data on recurrence PBC. Patients were not included in case of concomitant liver disease or in case they did not reach one year of follow-up with a functioning graft. The type of CNI was based on the registered maintenance immunosuppressive regimen, or in case this was not available, on the initial regimen.

**Results:** In total, the ELTR included 5306 PBC patients who received a DBD LT between 1990 and 2021. Overall, these patients were followed for a median of 8.3 years (IQR 2.0 – 15.9), during which 2213 patients lost their graft and/or died. The 5-year cumulative graft and recipient survival rates was 77.7% (95% CI 76.5 – 78.9) and 82.0% (95% CI 80.8 – 83.2), respectively. Of the 5306 patients, 443 (8.3%) patients did not (yet) reach one year of follow-up and 797 (15.0%) lost their graft or died during the first year. Among the remaining 4066 patients, there was no information concerning immunosuppressive drugs in 891 (21.9%) patients. The study population for the primary aim thus included 3175 PBC patients; 2764 (87.1%) females, median age at LT of 55.4 years (IQR 48.8 – 61.4), and a median year of LT of 2001 (IQR 1996 – 2009). Tacrolimus was used in 2056 (64.8%) patients and cyclosporine in 819 (25.8%), while 283 (8.9%) did not use any CNI and 17 (<0.01%) used both. Among patients using a single CNI, tacrolimus was not associated with higher risk of graft loss (HR 0.95, 95% CI 0.83 – 1.08, p = 0.397) or death (HR 0.91, 95% CI 0.80 – 1.04, p = 0.150). Adjusting for age, gender, year of LT, ischemia time and donor age did not change the association between the type of CNI and graft loss (aHR 0.97, 95% CI 0.82 – 1.15, p = 0.751) or death (aHR 0.96, 95% CI 0.81 – 1.14, p = 0.636). Findings were consistent in clinically relevant subgroups (e.g. based on age and time of LT) and sensitivity analyses including events in the first year post-LT (range of aHR for type of CNI was 0.83 – 1.22, p > 0.100 for all).
Conclusion: Among adult PBC patients transplanted with DBD liver grafts, the type of CNI was not associated with long-term graft survival or recipient survival. These results justify the continued use of tacrolimus after DBD LT in the patients with PBC.

Liver tumours – Therapy

OS-055
Characterization and burden of non-hepatocellular carcinoma focal lesions detected during surveillance of patients with cirrhosis
Pierre Nahon1, Layese Richard2, Nathalie Ganne-Carrié1, Cagnot Carole3, Etienne Audureau2, Pierre-André Natella1. 1APHP Avicenne, France; 2APHP Henri Mondor, France; 3ANRS, France
Email: pierre.nahon@aphp.fr

Background and aims: Hepatocellular carcinoma (HCC) surveillance is challenged by the detection of hepatic focal lesions (HFL) of other types. The aim was to describe the incidence, characteristics and outcomes of non-HCC HFL detected in patients with cirrhosis.

Method: We analyzed data obtained from medical files of French patients with cirrhosis included in protocolized multicentre HCC surveillance programs (prospective ANRS CirVir and CIRRAL cohorts, HCC 2000 trial). Incidences of HFL, applied recall procedures, diagnoses and outcomes were analyzed.

Results: 3295 patients were studied. After a median follow-up of 59.8 months, 1024 (31.1%) patients developed at least one HFL (5-yrs incidence: 33.3%). Following recall procedures 391 (38.2%) were considered as HCCs (5-yrs incidence: 12.1%, Fig1A). The 633 (61.8%) remaining lesions corresponded to non-HCC HFL (5-yrs incidence: 21.1%). These lesions were more frequently detected in younger patients with non-viral cirrhosis, with less severe liver disease and better screening compliance. Rates of unindolous lesions were similar in both groups (66.2% vs 65.7%), as was the examination that enabled detection (ultrasound 62.6% vs 59.7%). 283 (72.6%) HCC patients were classified as BCLC 0 or A. The diagnostic procedures performed for non-HCC HFL were available in 389 patients [median additional cross-sectional examination 1 (min: 0, max: 6), 0.7 exams per year (IQR : 0–1.4)]. Sixty-three/389 (16.1%) non-HCC HFL were not subsequently confirmed by recall procedures. One hundred and four/389 (26.7%) non-HCC HFL remained undetermined. A diagnosis of benign liver tumour was assessed for 206/389 (52.9%) HFL (cyst = 41, angioma = 38, vascular fistula = 37, regeneration nodule = 33, dysplastic nodule = 15, perfusion defect = 15, pseudo-lesion = 4, others = 23). Sixteen/389 (4.1%) malignant tumours (cholangiocarcinoma = 15, metastases = 1) were diagnosed. Overall survival of patients with non-malignant HFL was similar to that of patients who never developed HFL during follow-up (5-year survival 92% vs 88%, P = 0.07, Fig1B). Extra-hepatic mortality was the first cause of death in these 2 groups (60.3% and 63.7%).

Conclusion: The incidence of non-HCC HFL reaches 20% at 5 years and corresponds to two-thirds of lesions detected in patients enrolled in screening programs. This burden must be taken into account in cost-effectiveness analyses of future surveillance programs using more sensitive imaging techniques such as abbreviated MRI.

Figure: (abstract: OS-055).
Background and aims: The combination of atezolizumab and bevacizumab demonstrated superiority over the tyrosine kinase inhibitor (TKI) sorafenib in patients with advanced hepatocellular carcinoma (HCC). VEGF-inhibition with bevacizumab or TKI is associated with the risk of bleeding and thromboembolic events, which is of particular concern in HCC patients. In the pivotal IMbrave150 trial, there was a numerically higher rate of bleeding and arterial thromboembolic events with atezolizumab/bevacizumab compared to sorafenib. The current first-line alternative to a treatment with atezolizumab/bevacizumab is lenvatinib, which demonstrated longer progression free survival and higher objective response rates compared to sorafenib. However, data comparing the safety of atezolizumab/bevacizumab and lenvatinib are lacking.

In this study, we evaluated the risk of bleeding and thromboembolic events with atezolizumab/bevacizumab versus lenvatinib in a large, multi-centric real-world population.

Method: Data from HCC cohorts of six tertiary centers in Germany were used for analysis. In total n = 262 patients treated with atezolizumab/bevacizumab (treated between Jun. 2019 and Oct. 2022) and n = 136 patients treated with lenvatinib (treated between Jun. 2019 and Oct. 2023) were evaluated. Occurrence of bleeding or thromboembolic events within 3 months after initiation of therapy was assessed. For statistical analysis, normality of the data was assessed by Shapiro-Wilk test, followed by Student’s t test or Mann Whitney test. Fisher’s exact test was applied for contingency tables.

Results: Both groups were balanced with respect to demographics, presence of liver cirrhosis and variceal status (see figure). Median length of therapy was not different between groups (atezolizumab/bevacizumab 195.7 ± 107.9 vs. lenvatinib 187.7 ± 99.8 × 10⁹/L; p = 0.75) or spleen size (atezolizumab/bevacizumab 12.5 ± 2.6 vs. lenvatinib 12.6 ± 2.7 cm; p = 0.99) showed no differences between groups.

Bleeding episodes were described in 46 of 262 (17.6%) patients receiving atezolizumab/bevacizumab compared to 16 of 136 (11.8%) patients receiving lenvatinib (p = 0.15, Odds Ratio 1.60, 95% CI 0.86–2.95). Variceal hemorrhage occurred in 8 of 262 (3.0%) patients treated with atezolizumab/bevacizumab versus 5 of 136 (3.6%) patients treated with lenvatinib (p = 0.77, Odds Ratio 0.83, 95% CI 0.26–2.28). Thromboembolic events were reported in 20 of 262 (7.6%) patients in the atezolizumab/bevacizumab cohort compared to 5 of 136 (3.6%) patients in the lenvatinib cohort (p = 0.19, Odds Ratio 2.1, 95% CI 0.81–5.23).

Conclusion: Rates of bleeding and thromboembolic events did not differ significantly between atezolizumab/bevacizumab and lenvatinib and may not be helpful in choosing between the two treatments. Future prospective studies are needed to confirm our results.

OS-058 Multimodal integrative genomics and pathology analyses in neoadjuvant nivolumab treatment for borderline resectable HCC
Tan-to Cheung1, Daniel Ho1, Shirley Lyu1, Qingyang Zhang1, Yu Tsui1, Tiffany Yu1, Karen Sze1, Joyce Lee1, Vince Lau1, Yin-Lun Chu2, Simon Tsang2, Wong She1, Roland Leung2, Thomas Yau1, Irene Oi-Lin Ng1. 1The University of Hong Kong, Hong Kong; 2Queen Mary Hospital, Hong Kong
Email: iolng@hku.hk

Background and aims: Immunotherapy has resulted in pathologic responses in hepatocellular carcinoma (HCC) but the benefits and molecular mechanisms of neoadjuvant immune checkpoint blockade are largely unknown. In this study, we evaluated the efficacy and safety of pre-operative nivolumab (anti-PD1) in patients with borderline resectable HCC and investigated the molecular determinants for predicting treatment response.

Method: A single-arm study was designed to assess the clinical benefit of neoadjuvant treatment with nivolumab in patients with untreated, borderline resectable HCC. Between July 2020 and November 2021, 20 treatment-naïve HCC patients with intermediate and locally advanced tumors received preoperative nivolumab at 3 mg/kg for 3 cycles prior to surgical resection. Pathological examination of pre- and post-operative tumour specimens, RNA-sequencing to devise the cellular and molecular profiles of patients' HCC tumours, and plasma cell-free DNA and copy number variation (CNV) to derive a non-invasive biomarker anti-PD1 response score were used.
Results: Of the 20 patients, 19 underwent surgical resection on-trial. The majority (90%) of patients had locally advanced stage and 10% had intermediate stage per Hong Kong Liver Cancer (HKLC) staging classification. 70% of the patients were HBV carriers and the remaining 5 had chronic alcohol consumption. Seven (36.8%) of the 19 patients had major pathologic tumor necrosis (>60%) in the post-nivolumab resection specimens, with 3 having almost complete (>90%) tumor necrosis. The tumor necrosis was hemorrhagic and often accompanied with increased or dense immune cell infiltrate at the border of the tumors. None of the patients developed major adverse reactions contradicting hepatectomy. RNA-sequencing analysis on both pre-nivolumab tumor biopsies and post-nivolumab resected specimens revealed a change in the immune cellular landscape. In the cases with major pathologic necrosis, the proportion of CD8T cells in the HCC tissues predominantly increased after treatment. Immunohistochemistry for CD8 and CD4 T cells showed result consistent with those of the cellular deconvolution. With subsequent gene set enrichment analysis, we detected an overall upregulation of immune response, particularly lymphocyte activation and differentiation, consistent with our findings in the cellular landscape. Moreover, to investigate non-invasive biomarker for nivolumab response, we evaluated, on plasma cell-free DNA of the patients, the copy number variation (CNV) using target-panel sequencing and derived a CNV-based anti-PD1 score. The score correlated with the extent of tumor necrosis, and was validated in a Korean patient cohort with anti-PD1 treatment.

OS-059-YI  
Predicting response to atezolizumab plus bevacizumab in advanced hepatocellular carcinoma using single-cell RNA-sequencing-derived gene signatures

Sarah Cappuyyns1,2,3,4,5, Marta Piqué-Gili1,2, Roger Esteban-Fabró1,2, Gino Philips6,7, Roser Pinyol2, Vincent Vandecaveye6,7, Jordi Abril-Fornaguera1,2, Philipp Haber1,8, Chris Verslype9, Eric Van Cutsem3, Dietter Lambrechts4,5, Augusto Villanueva1, Jeroen Dekervel1, Josep Llovet1,2,9, Tisch Cancer Institute, Icahn School of Medicine at Mount Sinai, Mount Sinai Liver Cancer Program, Division of Liver Diseases, NY, United States; 2Institut d’Investigacions Biomèdiques August Pi i Sunyer (IDIBAPS), Liver Cancer Translation Research Laboratory, Spain; 3UZ/KU Leuven, Digestive Oncology, Department of Gastroenterology, Belgium; 4Katholieke Universiteit Leuven, Laboratory for Translational Genetics, Department of Human Genetics, Leuven, Belgium; 5Vlaams Instituut voor Biotechnologie, Center for Cancer Biology, Leuven, Belgium; 6UZ Leuven, Radiology Department, Belgium; 7Katholieke Universiteit Leuven, Laboratory of Translational MRI, Department of Imaging and Pathology, Belgium; 8Charité Universitätsmedizin Berlin, Germany; 9Institució Catalana de Recerca i Estudis Avançats, Spain
Email: sarahcappuyyns@hotmail.com

Background and aims: Single-cell transcriptomic profiling (scRNAseq) is a powerful explorative technique that has helped in the characterisation of tumour immune cell infiltration and how it relates to treatment response in advanced HCC (aHCC). Here, we aimed to 1) derive gene expression signatures that recapitulate distinct single-cell derived immune cell types that can be applied to bulk RNAseq data and to 2) evaluate whether these signatures are associated with clinical response in aHCC treated with atezolizumab plus bevacizumab (atezo + bev), current standard of care.

Method: Using scRNAseq data from 31 aHCC tumour biopsies (91,169 single cells), we defined gene signatures for 35 cell phenotypes using a customized bio-informatics pipeline based on differential gene expression analysis. Signatures were validated in an independent, publicly available scRNAseq dataset of 22 HCC patients (Ma et al. JHep 2021). To evaluate the power of single-cell derived signatures to capture the presence of specific intra-tumoural cell types in bulk transcriptomic data, we analysed three cohorts comprising a total of 547 HCC tumour samples: 1) 399 early HCCs, 2) 83 anti-PD1-treated aHCCs and 3) 65 aHCCs treated with atezo + bev in frontline. We performed a) single-sample Gene Set Enrichment Analysis (ssGSEA) and b) Nearest Template Prediction (NTP) analysis, and ssGSEA-derived scores and class prediction results were correlated with both known HCC immune subclasses and objective response to therapy (mRECIST).

Results: We successfully generated highly specific gene signatures for 21 out of 35 single-cell derived cell types. As expected, signature enrichment analysis using the bulk transcriptome of 399 early HCCs revealed that the ‘immune-active’ and ‘exhausted’ HCC subclasses (Sia et al. Gastroenterology 2017) were enriched in both T-cell and myeloid signals. In contrast, the ‘immune-like subclass (Montironi et al. Gut 2022) was mostly driven by myeloid populations, in particular PDL1+ CXCL10+ macrophages, previously associated with response to immunotherapy at the single-cell level (Cappuyyns et al. JHep 2022). In aHCC, 12% of tumours (n = 17/148) were enriched in PDL1+ CXCL10+ macrophages in bulk RNAseq (using the NTP-method). Importantly, their presence was associated with response to both anti-PD1 (n = 4/12 responders vs. 0/16 non-responders; p = 0.02) and atezo + bev (n = 6/18 responders vs. 1/39 non-responders; p = 0.003), thus identifying responders with a specificity of 100% and 97.5% and a positive predictive value of 100% and 86.6%, respectively.

Conclusion: Using scRNAseq data from immunotherapy-treated aHCC patients, we generated gene signatures representative of 21 distinct cell phenotypes. The presence of PDL1+ CXCL10+...
macrophages was associated with response to atezol + bev, confirming their essential role in facilitating the efficacy of immunotherapy in aHCC.

NAFLD: Therapy

OS-060
A Phase 2a, randomized, active-comparator-controlled, open-label study to evaluate the efficacy and safety of efipogepudtide in individuals with non-alcoholic fatty liver disease
Manuel Romero Gomez1, Eric Lawitz2, R. Ravi Shankar3, Eirum Chaudhri1, Jie Liu1, Raymond Lam1, Jeethi Kaufman2, Samuel Engel3, 1University of Seville/Virgen del Rocio University Hospital, Institute of Biomedicine of Seville (HUVR/CISC/US); Digestive Diseases Unit and CIBERehd, Sevilla, Spain; 2University of Texas Health Science Center at San Antonio–UT Health San Antonio, Texas Liver Institute, San Antonio, United States; 3Merck and Co Inc, MRL, Rahway, United States
Email: mromerogomez@us.es

Background and aims: Currently, there are no approved therapies for non-alcoholic steatohepatitis (NASH). This study was conducted to assess the effects of the GLP-1/glucagon receptor co-agonist efipogepudtide (EFI), relative to the selective GLP-1 receptor agonist semaglutide (SEMA), on liver fat content (LFC) in patients with non-alcoholic fatty liver disease (NAFLD), and to inform on the role of EFI as a therapy for NASH.

Method: This was a Phase 2a, randomized, active-comparator-controlled, parallel-group, open-label study in subjects with NAFLD (18–70 years, BMI 25–50 kg/m²; stable body weight, without type 2 diabetes mellitus (T2DM), or with T2DM with an A1C ≤8.5% controlled by diet and stable dose of metformin). During a 4-week screening period, an MRI-PDFF was performed to determine LFC. Participants with an LFC of ≥10% were randomized in a 1:1 ratio to open-label SC EFI 10 mg Q1W or SC SEMA 1.0 mg Q1W for 24 weeks, stratified according to concurrent diagnosis of T2DM. Both drugs were titrated to the target dose over an 8-week time period. The primary efficacy end point was the least squares (LS) mean relative reduction from baseline in LFC (%) after 24 weeks of treatment.

Results: Among 145 randomized subjects (EFI n = 72, SEMA n = 73), 55.2% were male, 35.2% were Hispanic and 33.1% had T2DM. At baseline, the mean BMI was 34.3 kg/m² and the mean LFC was 20.3%. The LS mean relative reduction from baseline in LFC at Week 24 was significantly (p < 0.001) greater with EFI (72.7% [95% CI: 66.8, 78.7]) than with SEMA (42.3% [95% CI: 36.5, 48.1]) (figure). Median relative reductions from baseline in LFC at Week 24 were 83.8% with EFI and 44.4% with SEMA. Greater proportions of participants had relative reductions from baseline at Week 24 in LFC of ≥30%, ≥50% and ≥70% with EFI (81.9%, 77.8%, and 70.8%, respectively) compared with SEMA (67.1%, 43.8%, and 12.3%, respectively) (figure). A greater proportion of participants achieved normal LFC (<5%) at Week 24 with EFI (66.7%) compared with SEMA (17.8%). Both treatment groups had an LS mean relative reduction from baseline in body weight at Week 24 (p = 0.085 for EFI 8.5% vs SEMA 7.1%). The relative reductions from baseline in LFC at Week 24 by weight loss category (≤5%, >5% to ≤10%, and >10% reduction in body weight from baseline) were greater in the EFI group (52.4%, 76.6%, and 86.2%, respectively) than in the SEMA group (13.4%, 39.6%, and 64.2%, respectively). There were no meaningful differences between the two treatment groups in the incidence of overall, serious, or drug-related adverse events, including adverse events that led to discontinuation.

Conclusion: In this study in patients with NAFLD, treatment with EFI 10 mg weekly led to a significantly greater reduction in LFC than SEMA 1 mg weekly. EFI may offer an effective treatment option for patients with NASH.

OS-061
Multicenter, randomized, double-blind, placebo-controlled trial of Fatty Acid Synthase (FASN) inhibitor, denifanstat, versus placebo in the treatment of biopsy-proven NASH: A 26-week interim analysis of the FASCINATE-2 Phase 2b trial
Marie O’Farrell1, Katharine Grimmer1, Alitheia Zetter1, Wen-Wei Tsai1, George Kemble1, Rohit Loomba2, Eduardo Bruno Martins3, Stephen Harrison3, 1Sagimet Biosciences, San Mateo, United States; 2University of California, San Diego, Dept of Medicine, NAFLD Research Center, La Jolla, United States; 3Pinnacle Clinical Research, San Antonio, United States
Email: marie.ofarrell@sagimet.com

Background and aims: Denifanstat (DEN) is a first-in-class FASN inhibitor. In the completed FASCINATE-1 study, patients with NAFLD treated with denifanstat for 12 weeks showed significant reductions of liver fat, ALT, low density lipoprotein cholesterol (LDL) and N-terminal type III collagen propeptide (PRO-C3). DEN exhibited a well-tolerated safety profile. The FASCINATE-2 (NCT04906421) study, is a Ph2b, placebo-controlled, double-blind study of DEN compared to placebo in 168 biopsy-confirmed NASH patients. The primary end points will evaluate safety and histological impact of a 50 mg daily oral dose of DEN compared to placebo after 52 weeks. A planned interim analysis (IA) at Week 26 of treatment was performed using non-invasive assessments including de novo lipogenesis assessment, MRI-PDFF and ALT.

Method: Adults ≥18 years were enrolled in this study with a screening biopsi confirining F2-F3 fibrosis and a NAFLD activity score (NAS) ≥4 with a score of at least 1 in each of the following parameters: steatosis, balloon degeneration and lobular inflammation. In the IA, the first 52 patients on study for 26 weeks with a baseline MRI-PDFF of ≥50% liver fat were evaluated. 30 of these patients received 50 mg of DEN and 22 received placebo; 65% were diabetic; mean ALT 62.7 U/L; mean liver fat by MRI-PDFF 19.3%; and 54% had F3 fibrosis.

Results: DEN inhibited FASN activity as demonstrated by reduction of plasma levels of the saturated fatty acid triglyceride tripalmitin (−42.0% vs +21.5%, p < 0.002). FASN inhibition resulted in a relative reduction of liver fat from baseline in DEN–treated patients compared to placebo (−34.1% vs −1.5%, p < 0.002). Importantly, 67% of DEN-treated patients reduced their liver fat by ≥30% (67% vs 18%, p < 0.002) and approximately half of these responders decreased liver fat by ≥50%. ALT also dropped significantly in the DEN-treated group (−16.5 U/L vs −4.0 U/L, p < 0.05). Recent studies show an MRI-PDFF reduction of ≥30% combined with an ALT reduction of ≥17 U/L highly correlate with histological improvement. The proportion of DEN patients achieving this combined metric was significantly improved (37% vs 9%, p < 0.05). Fibrosis markers declined from baseline with DEN.
ORAL PRESENTATIONS

treatment; enhanced liver fibrosis (ELF) score (−0.34 vs −0.02, p < 0.05) and PRO-C3 (−4.4 ng/ml vs −0.28 ng/ml, p < 0.05). Consistent with Ph2a results, LDL was significantly decreased by DEN (−12.4 mg/dL vs 0.0 mg/dL, p < 0.05) while FGF-21 increased (+0.21 vs −0.04 mg/ml, p < 0.05), indicating improved metabolism. There were no treatment-related serious adverse events, and the majority of adverse events were mild to moderate in nature (Grade 1 and 2).

Conclusion: Denifanstat showed a strong improvement of key non-invasive disease markers in NASH patients after 26 weeks of treatment. These data suggest that denifanstat will have a positive impact on histological end points in FASCINATE-2.

OS-062 Phase 1 study of the RNA interference therapeutic ALN-HSD in healthy adults and patients with non-alcoholic steatohepatitis

Arun Sanyal1, Jörg Taube2, Prajakta Badri3, Sarah Bond3, Nune Makarova4, Weizhi Zhao4, Satyajit Karnik5, Farshad Kajbaf3, Benjamin Olenchock5, Joshua Friedman5, John Gansner5, 1Virginia Commonwealth University, Division of Gastroenterology, Hepatology and Nutrition, Richmond, VA, United States; 2Richmond Pharmacology and St. George’s University of London, London, United Kingdom; 3Alnylam Pharmaceuticals, Cambridge, MA, United States; 4Regeneron Pharmaceuticals, Tarrytown, NY, United States

Email: jgansner@alnylam.com

Background and aims: Non-alcoholic steatohepatitis (NASH) is a prevalent chronic liver disease that can lead to progressive fibrosis, cirrhosis, and hepatocellular carcinoma. Genome-wide association studies have identified loss-of-function variants in the hydroxysteroid 17-beta dehydrogenase 13 (HSD17B13) gene that are associated with a reduced risk of chronic liver disease and progression from steatosis to steatohepatitis. ALN-HSD is an investigational, subcutaneously administered, N-acetylgalactosamine (GalNAc)-conjugated small interfering RNA (siRNA) targeting liver-expressed HSD17B13 mRNA, in development for the treatment of NASH. Here, we present interim results of the Phase 1 study of ALN-HSD.

Method: ALN-HSD-001 (NCT04565717) is a two-part, randomized, double-blind, placebo-controlled, multi-center, single-ascending dose and multiple-dose study designed to evaluate the safety, tolerability, pharmacokinetic (PK), and pharmacodynamic (PD) effects of ALN-HSD in healthy adults (Part A) and adult patients with NASH (Part B). The primary end point is frequency of adverse events (AEs). Secondary end points include characterization of ALN-HSD plasma and urine PK and change from baseline of liver HSD17B13 mRNA.

Results: In Part A, which is complete, 58 healthy adults were randomized 3:1 to receive a single dose of study drug (ALN-HSD or placebo) in ascending dose groups from 25 to 800 mg. The only AE occurring in at least 10% of subjects treated with ALN-HSD was injection site reaction (n = 5/44; 11%), all mild in severity and transient. One serious AE (SAE) of tonsillitis was reported and deemed unrelated to study drug. Consistent with other GalNAc-conjugated siRNAs, plasma concentrations of ALN-HSD declined rapidly by 24 hours post-dose. ALN-HSD showed a slightly more than dose proportional increase in exposures across doses. Across doses, ALN-HSD showed 17–37% excretion in urine. In Part B, which is ongoing, 46 patients with NASH were randomized 4:1 to receive ALN-HSD (25, 200, or 400 mg) or placebo on Day 1 and Day 85 (12 weeks apart). Liver biopsies were performed at baseline and either Day 169 or Day 337. At data cut-off, 45 patients received at least one dose of study drug. The only AE occurring in at least 10% of all patients was upper respiratory tract infection (13.3%), all deemed unrelated to study drug. Two SAEs, appendicitis and skin laceration, were also deemed unrelated to study drug. There was no evidence of drug-induced liver injury. In the cohorts with Day 169 liver PD data, ALN-HSD was associated with dose-dependent reduction of HSD17B13 mRNA. ALN-HSD was also associated with numerically lower liver enzymes and biopsy-derived non-alcoholic fatty liver disease activity score over six months relative to placebo.

OS-063 Pemvidutide, a glp-1/glucagon dual receptor agonist, significantly reduces liver fat, fibro-inflammation, and body weight in patients with non-alcoholic fatty liver disease: a 24-week multicenter, randomized, double-blind, placebo-controlled trial

Stephen Harrison1, Shaheen Tomah2, John Suschak2, Scot Roberts2, Jay Yang2, Liang He2, Bertrand Georges2, Lakisha Rodwell-Green2, Randy Brown2, M. Scott Harris2, Sarah Browne3, 1Pinnacle Research, San Antonio, United States; 2Altimmune, Inc, Gaithersburg, United States

Email: stephenharrison87@gmail.com

Background and aims: Pemvidutide is a long-acting, balanced GLP-1/glucagon (GCG) dual receptor (R) agonist under development for the treatment of NASH and obesity. The balanced 1:1 potency ratio combines the reduced caloric intake effects of GLP-1R agonism with the increased energy expenditure and lipometabolic effects of GCGR agonism. This study assessed the efficacy, safety, and tolerability of pemvidutide on liver fat content (LFC), body weight and non-invasive markers of fibro-inflammation in patients with NAFLD over 24 weeks of treatment.

Method: Subjects were randomized 1:1:1:1 to receive 1.2 mg, 1.8 mg, and 2.4 mg pemvidutide, or placebo weekly for 12 weeks with an optional 12-week extension for a total of 24 weeks of treatment. There was no dose titration at 1.2 mg or 1.8 mg; a brief 4-week titration was used at 2.4 mg. The primary efficacy end point was the reduction in LFC from baseline after 12 and 24 weeks of treatment. Key secondary end points included: reductions in serum alanine aminotransferase (ALT), corrected T1 (cT1) and percent (%) body weight loss from baseline after 12 and 24 weeks of treatment.

Results: 94 subjects were randomized and dosed, and 66 subjects participated in the 12-week extension study. Mean baseline body mass index (BMI), LFC by MRI-PDFF, ALT, and ALT were approximately 36 kg/m2, 22%, 920 ms and 37 IU/L, respectively. Twenty-seven (29%) participants had type 2 diabetes (T2D), and 71 (75.5%) were of Hispanic ethnicity. The primary end point was met in all pemvidutide treatment groups at both 12 and 24 weeks (Table 1). Significant reductions in absolute and relative LFC were noted at both time-points, with a mean relative LFC reduction of 76.4% at the 2.4 mg dose at 24 weeks, with 100% of subjects achieving ≥30% reduction in LFC and approximately 50% achieving normalization, defined as LFC ≤5%. cT1 decreased significantly from baseline, with 84.6% of subjects across all pemvidutide treatment groups achieving a reduction of ≥80% in cT1 at week 24 compared to 0% of subjects receiving placebo. Serum ALT levels decreased significantly in a dose-dependent manner, particularly in subjects with baseline ALT ≥30 IU/L, with all pemvidutide treatment groups achieving mean reductions ≥17 IU/L. Weight loss of 7.2% and 5.3% were achieved in patients without and with T2D at the 1.8 mg dose at 24 weeks. Pemvidutide was well-tolerated, with no serious or severe AEs related to study drug, and low rates of AEs leading to study discontinuation.

<table>
<thead>
<tr>
<th>Dose (mg)</th>
<th>N</th>
<th>Change from baseline of liver HSD17B13 mRNA at Day 169 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>Placebo</td>
<td>5</td>
<td>4.6 (10.7)</td>
</tr>
<tr>
<td>25</td>
<td>8</td>
<td>-38.7 (24.7)</td>
</tr>
<tr>
<td>200</td>
<td>8</td>
<td>-68.7 (8.9)</td>
</tr>
<tr>
<td>400</td>
<td>7</td>
<td>-73.2 (9.7)</td>
</tr>
</tbody>
</table>

Figure: Conclusion: ALN-HSD has exhibited an encouraging safety and tolerability profile to date, with robust reduction in liver HSD17B13 mRNA expression. A Phase 2 study has been initiated to further investigate ALN-HSD in patients with NASH (NCT05519475).

Co-funded by Alnylam Pharmaceuticals and Regeneron Pharmaceuticals, Inc.
Conclusion: Permivudine led to rapid and potent reductions in LFC, serum ALT, cT1, and body weight, and was well-tolerated without the use of dose titration. These findings support a high likelihood of histopathologic improvement in NASH patients in a forthcoming paired liver biopsy study.

OS-064-YI
Calorie restriction by time restricted intermittent fasting is better than standard calorie restriction in improving the metabolic profile and hepatic fibrosis in patients with non-alcoholic fatty liver disease

Deepanshi Aggarwal1, Ajay Kumar Duseja2, Arka De2, Sanjay Bhadada3, Naveen Kalra4, Nancy Sahni5.

Table:

<table>
<thead>
<tr>
<th>Week 12</th>
<th>Week 24</th>
</tr>
</thead>
<tbody>
<tr>
<td>placebo</td>
<td>pemvi 2.4 mg</td>
</tr>
</tbody>
</table>

Change in LFC

<table>
<thead>
<tr>
<th>Absolution</th>
<th>Relative reduction (%)</th>
<th>Total reduction (%)</th>
<th>Total reduction (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2</td>
<td>8.9</td>
<td>14.7</td>
<td>11.3</td>
</tr>
<tr>
<td>4.4</td>
<td>46.6</td>
<td>68.5</td>
<td>57.1</td>
</tr>
<tr>
<td>4.2</td>
<td>65.0</td>
<td>94.4</td>
<td>85.0</td>
</tr>
<tr>
<td>0.0</td>
<td>20.0</td>
<td>55.6</td>
<td>50.0</td>
</tr>
</tbody>
</table>

Change in ALT

<table>
<thead>
<tr>
<th>All subjects</th>
<th>Baseline ALT</th>
<th>Change in ALT</th>
</tr>
</thead>
<tbody>
<tr>
<td>62.0 ± 4.3</td>
<td>23.5 ± 3.7</td>
<td>38.6 ± 2.4</td>
</tr>
<tr>
<td>12.6 ± 3.7</td>
<td>17.8 ± 2.3</td>
<td>-5.2 ± 1.3</td>
</tr>
</tbody>
</table>

Conclusion: Calorie restriction by time restricted intermittent fasting is better than standard calorie restriction in improving the metabolic profile and hepatic fibrosis; both IF and SOC are equally effective in causing weight reduction and improving hepatic steatosis and inflammation in NAFLD.

Viral hepatitis B/D - Current treatments

OS-065-YI
Predictors of severe flares after nucleos (t)ide analogue cessation-results of a global cohort study (RETRACT-B study)

Edo Dongelmans1, Grishma Hirode2,3,4, Bettina Hansen2,5,6, Chien-Hung Chen7, Tung-Hung Su8, Wai-Kay Seto9, Arno Furquim dAlmeida10, Stijn Van Hee12, Margarita Papatheodoridi11, Sabela Lens12, Grace Wong13, Sylvia Brakenhoff1, Jong-Nan Chien14, Jordan J. Feld2,3,4, Henry Ly Chan15, Xavier Forns12, George Papatheodoridis11, Thomas Vanwolleghem12, Man-Fung Yuen13, Yau-Chun (Holden) Hsu16, Jia-Horng Kao8, Markus Cornberg17, Milan Sonneveld1, Rachel Wen-Juei Jeng14, Harry LA Janssen1,2, Erasmus MC, Department of Gastroenterology and Hepatology, Rotterdam, Netherlands; 2Toronto General Hospital, Toronto Centre for Liver Disease, Canada; 3The Toronto Viral Hepatitis Care Network, Toronto, Canada; 4Antwerp University Hospital, Department of Gastroenterology and Hepatology, Belgium; 5Erasmus MC, Department of Epidemiology, Biostatistics, Netherlands; 6University of Toronto, Institute of Health Policy, Management and Evaluation, Canada; 7Koalsium Chang Gung Memorial Hospital, Division of Hepatogastroenterology, Department of Internal Medicine, Taiwan; 8National Taiwan University Hospital, Division of Gastroenterology and Hepatology, Department of Internal Medicine, Taiwan; 9The University of Hong Kong, Department of Medicine and State Key Laboratory of Liver Research, Hong Kong; 10Antwerp University Hospital, Department of Gastroenterology and Hepatology, Belgium; 11Medical School of National and Kapodistrian University of Athens, Department of Gastroenterology, Greece; 12University of Barcelona, Liver Unit, Hospital Clinic de Barcelona, IDIBAPS and CIBEREHD, Spain; 13The Chinese University of Hong Kong, Medical Data Analytics Centre (MDAC), China; 14Chang Gung Memorial Hospital Linkou Medical Center, Chang Gung University, Department of Gastroenterology and Hepatology, Taiwan; 15The Chinese University of Hong Kong, Department of Medicine and State Key Laboratory of Liver Research, Hong Kong; 16Rotterdam, Netherlands; 17Rotterdam, Netherlands; 18Toronto General Hospital, Toronto Centre for Liver Disease, Canada; 19The Toronto Viral Hepatitis Care Network (VIRCAN), Canada; 20University of Toronto, Institute of Medical Science, Canada; 21Erasmus MC, Department of Epidemiology, Biostatistics, Netherlands; 22University of Toronto, Institute of Health Policy, Management and Evaluation, Canada; 23Koalsium Chang Gung Memorial Hospital, Division of Hepatogastroenterology, Department of Internal Medicine, Taiwan; 24National Taiwan University Hospital, Division of Gastroenterology and Hepatology, Department of Internal Medicine, Taiwan; 25The University of Hong Kong, Department of Medicine and State Key Laboratory of Liver Research, Hong Kong; 26University of Barcelona, Liver Unit, Hospital Clinic de Barcelona, IDIBAPS and CIBEREHD, Spain; 27The Chinese University of Hong Kong, Medical Data Analytics Centre (MDAC), China; 28Chang Gung Memorial Hospital Linkou Medical Center, Chang Gung University, Department of Gastroenterology and Hepatology, Taiwan; 29The Chinese University of Hong Kong, Department of Medicine and State Key Laboratory of Liver Research, Hong Kong.
HDV-RNA decline less than 1 log after 6 months of BLV 2 mg monotherapy could define poor-response and lead to therapeutic decision. Data from real-life cohort

Victor de Lédinghen, Etoudou Bardou-Jacquet, Sophie Metivier, Nathalie Ganne-Carrié, Veronique Loustaud-Ratti, Marie-Noëlle Hilleret, Laurent Alric, Anne Minello Franza, Tarik Asselah, Dominique Roulot, Isabelle Fouchard Hubert, Stanislas Poil, Bruno Roche, Valérie Canva, Xavier Causse, Anne Gervais, Frederic Heluwaert, Jérôme Dumortier, Karine Lacombe, Caroline Lascoux-Come, Louis d’Alterecho, Patrick Maillé, Leon Mutt, Isabelle Ollivier-Hourmand, Christiane Stern, Isabelle Rosa, Fabien Zoulim, Juliette Foucher, CHU Bordeaux, France; CHU rennes, France; CHU Toulouse, France; APHP, France; CHU Limoges, France; CHU Grenoble, France; CHU Dijon, France; CHU Angers, France; CHU Lille, France; CHU Orleans, France; CH Annecy, France; CHU Lyon, France; CHU Tours, France; CH Bourg en Bresse, France; CHU Clermont-Ferrand, France; CHU Caen, France; CHU Créteil, France; INSERM, France

Email: victor.deledinghen@chu-bordeaux.fr

Background and aims: Bulevirtide (BLV) is a lipopeptide inhibiting the HBV/HDV entry into the hepatocytes. Significant HDVRNA decline was observed in HBV/HDV patients who received 48 weeks of BLV in monotherapy or in combination with PEG-interferon α2a (PEG-IFNα). The aim of this analysis was to evaluate the efficacy of BLV 2 mg daily with or without PEG-IFNα 2a in HDV patients with poor early virologic response in the French BLV early access program.

Method: 118 HDV patients (male 67.8%, mean age 42 years, cirrhosis 52%, median HDV-RNA 6.52 log_{10} IU/ml) with chronic HDV infection, with compensated cirrhosis/severe fibrosis or moderate fibrosis with elevated ALT levels were included in this analysis. Patients received at least 6 months of BLV 2 mg QD SC alone or in combination with PEG-IFNα once weekly according to physician’s choice. Poor response was defined as HDV-RNA decline lower than 1 or 2 log_{10} IU/ml at M3 or M6. The evaluation at M12 and M18 was performed only in patients who continued treatment during 12 and 18 months respectively.

Results: From baseline, median HDV RNA (log_{10} IU/ml) and median ALT levels (IU/L) declined over time: M3 – 1.33 and – 27, M6 – 3.48 and – 29, and M12 – 3.83 and – 33, respectively. Algorithm of virologic response in BLV monotherapy is proposed in Figure. In the BLV group (N = 59), among the 23 patients with HDV-RNA decline <1 log at M3, 8/21 (38%), 2/21 (9.5%), and 11/21 (52.4%) had HDV-RNA decline <1 log, between 1 and 2 log, and >2log at M6, respectively. In the 10 patients who had HDV-RNA <1 log at M6, HDV-RNA decline <1 log, between 1 and 2 log, and >2log at M12 was observed in 6 (60%), 4 (40%), and 0% of patients, respectively. In these patients, ALT <1.5 at M18 was observed in 2/6 (33.3%), 3/4 (75%), and 0% of patients, respectively. In the BLV + PEG-IFN group, at M3, only 4/58 (7%) of patients had HDV-RNA decline <1 log and 10/58 (17%) had HDV-RNA decline between 1 and 2 log. Among the 6 patients with HDV RNA decline <2 log at M6, 3/5 (60%) had decline <2 log at M18.

Figure: Algorithm of virologic response in BLV monotherapy

---

Multivariable analyses showed that older age (aHR 1.02, 95%CI 1.01 – 1.03), male sex (aHR 1.49 95%CI 1.11 – 1.99), higher HBsAg levels at NA withdrawal (100 – 1.000 IU/ml; aHR 2.15, 95%CI 1.47 – 3.16, >1.000 IU/ml; aHR 2.79, 95% CI 1.85 – 4.22) and Tenofovir (TDF) vs. Entecavir therapy (aHR 2.23, 95%CI 1.76 – 2.83) were predictive for any flare (≥5x ULN). TDF therapy (aHR 2.50, 95%CI 1.78 – 3.49), previous NA-therapy (aHR 1.53, 95%CI 1.04 – 2.25) and a HBsAg level >1.000 IU/ml at withdrawal (aHR 2.41, 95%CI 1.38 – 4.19) were predictive for moderate flares. Only TDF therapy was associated with an increased risk of severe flares (aHR 4.06, 1.92 – 8.86).

When focusing on available HBV DNA data from 12 weeks after NA-cessation (n = 685), only levels between 2.000 – 10.000 IU/ml (aHR 2.15, 95%CI 1.00 – 4.61) and >10.000 IU/ml (aHR 4.63, 95%CI 2.42 – 8.86) were associated with an increased risk of mild flares (HBV-DNA <100 IU/ml as reference).

Conclusion: Flares are common after NA withdrawal and were predominantly observed in the first year after NA cessation and could result in liver decompensation or death. Older age, male sex, increased HBsAg levels at end of treatment and TDF therapy before drug withdrawal were associated with a higher risk of flares. HBV DNA kinetics after stopping NA may be used to stratify the risk of flares, with an increased risk observed among patients with an HBV DNA level ≥2.000 and >10.000 IU/ml 12 weeks after NA withdrawal.
Conclusion: For the first time, in patients receiving BLV monotherapy 2 mg daily, we could define a subgroup of poor-responders with low probability to improve virological response overtime. The data of this real-life cohort suggest that BLV monotherapy should be stopped and another strategy offered in patients with HDV-RNA decline <1 log at M6. This strategy needs to be evaluated in future studies.

OS-067
Long-term efficacy of tenofovir alafenamide in HBeAg-positive and -negative chronic hepatitis B patients treated for up to 8 years in 2 phase 3 studies

Maria Buti1,2, Kosh Agarwal3, Henry Ly Chan4, Wai-Kay Seto5, Young-Suk Lim2, Maurizia Brunetto2, Wan-Long Chuang6, Harry Janssen9,10, Scott Fung11, Namiki Izumi12, Maciej Jablkowski13, Frida Abramov14, Hongyuan Wang14, Leland Yee15, Roberto Mateo14, John F. Flaherty16, Calvin Fan15, Shalimar16, Patrick Marcellin17, Edward J. Gane18,19, Hospital Universitario Vall d’Hebron, Barcelona, Spain; 2CIBERehd del Instituto Carlos III, Madrid, Spain; 3King’s College Hospital NHS Foundation Trust, Institute of Liver Studies, London, United Kingdom; 4Chinese University of Hong Kong, HMA office, 9/F Union Hospital, Tai Wai, Hong Kong; 5The University of Hong Kong, Department of Medicine and School of Clinical Medicine, Pok Fu Lam, Hong Kong; 6University of Ulster College of Medicine, Asan Medical Center, Seoul, Korea, Rep. of South Korea; 7Azienda Ospedaliero-Universitaria Pisana, Pisa, Italy; 8Kaohsiung Medical University Hospital, Kaohsiung City, Taiwan; 9University Health Network, Toronto Centre for Liver Disease, Toronto, Canada; 10Erasmus University Medical Center, Rotterdam, Netherlands; 11University of Toronto, Department of Medicine, Toronto, Canada; 12Japanese Red Cross Musashino Hospital, Department of Gastroenterology and Hepatology, Tokyo, Japan; 13Medical University of Lodz, Lodz, Poland; 14Gilead Sciences, Inc., Foster City, United States; 15New York University Grossman School of Medicine, NYU Langone Health, New York, United States; 16All India Institute Of Medical Sciences, New Delhi, India; 17Hôpital Beaujon, Hepatology department, Clichy, France; 18Auckland Clinical Studies, Symonds St, Auckland, New Zealand Email: frida.abramov@gilead.com

Background and aims: In 2 similarly designed double-blind (DB), randomized (2:1), Phase 3 studies (Study 108 in HBeAg-negative patients [N = 425] and Study 110 in HBeAg-positive patients [N = 873]), tenofovir alafenamide (TAF) demonstrated noninferior efficacy relative to tenofovir disoproxil fumarate (TDF) in the blinded assessments. After completing up to 3 years (yr) of DB treatment, all patients were eligible to receive open-label (OL) TAF through week 384 (yr 8). Here we present the final 8-yr results.

Method: Efficacy was assessed for each study by missing equals excluded analysis. Safety was assessed in all patients with ALT above ULN at baseline.

Conclusion: After 8 yr of treatment with TAF or up to 6 yr after switch from TDF, virologic suppression rates remained high across all groups; up to 33% achieved HBeAg/HBeAb seroconversion, while HBsAg loss was low (≤5%).

Table: Results at Yr 8.

<table>
<thead>
<tr>
<th>n/N (%)</th>
<th>TAF 8 yr</th>
<th>TDF-TAF 6 yr</th>
<th>TDF-TAF 5 yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study 108</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HBV DNA &lt; 20 IU/ml</td>
<td>201/208 (97)</td>
<td>43/44 (98)</td>
<td>57/58 (98)</td>
</tr>
<tr>
<td>Normalized ALTb</td>
<td>147/189 (78)</td>
<td>30/41 (73)</td>
<td>44/57 (77)</td>
</tr>
<tr>
<td>HBeAg loss/ Seroconversion</td>
<td>8/199 (4)</td>
<td>0/41</td>
<td>1/58 (2)</td>
</tr>
<tr>
<td>Mean (SD) log10 IU/ml change in HBsAg</td>
<td>6/199 (3)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mean (SD) log10 IU/ml change in FibroTest score (SD)</td>
<td>-0.62 (0.924)</td>
<td>-0.50 (0.526)</td>
<td>-0.61 (0.758)</td>
</tr>
<tr>
<td>Study 110</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HBV DNA &lt; 20 IU/ml</td>
<td>370/392 (94)</td>
<td>74/81 (91)</td>
<td>108/112 (96)</td>
</tr>
<tr>
<td>Normalized ALTb</td>
<td>295/380 (78)</td>
<td>55/79 (70)</td>
<td>83/103 (81)</td>
</tr>
<tr>
<td>HBeAg loss/ Seroconversion</td>
<td>171/373 (46)</td>
<td>32/73 (44)</td>
<td>50/108 (46)</td>
</tr>
<tr>
<td>Mean (SD) log10 IU/ml change in HBsAg</td>
<td>114/373 (31)</td>
<td>20/73 (27)</td>
<td>36/108 (33)</td>
</tr>
<tr>
<td>Mean (SD) log10 IU/ml change in FibroTest score (SD)</td>
<td>9/384 (2)</td>
<td>4/76 (5)</td>
<td>3/109 (3)</td>
</tr>
</tbody>
</table>

Full analysis set by missing = excluded analysis. Population included only patients with ALT above ULN at baseline.

Conclusion: After 8 yr of treatment with TAF or up to 6 yr after switch from TDF, virologic suppression rates remained high across all groups; up to 33% achieved HBeAg/HBeAb seroconversion, while HBsAg loss was low (≤5%).

OS-068
Efficacy and safety at 96 weeks of bulevirtide 2 mg or 10 mg monotherapy for chronic hepatitis D: results from an interim analysis of a phase 3 randomized study

Heiner Wedemeyer1, Soo Aleman2, Maurizia Brunetto3,4, Anjte Blank5, Pietro Andreone6, Pavel Bogomolov7, Vladimir Chulanov8, Nina Mamonova8, Natalia Geyvandova8, Morozov Viacheslav9, Olga Sagalova9, Tatyana Stepanova9, Dmitry Manuilov10, Renee-Claude Mercier12, Qi An12, John F. Flaherty12, Anu Osinusi12, Audrey Lau12, Antje Blank12, Edward J. Gane18, 1Medizinische Hochschule Hannover, Klinik für Gastroenterologie, Hepatologie und Endokrinologie, Hannover, Germany; 2Karolinska University Hospital/Karolinska Institute, Department of Infectious Diseases, Stockholm, Sweden; 3Azienda Ospedaliero-Universitaria Pisana, Italy; 4University of Pisa, Department of Clinical and Experimental Medicine, Pisa, Italy; 5Heidelberg University Hospital, Clinical Pharmacology and Pharmacoepidemiology, Heidelberg, Germany; 6University of Modena and Reggio Emilia, Italy; 7Heidelberg University Hospital, Clinical Pharmacology and Pharmacoepidemiology, Heidelberg, Germany; 8University of Modena and Reggio Emilia, Italy; 9Baggiovara Hospital, Internal Medicine, Modena, Italy; 10Moscow Regional Research Clinical Institute after M.V. Vladimirsky, Moscow, Russian Federation; 11FSBI National Research Medical Center for Phthisiopulmonology and Infectious Diseases of the Ministry of Health of the Russian Federation, Russian Federation; 12LLC Medical Company “Hepatol,” Samara, Russian Federation; 13Federal state-funded institution of higher education “Southern Ural State Medical University of Ministry of Health of the Russian Federation,” Chelyabinsk, Russian Federation; 14Limited liability company “Clinic of Modern Medicine,” Moscow, Russian Federation; 15Gilead Sciences, Inc., Foster City, United States; 16Universitätsklinikum Hamburg-Eppendorf, Medizinische Klinik Studienambulanz Hepatologie, Hamburg, Germany; 17Medizinische Hochschule Hannover, Klinik für Gastroenterologie, Hepatologie und Endokrinologie, Hannover, Hannover, Germany; 18University Hospital Frankfurt, Department of Medicine, Frankfurt am Main, Germany; 19University Hospital Frankfurt, Department of Medicine, Frankfurt am Main, Germany; 12Foundation
Background and aims: Bulevirtide (BLV) is a first-in-class, entry inhibitor for chronic hepatitis D (CHD) which was conditionally approved in the EU in July 2020. Results from the Week 48 primary end point analysis for MYR301 (NCT03852719), a phase 3 randomized study, showed monotherapy with BLV at 2 mg/d or 10 mg/d given subcutaneously was superior to no active anti-HDV treatment based on the combined viral and biochemical response. Efficacy was similar at the 2 dose levels and BLV was generally safe and well tolerated. Here, we present findings from the predefined week 96 interim analysis of this ongoing study.

Method: 150 patients with CHD were randomized (1:1:1) and stratified based on the presence/absence of compensated cirrhosis as follows: Arm A: no active anti-HDV treatment for 48 weeks followed by BLV 10 mg/d for 96 weeks (n = 51), and Arms B or C: immediate treatment with BLV at 2 mg/d (n = 49) or 10 mg/d (n = 50), respectively, each for 144 weeks, with follow-up of 96 weeks after end of treatment (i.e. up to Week 240). The combined response was defined as undetectable HDV RNA or decrease by ≥2 log_{10} IU/ml from baseline and ALT normalization; other end points included viral response (undetectable HDV RNA or decrease by ≥2 log_{10} IU/ml from baseline), ALT normalization, log_{10} change in HDV RNA and change in liver stiffness (LS) by transient elastography (TE).

Results: Baseline characteristics were similar between groups and included: mean (SD) age 41.8 (8.4) years, 57% males, 83% White, 47% with compensated cirrhosis, mean (SD) HDV RNA 5.05 (1.34) log_{10} IU/ml, mean (SD) ALT 110.9 (69.0) U/L, mean (SD) LS of 15 (8.9) kPa; and 61% were on concomitant nucleos(t)ide analogues therapy. Of 150 patients, 143 (95%) completed 96 weeks of treatment. Week 96 efficacy responses were improved vs. Week 48 (Table). At Week 96, similar combined responses were seen in arms B and C. Viral and biochemical responses were also similar among arms B and C. BLV was safe and well tolerated; there were no drug discontinuations, serious AE (SAE) or deaths attributed to BLV. Increases in bile acids without a correlation to pruritus or other symptoms were noted with BLV treatment. Injection site reactions occurred in a higher proportion receiving 10 mg/d dosing.

Conclusion: BLV continues to be safe and well tolerated as monotherapy for CHD through Week 96. Virological and biochemical responses increased with longer term therapy.

OS-069 Prophylaxis of HBV-recurrence after liver transplantation in patients with HCC: risk of HCC recurrence from a large, multicentre retrospective study from Italy

Patrizia Burra1, Sara Battistella1, Francesco Paolo Russo1, Laura Turco2, Chiara Manulli3, Albertino Calleri1, Luisa Pasulo4, Valerio Giannelli2, Clara DiBenedetto5, Laura Mameli7, Alberto Ferrarese8, Simona Marenco9, Flaminia Ferri10, Ilaria Lenci11, Domenico Forastiere12, Silvia Schiavone2, Vittoria Vero2, Luca Vizioli2, Agnese Carrol1, Gabriella Frassanito13, Francesco Ponziadli12, Marco Biolo13, Ezio Fornasiri15, Flaminia Ferri10, Silvia Martini3, Silvia Trapani18, Paolo Antonio Grossi19, Alessio Aghemo20,21, Alberto Zanetto1.
Background and aims: Discontinuation of hepatitis B (HBV) immune globulin (HBIG) after liver transplantation (LT) for HBV-related cirrhosis with and without hepatocellular carcinoma (HCC) represents a challenging option. The adherence to this option in real-life practice is unknown. In a contemporary cohort of patients transplanted for HBV, with and without HCC, we aimed to: (1) assess the rate of HBV recurrence (HBV-R); (2) evaluate risk factors for HBV-R; (3) evaluate the association between HBV-R and HCC recurrence (HCC-R) and patient survival.

Method: This is a multicentric, retrospective study designed by the “Permanent Transplant Commission” of the Italian Association for the Study of the Liver; 20 LT Italian centers were invited to participate and 17 were finally included. All recipients who underwent LT for HBV-related liver disease were considered for inclusion. Exclusion criteria were: LT prior to January 1, 2010; age < 18 years old; combined transplantation; HIV coinfection; duration of follow-up after LT < 12 months. HBV-R was defined by positivity of HBV-DNA and/or HBsAg. Uni and multivariate linear regression analysis were used to identify predictors of HBV/HCC-R.

Results: 1115 patients were included (77% male; median age 57 years old). Indications for LT were HCC (51%), decompensated cirrhosis (34.2%), acute on chronic liver failure (4.3%), acute liver failure (ALF) (4.2%). Median MELD at LT was 15 (10–21). Data regarding HBV prophylaxis were available in 984 (88%) of patients. Among them, life-long HBIG + nucleos (t)ide analogues (NA) were used in 94.4%; withdrawal HBIG + life-long NA in 2.8%; HBIG alone in 0.5%; NA alone in 2.3%. Overall rate of HBV-R was 2.2% (median time after LT: 7 months [2–15]). Patients who received life-long HBIG + NA had lower rates of HBV-R than those in whom HBIG were withdrawn and those who received NA alone (1.4% vs. 10.7% vs. 13.6%; respectively, p < 0.001). HBV-R was associated with a lower survival after LT (p = 0.008). No association was found between HBV-R and MELD, HBV-DNA positivity or title >2000 UI/L at time of LT, HCC, use of anti-HBc prophylaxis after LT: 7 months [2–15]. Rate of HBV-R was higher in patients with vs. without HCC-R (14.6% vs. 1.2%; p < 0.001). Vascular invasion, TNN M, AFP, and HBV-R were associated with HCC-R. Multivariate analysis showed that HBV-R was the only parameter independently associated with HCC-R (HR: 20; CI95% 5–86; p < 0.001). HCC-R was associated with a significantly reduced survival after LT (5-year survival 36% vs. 94%; p < 0.001).

Conclusion: Life-long HBIG + NA is the most commonly used scheme for HBV-R prophylaxis after LT in Italy, leading to a low risk of HBV-recurrence. In LT recipients, HBV recurrence is associated with an increased risk of death. In patients transplanted for HCC, HBV-R is independently associated with HCC recurrence. Therefore, discontinuation of HBIG in these patients should be considered only in the setting of clinical trials.

(2) Immune-mediated and cholestatic diseases

OS-070 Development and validation of a score predicting response to obeticholic acid in primary biliary cholangitis: The OCA response score (ORS)

Antonio De Vincentiis1, Francesca Terracciani2, Daphne D’Amato3, Pietro Invernizzi4, Anna Morgando5, Rinaldo Pellicano5, Esther Vanni6, Mauro Viganò7, Domenico Alvaro7, Rosanna Venere8, Ana Lleo9, Francesca Colapietro10, Elisabetta Degasperi10, Raffaella Viganò10, Edardo Giovanni Giannini7, Sara Labanca7, Valentina Feletti7, Alessandro Mussetto7, Raffaele Cozzolongo7, Francesco Losito11, Maurizio Pompili5, Francesca Pozzani5, Grazia Niro5, Rosa Cotugno5, Pietro Pozzoni7, Luchino Chessa7, Giuseppe Cuccorese7, Valeria Pace Palitti7, Maurizio Russello7, Maria Rita Cannavò4, Evelise Frazzetto7, Gaetano Bertino12, Marco Marzioni5, Natalia Terreni7, Teresa Zolfino1, Carlo Saïtta1, Adriano Leggericelli7, Barbara Coccov6, Maurizia Brunetto7, Nora Cazzagon7, Annarosa Floreani7, Luigi Muratori7, Floriano Rosina7, Marco Distefano7, Gaetano Scifo7, Leonardo Baiocchi7, Giuseppe Grassi7, Rodolfo Sacco7, Antonio Izzii7, Saveria Lory Croce7, Cecilia Fiorini7, Fabio Marra7, Loredana Simone7, Olivia Morelli7, Ludovico Abenavoli7, Fabrizio Pizzolante7, Nicoletta De Matthaes7, Miki Scaravaglio7, Giancarlo Gimignani7, Valentina Boano7, Giulia Francesca7, Massimo Marignani7, Silvia Fanella7, Marco Giacchetto7, Antonino Castellaneta8,9, Guido Poggi7, Valerio Buzzanca7, Paolo Scivetti7, Annalisa Tortora7, Silvia Casella7, Valentina Bellia7, Barbara Omazzi7, Giuliano Alagna7, Chiara Ricci7, Paolo Poisaa7, Cristina Rigamonti10, Vincenzo Calvaruso7, Umberto Vespasiani Gentilucci7, Marco Carbone7, University Campus Biomedico of Rome, Rome, Italy; 2Campus, Italy; 3Turin, Italy; 4Turin, Italy; 5Humanitas University, Pieve Emanuelle, Italy

Email: devincentiis@policlinicocampus.it

Background and aims: Obeticholic acid (OCA) is the only approved second-line treatment for patients with primary biliary cholangitis (PBC), and has been shown to provide an effective biochemical response in around 40% of patients, according to POISE criteria. We aimed to derive and validate a predictive score (OCA response score, ORS) for predicting response to OCA at 12 and 24 months.

Method: We exploited data from the Italian recapitulate database including centers from the Italian PBC Registry, the Sicilian PBC Network, the PBC Project Piemonte-Liguria-Valle D’Aosta and CLEO/AIGO PBC study group. Multivariable Cox’s regressions with backward selection method were applied to obtain parsimonious predictive models, including pre-treatment variables and/or the change of ALP/ULN and total bilirubin after 6 months’ therapy. Biochemical response was evaluated according to the POISE (alkaline phosphatase (ALP)/upper limit of normal (ULN) <1.67 with a reduction of at least 15%, and a normal bilirubin) and ALP/ULN < 1.67 criteria. Discrimination and calibration were evaluated by c-
statistics and comparing observed and predicted probabilities, and internally validated with bootstrap resampling procedure.

**Results:** We selected 441 subjects (median age 58, women 88%, cirrhosis 34%, median follow-up 24 months) with at least 6 months’ observation after of OCA prescription. The observed response rates were 38%, 47% for POISE and 58%, 67% for ALP/ULN <1.67 criteria at 12 and 24 months. A score including age, pre-treatment pruritus, cirrhosis, ALP/ULN, GGT/ULN and bilirubin (ORS), and one that includes also the relative change of ALP/ULN and total bilirubin after 6 months (ORS+), showed good discrimination for response by POISE (c-statistics = 0.76 and 0.84, for ORS and ORS+, respectively) and by ALP/ULN <1.67 (c-statistics = 0.78 and 0.89, for ORS and ORS+, respectively). Bootstrap validation evidenced modest overfitting (slopes>0.90) and consistent discrimination. The score also disclosed a good calibration (mean absolute errors <0.04 for prediction of POISE and ALP/ULN <1.67 response at 24 months according to ORS and ORS+).

**Conclusion:** We derived and internally validated the ORS, that accurately predicts OCA response at 12 and 24 months. This could enhance allocation of second-line therapies in PBC with a personalized medicine approach. The present performances will need validation in external cohorts.

**OS-071-YI**

**Laminin 511-E8 is an autoantigen in IgG4-related cholangitis patients that protects cholangiocytes against T lymphocyte-induced epithelial barrier dysfunction**

David Trampert1, Remco Kersten1, Aldo Jongejan2, Dagmar Tolenaars1, Stijn van de Graaf1, Ulrich Beuers1. 1Tytgat Institute for Liver and Intestinal Research, Amsterdam Gastroenterology Endocrinology Metabolism (AGEM), Amsterdam University Medical Centers, Department of Gastroenterology and Hepatology, Netherlands; 2Amsterdam University Medical Centers, Department of Clinical Epidemiology, Biostatistics and Bioinformatics, Netherlands

Email: u.h.beuers@amsterdamumc.nl

**Background and aims:** IgG4-related disease is a systemic, lymphocyte driven, fibroinflammatory disorder. The most common organ manifestations are autoimmune pancreatitis (AIP) and IgG4-related cholangitis (IRC). Laminin 511-E8 is an extracellular matrix protein and autoantibodies against laminin 511-E8 have been described in AIP. We have previously demonstrated that laminin 511-E8 protects human cholangiocytes against toxic bile acids (J Hepatol, 2022; 77 (S1): 603). Additionally, laminin 511-E8 appears to aid in establishing barrier function and lymphocyte recruitment. Here, we aimed to investigate whether IRC patients have autoantibodies against laminin 511-E8 and via which mechanisms laminin 511-E8 could further contribute to cholangiocyte health.

**Method:** Anti-laminin 511-E8 autoantibody positivity in patient sera was assessed by ELISA and compared to healthy control and primary sclerosing cholangitis (PSC) sera. In vitro, human H69 cholangiocytes were treated with recombinant laminin 511-E8, after which RNA sequencing was performed. For permeability assays, Transwell inserts were coated with recombinant laminin 511-E8 alongside BSA control coating, after which H69 cholangiocytes were seeded onto the inserts. In addition, T lymphocytes were activated in vitro and then added to the basolateral compartment of the co-culture system to better mimic the phenotype of IRC. The effect of laminin 511-E8 coating was studied by subjecting confluent H69 monolayers to 4kD FITC-dextran permeability assays.

**Results:** Seven out of 52 patients (13.5%) with IRC had autoantibodies against laminin 511-E8 confirming that laminin 511-E8 is an autoantigen in patients with IRC. In contrast, no PSC patients and one healthy control had autoantibodies against laminin 511-E8. RNA sequencing of H69 cholangiocytes treated with recombinant laminin 511-E8 compared to controls showed differential expression of genes involved in cell barrier function and inflammation. Permeability assays revealed that laminin 511-E8 reduced leakage of FITC-dextran past the H69 monolayer. When Transwell inserts were coated with recombinant laminin 511-E8 in the co-culture setup, H69 cholangiocytes were protected from T lymphocyte-induced epithelial barrier dysfunction.

**Conclusion:** In this study we establish that laminin 511-E8 is an autoantigen in a subset of IRC patients. RNA sequencing and FITC-dextran permeability assays indicate that laminin 511-E8 enhances barrier function and protects cholangiocytes against T lymphocyte-induced epithelial barrier dysfunction. In addition to the previously reported effects of laminin 511-E8 protecting cholangiocytes against toxic bile acids, we speculate that autoantibodies against laminin 511-E8 may contribute to the pathogenesis of IRC by impairing cholangiocyte barrier function with increased inflammatory bile duct damage.
Background and aims: Progressive Familial Intrahepatic Cholestasis (PFIC) refers to inherited disorders of abnormal bile formation causing pruritus, chronic liver disease, and increased serum bile acid (sBA) levels. Evidence exists that elevated serum bile acid levels portend poor outcomes in PFIC. Ileal bile acid transporter inhibitors (IBATi) interrupt enterohepatic circulation of bile acids. We evaluated the pre-specified secondary endpoint of the impact of maralixibat (MRX) on bilirubin and a post-hoc analysis of bilirubin normalization in the MARCH-PFIC study.

Method: MARCH-PFIC enrolled patients with a genetic diagnosis of PFIC, pruritus, and elevated sBA. Patients were randomized to MRX 570 µg/kg BID or placebo (PBO) for 26 weeks. Changes were determined as the difference between MRX and PBO groups for Change from Baseline (CFB) to the average of the final 3 measurements (Weeks 18, 22 and 26) using a mixed-effects model with recurrent measurements. Total/direct bilirubin (TB/DB) categories were defined as normal (<12.0 mg/dL) or abnormal (≥12.0 mg/dL).

Results: Analysis included 64 patients from the All-PFIC cohort (13 FIC1, 31 nt-BSEP, 9 MDR3, 7 TJP2, and 4 MYOSB); patients were randomized to MRX (n = 33) or PBO (n = 31). Baseline median (Q1, Q3) TB in the MRX and PBO groups were 2.8 (1.4, 5.5) and 2.6 (0.8, 5.5) mg/dL, and DB were 2.1 (0.9, 4.0) mg/dL and 1.9 (0.5, 4.3) mg/dL, respectively. The study achieved significant CFB between MRX vs PBO for TB (−1.1 vs +0.9 mg/dL; group difference: 2.0; p = 0.047) and DB (−0.8 vs +0.8 mg/dL; group difference: 1.5; p = 0.048). Among individuals with normal baseline bilirubin (total: n = 46; direct: n = 56), there was a significant CFB between MRX vs PBO for TB (−1.8 vs +1.0 mg/dL; group difference: 2.8; p = 0.042) and DB (−0.8 vs +0.8 mg/dL; group difference: 1.6; p = 0.0001). For treatment-emergent adverse-event reporting, bilirubin increases were observed less frequently in MRX vs PBO (14.5% vs 19.6%).

Conclusion: MRX is the only IBATi inhibitor to demonstrate significant decreases in TB/DB compared to PBO in children with PFIC and across PFIC types. 40% of MRX patients with abnormal Baseline bilirubin achieved normalization vs none in the PBO group, suggesting that MRX may yield clinically meaningful improvements in liver health in patients with PFIC.
with autoimmune hepatitis overlap syndrome, and those exposed to second-line therapies (i.e., fibrates, obeticholic acid, corticosteroids) at any time were excluded. Unreliable LSM values, defined by an interquartile/median ratio >30%, were excluded from the analysis. Advanced PBC was defined by LSM ≥10 kPa. Biochemical response to UDCA was defined by the Paris-2 criteria. The primary composite end point was time to adverse clinical events, defined as death, liver transplantation, or liver-related complications. Joint models for longitudinal and time-to-event data, adjusted for age and sex, were used to assess the association between changes in LSM and clinical outcomes.

**Results:** A total of 4408 LSMs performed in 2244 patients (female 90.8%; mean age 58.4 years; advanced disease 25.4%; mean prior treatment with UDCA 5.9 years) were analyzed. A total of 217 adverse clinical events occurred during 101223 patient-years (incidence, 21.4 per 1000 patient-years). Any increase in LSM was associated with an increased risk of poor clinical outcomes (figure), with an overall hazard ratio per 10% increase in LSM/year of 1.47 (95% CI 1.40–1.55, p < 0.001). This association was consistent regardless of age (<45 years; >45 years) and LSM (<8 kPa; >8 kPa) and ≤15 kPa; ≥15 kPa risk groups at baseline. Conversely, LSM progression was significantly higher in patients who met the primary end point than in those who did not (p < 0.05). No association was found between LSM progression and baseline values of LSM, except in the youngest patients (<45 years; p < 0.05) and those who did not have an adequate response to UDCA (p < 0.01).

**Conclusion:** In patients with PBC treated with UDCA, progression of LSM over time is associated with poorer clinical outcomes regardless of age and LSM values at baseline. LSM values on UDCA are associated with LSM progression in the youngest patients and those with inadequate biochemical response to UDCA.

**OS-074-YI**

A3907, a systemic ASBT inhibitor, improves cholestasis in mice by inhibiting multi-organ bile acid transport and shows translational relevance to human

Francisco J. Caballero1,2, Pedro Miguel Rodriguez2,3,4
Alóña Agirre Lizaso5, Paula Olaizola2, Laura Izquierdo-Sánchez2, Maria Jesús Perugorria1,2, Luis Bujanda1,2,3,4, Bo Angelin5, Sara Straniero5, Anna Wallehål6, Ingemar Starke6, Per-Göran Gillberg6, Ellen Strängberg6, Fredrik Wangsell6, Jan Mattsson1, Henrik B. Hansen7, Erik Lindström7, Peter Akerblad6, Jesús Maria Banales2,3,4,5

**Background and aims:** Cholestasis is characterized by impaired bile flow leading to intrahepatic accumulation of bile constituents, including bile acids (BAs). Sustained cholestasis can progress to advanced stages of liver disease, increasing the risk of hepatobiliary malignancies and liver failure. The apical sodium-dependent BA transporter (ASBT) is pivotal for BA reabsorption in the ileum, bile ducts and kidneys, contributing to BA overload during cholestasis by preventing BA excretion. Our aim was to explore the therapeutic and translational potential of a novel oral systemic ASBT inhibitor (A3907) for the treatment of cholestasis.

**Method:** The pharmacological profile of A3907, its therapeutic potential in experimental models of cholestasis, and its translational potential in healthy human subjects was investigated.

**Results:** A3907 was a potent and selective inhibitor of both mouse and human ASBT displaying significant systemic biodistribution in healthy rodents. Daily oral administration of A3907 for 7 days promoted fecal BA excretion in healthy mice without affecting urine BA levels. A3907 was evaluated in two animal models of cholestasis, Mdr2−/− and BDL mice. Daily oral administration of A3907 resulted in high systemic exposure in both models. In the Mdr2−/− mice, 4-week oral treatment with A3907 significantly reduced liver-to-body and spleen-to-body weight ratios, serum bile acids, plasma markers of liver injury, and liver markers of inflammation, fibrosis, and ductular reaction. Interestingly, A3907 prevented apoptosis in cultured cholangiocytes exposed to high concentrations of GCDCA (1 mM), also indicating a direct cholangioprotective effect. In the BDL mice, oral A3907 administration for 11 days enhanced renal BA clearance resulting in substantial reduction of serum and biliary BA levels. As a result, the pronounced body weight loss observed in BDL mice was prevented by A3907 administration. Furthermore, A3907 treatment led to marked reduction in serum transaminases (AST and ALT), bilirubin, and urea, and liver histopathological analysis revealed reduced inflammatory cell infiltration and fewer necrotic areas in the treated animals. Finally, the translational potential of A3907 into clinical practice was investigated in a placebo-controlled Phase 1 study, showing that A3907 was well-tolerated in human subjects at pharmacologically active doses.

**Conclusion:** A3907 is the first oral systemic ASBT inhibitor that acts at the level of the intestine, liver and kidney and robustly attenuates cholestatic liver damage in experimental models. A3907 was well-tolerated in human subjects at doses reaching systemic exposures comparable to those required for therapeutic effects in animal models of cholestasis. Collectively these results highlight the promising translational potential of A3907 for the treatment of cholestatic diseases.

**Liver immunology**

**OS-075**

Single-cell atlas of liver myeloid cells with cure of chronic viral hepatitis

Ang Cui1,2, Bo Li1,2, Michael Wallace3, Anna Gonye3, Christopher Oetheimer3, Hailey Patel1, Pierre Tonnerre3, Jacinta Holmes4, David Lieb5, Brinna Yao1, Aileen Ma1, Kela Roberts1, Charles Carlton-Smith3, Joelle Brown3, Ravi Mylvaganam2, Jeremy Fung3, Moshe Sade-Feldman1,3, Jasneet Aneja3, Ang Cui1,2, Boli1,2, Michael Wallace3, Anna Gonye3, Christopher Oetheimer3, Hailey Patel1, Pierre Tonnerre3, Jacinta Holmes4, David Lieb5, Brinna Yao1, Aileen Ma1, Kela Roberts1, Charles Carlton-Smith3, Joelle Brown3, Ravi Mylvaganam2, Jeremy Fung3, Moshe Sade-Feldman1,3, Jasneet Aneja3, Jenna Gustafson3, Eliana Epstein3, Shadi Salloum3, Cynthia Briscac3, Ashraf Thabet1, Arthur Kim5, Georg Laufer1, Nir Hacohen1,4, Raymond Chung1, Nadia Atalatrachi1, 2Broad Institute of MIT and Harvard, United States; 3Harvard University, United States; 4Massachusetts General Hospital and Harvard Medical School, United States Email: angcui@broadinstitute.org
Background and aims: Direct-acting antivirals (DAAs) are now able to cure nearly all patients infected with the hepatitis C virus (HCV), representing the only definitive cure of a human chronic viral infection to date. DAAs provide a valuable opportunity to study immune pathways in the reversal of chronic immune failures in humans.

Method: To leverage this opportunity, we used plate-based single-cell RNA-seq (scRNA-seq) to deeply profile myeloid cells from liver fine needle aspirates (FNAs) in HCV patients before and after DAA treatment. We comprehensively characterized liver neutrophils, eosinophils, mast cells, conventional dendritic cells (cDCs), plasmacytoid dendritic cells (pDCs), classical monocytes, non-classical monocytes, and macrophages, and defined fine-grained subpopulations of several cell types.

Results: We discovered cell-type-specific changes post-cure, including an increase in MCM7+STMN1+ proliferating CD1C+ cDCs, which may support restoration from chronic exhaustion. We observed an expected downregulation of interferon stimulated genes (ISGs) post-cure as well as an unexpected inverse relationship between pretreatment viral load and post-cure ISG expression in each cell type, revealing a link between viral loads and sustained modifications of the host’s immune system. We found an upregulation of PD-L1/L2 expression in ISG-high neutrophils and IDO1 expression in eosinophils, pinpointing cell subpopulations crucial for immune regulation. We identified three recurring gene programs shared by multiple cell types, distilling core functions of the myeloid compartment.

Conclusion: This comprehensive scRNA-seq atlas of human liver myeloid cells in response to a cure of chronic viral infections reveals principles of liver immunity and provides immunotherapeutic insights.

OS-076
Liver-on-chip platform for studying recruitment and differentiation of circulating monocytes
Aleksandra Aizenshtadt1, Mathias Busek1,2, Inger Øynebråten1,3, Shadab Abadpour4, Anna Katharina Frank1,5,6,7, Alexey Golovin1, Justyna Stokowiec1, Alexandre Corthay1,3, Espen Melum1,4,5,6,7, Stefan Krauss1,2,1 University of Oslo, Hybrid Technology Hub, Institute of Basic Medical Science, Oslo, Norway; 2Oslo University Hospital, Department of Immunology and Transfusion Medicine, Oslo, Norway; 3Oslo University Hospital, Department of Pathology, Oslo, Norway; 4Oslo University Hospital, Department of Transplant Medicine and Institute for Surgical Research, Oslo, Norway; 5Oslo University Hospital, Norwegian PSC Research Center, Department of Transplantation Medicine, Division of Surgery, Inflammatory Diseases and Transplantation, Oslo, Norway; 6Oslo University Hospital, Research Institute of Internal Medicine, Division of Surgery, Inflammatory Diseases and Transplantation, Oslo, Norway; 7University of Oslo, Institute of Clinical Medicine, Faculty of Medicine, Oslo, Norway
Email: aleksandra.aizenshtadt@medisin.uio.no

Background and aims: Recent studies based on single-cell and spatial (proteo)genomics uncovered a significant diversity of immune cells in the liver, reflecting metabolic zonation, and might be altered during diseases. For instance, circulating monocytes can be recruited to damaged liver tissue and change fate depending on signals from the microenvironment. An expanded population of recruited macrophages is believed to affect the progression of liver diseases. The exact mechanisms and functions of recruited macrophages are not fully understood, partially due to the absence of relevant human in vitro models. The aim of this study was to establish an in vitro system for functional studies of circulating immune cells in the liver.
the context of their recruitment and interactions with healthy and diseased 3D liver tissue representations with metabolic zonation.

**Method:** We developed medium compositions for generating and maintaining human pluripotent stem cells-derived periportal (zone 1) and pericentral (zone 3)-like liver organoids (HLO). The zone-specific phenotype of the HLOs was demonstrated by immunofluorescence, gene expression analysis, proteomics. Functional assays included drug metabolism, production of albumin, urea, glutamine and accumulation of glycogen. Using a recently developed pump-less recirculation Organ-on-a-Chip (rOoC) platform, healthy and diseased zonated HLOs were co-cultured with human primary CD14+ monocytes, isolated from peripheral blood mononuclear cells (PBMC). Confocal imaging, flow cytometry and multiplex assay of cytokines were employed for the analysis of interaction between HLOs and monocytes.

**Results:** We present a novel in vitro model for studying interactions between circulating human immune cells and liver tissue representations with metabolic zonal identity (Fig. a) in a rOoC platform (Fig. b). In this setting, HLOs could be cultured for at least 2 weeks while retaining viability and functionality. Moreover, disease phenotype (hepatic steatosis or drug-induced liver injury, DILI) can be induced in HLOs in a rOoC platform in response to free fatty acids or acetaminophen (APAP) (Fig. c), respectively. Monocytes could be circulated in the rOoC platform without trapping, activation or decrease in viability. The functional interactions between zonated HLOs and circulating monocytes were analyzed in control and disease-mimicking conditions. We observed an increased migration of monocytes toward APAP-treated HLOs compared to untreated HLOs (Fig. c). The multiplex analysis of cytokines and in situ immunophenotyping enabled a thorough characterization of deployment and disease-dependent alterations of monocytes and liver cells “on chip.”

**Conclusion:** In this proof-of-concept study, we developed a novel platform for modelling the interactions between zonated liver 3D representations and circulating immune cells “on chip.” The platform provides an improved tool for a scalable and personalized evaluation of human liver responses to drug interventions and disease modelling.

**OS-077**

Liver immunity index: circulating HBV-specific CXCR6+ CD8T cells mirror intrahepatic anti-viral T cell immunity and predict immune control in models of chronic hepatitis B

Hannah Wintersteller1, Miriam Bosch1, Donakonda Sainitin1, Anna Kosinska2,3, Edanur Ates-Oz2,3, Christine Wurmser4, Dietmar Zehn5, Ulrike Protzer2,3, Dirk Wohlleber1, Percy A. Knolle1,3, 

1Institute of Molecular Immunology, Technical University of Munich, Germany; 2Institute of Virology, Technical University of Munich, Germany; 3German Center for Infection Research, Munich, Germany; 4Division of Animal Physiology and Immunology, School of Life Sciences Wurzach, Germany

Background and aims: Persistent hepatic viral infections, such as chronic hepatitis B, are characterized by a scarcity and dysfunction of virus-specific CD8T cells detected in the liver and the circulation. Immunotherapies, such as therapeutic vaccination, thus aim to reinvigorate and expand virus-specific CD8T cell immunity to control viral infection in the liver. Since liver biopsies are difficult to obtain, we sought to identify markers on circulating antigen-specific CD8 T-cells that reflect the immune response at the site of infection in the liver and could be used for immune monitoring of immune therapies.

Method: We used pre-clinical models of adenoviral hepatocyte-specific delivery of nominal antigens and HBV genomes to study the dynamics of virus-specific T cell responses by flow cytometry and single-cell RNA sequencing (scRNAseq).

Results: After adenoviral transduction of hepatocytes, we detected generation of CXCR6+ virus-specific CD8T cells with a liver-resident phenotype that were absent from the spleen. During an acute infection, CXCR6+ CD8T cells were potent effector cells, expressing high levels of Granzyme B and TNF/IFNγ after ex vivo stimulation. CXCR6+ CD8T cells in a persistent infection of the liver were rendered dysfunctional. Strikingly, during clearance of hepatic infection, high numbers of circulating CXCR6+ CD8T cells were detected in peripheral blood, whose phenotype and functionality were identical to their counterparts in the liver, and most importantly predicted outcome. Notably, CXCR6+ CD8T cells developed solely when recognizing their antigen in the liver and not after systemic DNA vaccination in the absence of infection, which led to formation of circulating CX3CR1+ effector T cells. scRNAseq analysis of sorted, virus-specific CD8T cells confirmed co-clustering of CD8T cells from the liver and blood but not spleen.

Conclusion: Our results reporting the occurrence of HBV-specific CXCR6+CD8T cells in the circulation, that have previously seen their antigen in the liver, provide the basis for using CXCR6 as a predictive marker for intrahepatic immune responses during monitoring of immune therapies, such as therapeutic vaccination, in patients with chronic hepatitis B.

Figure: The Liver-on-chip platform. A) Scheme of generation of zonated HLO. B) rOoC chips in the culture 8-wells format, and scheme of rOoC perfusion. C) Example of disease model in rOoC-APAP-induced liver injury. “On chip” confocal imaging showing expression of albumin (green) and PDGFR (magenta) in control and APAP-treated HLO. Live/dead staining was used for the visualization of monocytes (green dots) migration toward APAP-treated organoids.
OS-079-YI
2D-interactome of the tumor immune-microenvironment reveals immunosuppressive T cells in primary sclerosing cholangitis-associated cholangiocarcinoma

Jenny Krause1, Christian Casar2, Sonja Haenelzelm1,3,4,5, Fabian Hausmann1,4, Robin Khati1,4, Camilla Engholm6, Srustidhar Das7,8, Dominik Kylies5, Tobias Poch1, Dorothee Schwing1, Franziska Muscate9,10, Filippo Cortesi1,12, Asmus Heumann9, Tarik Ghadban9, Lutz Fischer10, Till Clauditz11, Christian F. Krehb5,12, Victor Puellas9, Eduardo Villablance7,8, Samuel Huber1,12, Stefan Bonn1,4,12, Christoph Schramm1,12, Nicola Gagliani1,9,12, 
1University Medical Center Hamburg-Eppendorf, I. Department of Medicine, Hamburg, Germany; 2University Medical Center Hamburg-Eppendorf, Bioinformatics Core, Hamburg, Germany; 3University Medical Center Hamburg-Eppendorf, Institute of Medical Systems Biology, Hamburg, Germany; 4University Medical Center Hamburg-Eppendorf, Center for Biomedical AI, Hamburg, Germany; 5University Medical Center Hamburg-Eppendorf, III. Department of Medicine, Hamburg, Germany; 6Karolinska Institute and Department of Cell and Molecular Biology, Stockholm, Sweden; 7Karolinska Institute and University Hospital, Division of Immunology and Allergy, Department of Medicine Solna, Stockholm, Sweden; 8Center of Molecular Medicine, Stockholm, Sweden; 9University Medical Center Hamburg-Eppendorf, Department of General, Visceral and Thoracic Surgery, Hamburg, Germany; 10University Medical Center Hamburg-Eppendorf, Department for Visceral Transplant Surgery, Hamburg, Germany; 11University Medical Center Hamburg-Eppendorf, Department of Pathology, Hamburg, Germany; 12University Medical Center Hamburg-Eppendorf, Department for Translational Immunology, Hamburg, Germany.

Email: je.krause@uke.de

Background and aims: Primary Sclerosing Cholangitis (PSC) is the greatest risk factor for Cholangiocarcinoma (CCA), its most feared complication (1, 2). Curative therapeutic options are limited, and its pathogenesis is still only partially understood. Altered T cell function has recently been described in patients with PSC, characterized by a pro-inflammatory CD4+ TEM phenotype dominated by IL-17 producing cells (T17) (3–5). In CCA, highly active immunosuppressive regulatory Foxp3+ T cells (Foxp3+ TREG) have been linked to unfavorable outcomes (6). The tumor-immune-microenvironment (TIME) of PSC-associated CCA (PSC-CCA) has never been thoroughly characterized, thus whether T17 or Foxp3+ TREG contribute to TME of PSC-associated CCA remains unknown.

Method: To understand the composition and function of the TIME in PSC-CCA, we applied state-of-the-art single-cell multi-omics, as well as spatial transcriptomics (ST). By using a combination of novel analyses such as interactome and spot deconvolution, we overcame the limitation of 1-dimensional biased morphological experiments, revealing the cellular neighborhood composition and the comprehensive 2D interactome of PSC-CCA TIME.

Results: We provide the first comprehensive characterization of the TIME in PSC-CCA. We developed a new method to elucidate the 2D-immune-interactome based on single-cell multi-omics, and thereby identified immunosuppressive T cell interaction within the PSC-CCA TIME. Trajectory analyses and scTCR-Seq suggest plasticity of CD4+ TEM with a T17 polarization-state towards Foxp3+ TREG in PSC-CCA. ST spot deconvolution revealed the neighborhood composition of Foxp3+ TREG within the tumor, showing proximity to CCA cells and cancer associated fibroblasts. Finally, we found TGFβ1, a cytokine known to promote the conversion of CD4+ T cells to Treg, gene expression increased in tumors when compared to the adjacent liver.

Conclusion: We here generated the first comprehensive multi-omics dataset on the complex TIME of PSC-CCA proposing potential therapeutic targets. By revealing the 2D-immune-interactome, we identified location and cellular network of Foxp3+ TREG and suggested them as a potent mediator of tumor maintenance. We further suggest TGFβ1 from the tumor microenvironment to be the potential cytokine able to polarize CD4+ TEM in the liver toward immunosuppressive regulatory T cells in PSC-CCA, and thus impair antitumorigenic function of cytotoxic CD8+ T cells.

References

Liver tumours - Clinical except therapy

OS-080-YI
Platelet, elastography, age, sex and etiology for hepatocellular carcinoma surveillance in patients with advanced chronic liver disease: Please algorithm

Wenyi Gu1, Victor de Lédinghen2, Christophe Aubé3, Aleksander Krag4, Christian Strassburg5, Laurent Castera6, Jérôme Dumontier7, Mireen Friedrich-Rust8, Stanislas Pol8, Ivica Grzurevic9,10, Yasmin Zeleke9, Michael Praktiknio11, Sven Francque11,12, Halima Gottfriedova12, Thomas Vanwolleghe11, Ioan Sporea13, Ida Tjäsvi–Drinkovic10, Chang Johannes3, Sandra Mustapic10, Philipp Schindler1, Florian Rennebaum1, Maria Kjærgaard4, Olivier Guillaud7, Cristina Margini14, Cristophe Cassinotto15, Jan Best16, Ali Canbay16, Pierre-Emmanuel Rautou16, Maxime Ronot16, Filipe Andrade16, David Jm Bauer17,17, Benedikt Simbrunner17, Georg Sennmann17, Thomas Reiberger17, Jerome Boursier17, Ditlev Nytoft Rasmussen14, Valerie Vilgrain18, Aymeric Guibl19, Stefan Zeuzem7, Camille Vassord20, Luisa Vonghia13, Renata Senkerikova18, Alina Popescu13, Annalisa Berzigotti14, Wenping Wang18, Wim Laleman19, Maja Thiele21, Christian Jansen21, Janet Trebicka1, 1University Hospital Muenster, Germany; 2Bordeaux University Hospital, France; 3Angers University Hospital, France; 4University Hospital Nantes, France; 5University Hospital Herriot, University of Geneva, Switzerland; 6Frankfurt University Hospital, Germany; 7Lyon Edouart Herriot University Hospital, France; 8Frankfurt University Hospital, Germany; 9Paris Cochin University Hospital, France; 10Dubrava University Hospital, Croatia; 11Antwerp University Hospital, Belgium; 12Institute for Clinical and Experimental Medicine, Prague, Czech Republic; 13Victor Babes University of Medicine and Pharmacy, Romania; 14Bern University Hospital, Switzerland; 15University Hospital of Montpellier, France; 16University Hospital Knappschaftskrankenhaus, Germany; 17Medical University of Vienna, Austria; 18Zhongshan University Hospital of Fudan University, China; 19University Hospitals Leuven, Belgium.

Email: jonel.trebicka@ukmuenster.de

Background and aims: Patients with advanced chronic liver diseases (AILD) have high risk of developing hepatocellular carcinoma (HCC). Therefore, ultrasound surveillance is recommended every 6 months. This large-scale international multicenter study aims to stratify the risk of de novo HCC development in AILD and establish a cost-effective surveillance algorithm.
ORAL PRESENTATIONS

Method: Three thousand sixteen aCLD patients were screened from 15 centers in Europe and China using ultrasound measurement (two dimensional shear wave elastography [2D-SWE]), transient elastography [TE] measurement and point-SWE [p-SWE]). Patients were followed up regularly. Logistic regression model was used to explore risk factors of de novo HCC. Additionally, cut-off values were created with the best Youden index of each parameter to predict 2-year HCC. We further conducted a Markov model to analyze the cost-effectiveness of our PLEASE surveillance algorithm compared to the normal follow-up of patients.

Results: A total of 2340 patients were included in the study. Most of the patients were male (61.8%) and middle-aged (median [IQR]: 55 [45–63] years), with an median MELD score of 7.6. Alcoholic liver diseases and non-alcoholic fatty liver diseases (NAFLD) (43.0%) accounted for the major etiology, followed by viral hepatitis (25.7%), including 15% HCV and 10.7% HBV, and 127 (5.4%) patients were diagnosed with de novo HCC in 2 years. Liver stiffness (LS) (mean: 11.2 kPa) was measured by elastography (odds ratio [OR]: 2.367, p < 0.0001) was found by logistic regression model (AUC: 0.84) to be independently associated with the development of de novo HCC, together with age, sex, etiology and platelet. We established the PLEASE algorithm with cutoffs as follows: PLatelet below 150G/l, liver Elastography ≥15 kPa, Age over 50, Sex: male and Etiology. For etiology we stratified among uncontrolled viral hepatitis, controlled viral hepatitis/NAFLD and others. Each variables were given a subscore and total score over 3 points were assigned in high-risk group. Patients in the high-risk group showed a significantly higher probability of HCC over the 2-year period than those in the low-risk group (13% vs. 1%, log rank p < 0.0001). The PLEASE algorithm was validated in two external cohorts (n = 245 and 121, respectively), and validated in two external cohorts (n = 245 and 121, respectively), and the incremental cost-effectiveness ratio was only 2,813 Euros per quality-adjusted life-year (QALY).

Conclusion: The PLEASE algorithm based on LS, platelet count, etiology, age and sex is predictive of de novo HCC development. Patients with a higher risk for developing de novo HCC in patients with ACLD based on the PLEASE algorithm may benefit from every- two-months screening for HCC, which appears cost-effective for the surveillance of HCC in ACLD patients. A yearly interval seems to be safe for patients at low-risk based on the PLEASE algorithm.

OS-081
Epidemiology and characteristics of hepatocellular carcinoma in France: results of the first 2000 patients in real-life situations from the French prospective chief cohort
Eric Nguyen Khac1, Philippe Merle2, Ben Khadhra Hajar3, Giuliana Amaddeo4, Thomas Daecaens5, Thomas Uguen6, Jean-Frédéric Blanc7, Nathalie Ganne-Carrié8, Mohamed Bouattour9, Stéphane Cattan10, Christine Silvain11, Ghassan Riachi12, Jean Marie Peron13, Rodolphe Anty14, Jean-Pierre Bronowicki15, Aurore Baron16, Georges-Philippe Pageaux17, Veronique Loustaud-Ratti18, Frédéric Oberti19, Manon Allaire20, Sylvain Manfredi21, Yasmina Ben Merabet22, Isabelle Ollivier-Hourmand23, Marie Lequoy24, Jean Baptiste Noutsouba25, Moana Gelu-Simeon26, Lucien Grados3, Pierre Nahon5, Charlotte Costentin6, Gerard Ducournau7, Olivier Ganry8, 1Amiens University Hospital, Hepato-Gastroenterology and Oncology digestive, Amiens, France; 2CHU Amiens, France; 3CHU Amiens, France; 4CHU Henry Mondor Créteil, France; 5CHU Grenoble, France; 6CHU Rennes, France; 7CHU Bordeaux, France; 8CHU Aricennes Bobigny, France; 9CHU Beaujon Chivy, France; 10CHU Lille, France; 11CHU Poitier, France; 12CHU Rouen, France; 13CHU Toulouse, France; 14CHU Nice, France; 15CHU Nancy, France; 16CHU Sud Francilien, France; 17CHU Montpellier, France; 18CHU Limoges, France; 19CHU Angers, France; 20CHU GH Pitié Salpêtrière, France; 21CHU Dijon, France; 22CHU Paul Brousse Villejuif, France; 23CHU Caen, France; 24CHU Saint Antoine Paris, France; 25CHU Brest, France; 26CHU Guadeloupe, France
Email: nguyen-khac.eric@chu-amiens.fr

Background and aims: Hepatocellular carcinoma (HCC) is the first cause of primary liver cancer, constantly increasing, and the 3rd cause of cancer death worldwide. The objective of the study is to describe the epidemiology and management of HCC in France.

Method: CHIEF is a prospective and nationwide observational cohort initiated in September 2019, with the aim to include all patients with HCC in a real-life situation. The clinical, biological, radiological and therapeutic characteristics of the patients were collected with a follow-up for 5 years for each patient.

Results: 2043 patients were included from September 2019 to September 2021 in 31 centers. The analysis involved 1640 patients, with 68 years of median age, 86% of men, BMI at 26.8 kg/m2. HCC was diagnosed by a screening program in 35.2% of cases, associated with better survival (84.7% at 1 year, p < 0.0001) compared to those diagnoses during a complication. A diagnostic by liver biopsy was performed in 46.3% of cases. Cirrhosis was present in 70.8% of cases, with median MELD 9 IQR(7,11). Child-Pugh A in 77.8%, median ALBI score at –2.4 [–2.7; –1.9] (ALBI 1: 36.3%, ALBI 3: 7%), esophageal varices of grade ≥2 in 28.4%. The etiologies were at least alcohol in 53.5% of cases, metabolic syndrome in 39%, and viral infection in 23.3% (16.4% HCV). HCC was diagnosed within the Milan criteria in 32.9%, with a median AFP level of 39 ng/ml IQR [7–562], a portal thrombosis in 5.9% and a metastatic condition in 10.7% of cases. The distribution of BCLC stages 0, A, B, C and D was 6.1%, 29.8%, 28.8%, 32.1% and 3.2% respectively. The median follow-up of new cases was 17.8 months 95% CI [17.3;18.5], IQR [13.7;23.3], with 29.1% of death. The survivals at 6 months, 1 year and 18 months were 84.5% 95%CI [82.8;87.9], 76.7% [74.2;79.2] and 69.3% [66.4; 72.3]. Median overall survival was not reached. First-line therapeutic access was 40.5% for curative treatments, 36.2% for locoregional procedures, 19.2% for systemic treatments and 4% palliative. The 1-year survival rates for BCLC stages 0, A, B, C and D were 95.6%, 89.7%, 81.7%, 54.9% and 40% (log rank test p < 0.0001). BCLC 0, A and B median survivals were not reached. They were 14.6 months and 6.1 months for BCLC stages C and D. The 1-year survival rates for curative, locoregional and systemic treatments were 92.9% 82.2% and 57.8% (p < 0.0001).

Figure: Cumulative incidence of denovo HCC risk compared patients in high-risk group with low-risk group based on PLEASE algorithm

Conclusion: The PLEASE algorithm based on LS, platelet count, etiology, age and sex is predictive of de novo HCC development. Patients with a higher risk for developing de novo HCC in patients with ACLD based on the PLEASE algorithm may benefit from every-two-months screening for HCC, which appears cost-effective for the surveillance of HCC in ACLD patients. A yearly interval seems to be safe for patients at low-risk based on the PLEASE algorithm.
Conclusion: The first analysis of the CHIEF cohort provides epidemiological data and recent therapeutic results in real life. In this cohort, the overall survival at 1 year, the survivals observed for the treatments applied, and the access to curative treatments seem interesting. First-line immunotherapy shows comparable survival in real life as in trials.

OS-082

Glycemic control as a modifiable and independent risk factor for the development of liver, biliary tract and pancreatic cancer: a territory-wide study of 273,421 patients with diabetes mellitus

Chi Ho Lee1, CL Chiang3, Ho Ming Cheng1, Rex Wan-Hin Hui1, Man-Fung Yuen1, Wai Keung Leung1, Wai-Kay Seto1,2. The University of Hong Kong, Medicine, Hong Kong; 2The University of Hong Kong-Shenzhen Hospital, Medicine, China; 3The University of Hong Kong, Clinical Oncology, Hong Kong

Email: wkseto@hku.hk

Background and aims: Diabetes mellitus (DM) is an established risk factor for liver, biliary and pancreatic cancer, but the impact of glycemic control on the development of these cancers in patients with DM has not been well-investigated.

Method: We identified adults (age ≥18 years) newly diagnosed with DM between 2000 and 2015 via a territory-wide electronic healthcare registry in Hong Kong. DM was identified by (i) the American Diabetes Association criteria with two abnormal test results of hemoglobin A1c (HbA1c) ≥6.5% or fasting plasma glucose ≥7 mmol/L, (ii) use of antidiabetic medications, or (iii) international classification of diseases (ICD-9) coding. An initial lead-in period of three years from the date of DM diagnosis was used to minimize reverse causality, with optimal glycemic control defined as mean HbA1c <7% from at least two values within the lead-in period. Average successive variabilities of HbA1c were calculated to assess the variability. Outcomes of interest were incident liver, biliary (gall-bladder and extrahepatic biliary tract), and pancreatic cancer development. A multivariable Cox regression model was used to calculate the adjusted hazard ratio (aHR) of cancer development with glycemic control. Additional sensitivity analyses (Table 1) were applied to assess robustness of results.

Results: Among 421,818 screened individuals, 273,421 patients with DM (mean age 61.5 ± 11.7 years, 52.6% male) were included. The median follow-up duration was 6.7 (4.4–10.1) years, with the occurrence of 2,018, 517, and 721 liver, biliary and pancreatic cancers respectively. When compared with a mean HbA1c ≥7%, a level ≤7% was independently associated with a lower risk of liver cancer (aHR: 0.74; 95% CI: 0.67–0.81), biliary tract cancer (0.67; 0.56–0.80), and pancreatic cancer (0.83; 0.71–0.97). The associations remained significant after 1:2 propensity score matching (HR 0.68–0.80), inverse probability of treatment weighting (HR 0.71–0.85), and via other sensitivity analyses (Table 1). A lower risk of liver cancer was observed regardless of presence or absence of obesity (aHR 0.69–0.78), aspirin intake (aHR 0.71–0.75); or viral hepatitis (aHR 0.68, 0.59–0.79; and aHR 0.78, 0.69–0.88 respectively). Significant associations were also demonstrated in biliary tract cancer regardless of smoking, hypertension, and hyperlipidemia (aHR 0.46–0.74). For pancreatic cancer, the association was significant in non-smokers, normotensive and non-dyslipidemia individuals (aHR 0.80–0.82), but became insignificant when these metabolic risk factors were present.

Conclusion: Optimal glycemic control with mean HbA1c <7% was independently associated with a lower risk of cancers of the liver, biliary tract, and pancreas among patients with DM. Glycemic control is a modifiable risk factor which can influence oncoprotective strategies for hepatobiliary and pancreatic cancers.

OS-083-YI

Natural history and management of recurrent hepatocellular carcinoma after liver transplantation: a multicenter nationwide study

Massih Lingarhari1, Camille Henry1, Emmanuel Boleslawski1, Camille Besch2, François Faitot2, Eric Assenat3, Astrid Herrera3, Jose Ursic-Bedoya3, Fabien Robin9, Thomas Uguen5, Teresa Antonini5, Domitille Erard2, Sylvie Radenne2, Bleuenn Brusset6, Thomas Decaens5, Manon Allaire7, Filomena Conti7, Hélène Barraud6, Laure Elkrief6, Ephrem Salamé6, Olivier Boillot6, Jérôme Dumortier6, Line Carolle-Notrandja Wandji1, Alexandre Louvet1, Philippe Mathurin1, Sebastien Dharancy1, Guillaume Lassailly1, 1CHU Lille, France; 2CHU Strasbourg, France; 3CHU Montpellier, France; 4CHU Rennes, France; 5HCL Lyon, Croix-Rousse, France; 6CHU Grenoble, France; 7APHP Pitié-Salpêtrière, France; 8CHU Tours, France; 9HCL Lyon, Edouard-Herriot, France

Email: massih.lingarhari@chu-lille.fr

Background and aims: Liver transplantation (LT) is the best curative treatment for hepatocellular carcinoma (HCC). Recurrence of HCC (rHCC) still occurs in approximately 15% of patients at 5 years after LT despite stringent selection criteria, and significantly impairs post-

Table 1. Effect of Optimal Glycemic Control on Risk of Liver, Biliary Tract, and Pancreatic Cancers.

<table>
<thead>
<tr>
<th></th>
<th>Liver</th>
<th>Biliary tract</th>
<th>Pancreas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main analyses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age-adjusted HR</td>
<td>0.85</td>
<td>0.81</td>
<td>0.74</td>
</tr>
<tr>
<td></td>
<td>(0.78-0.93)</td>
<td>(0.74-0.89)</td>
<td>(0.67-0.81)</td>
</tr>
<tr>
<td>Model 2*</td>
<td>0.80</td>
<td>0.69</td>
<td>0.67</td>
</tr>
<tr>
<td></td>
<td>(0.67-0.95)</td>
<td>(0.57-0.83)</td>
<td>(0.56-0.80)</td>
</tr>
<tr>
<td>Model 3†</td>
<td>0.87</td>
<td>0.83</td>
<td>0.83</td>
</tr>
<tr>
<td></td>
<td>(0.75-1.01)</td>
<td>(0.71-0.97)</td>
<td>(0.71-0.97)</td>
</tr>
<tr>
<td>Sensitivity analyses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PS matching</td>
<td>0.73</td>
<td>0.68</td>
<td>0.80</td>
</tr>
<tr>
<td></td>
<td>(0.66-0.81)</td>
<td>(0.56-0.83)</td>
<td>(0.68-0.95)</td>
</tr>
<tr>
<td>IPTW</td>
<td>0.80</td>
<td>0.71</td>
<td>0.85</td>
</tr>
<tr>
<td></td>
<td>(0.73-0.88)</td>
<td>(0.59-0.85)</td>
<td>(0.73-0.99)</td>
</tr>
<tr>
<td>Mean A1c &lt;6.5% vs. ≥6.5%</td>
<td>0.69</td>
<td>0.53</td>
<td>0.75</td>
</tr>
<tr>
<td></td>
<td>(0.62-0.77)</td>
<td>(0.42-0.67)</td>
<td>(0.62-0.90)</td>
</tr>
<tr>
<td>Based on at least three A1c values during lead-in period</td>
<td>0.77</td>
<td>0.66</td>
<td>0.86</td>
</tr>
<tr>
<td>A1c ASV &lt;25% quartile vs. ≥25%</td>
<td>0.74</td>
<td>0.86</td>
<td>0.76</td>
</tr>
<tr>
<td></td>
<td>(0.66-0.83)</td>
<td>(0.70-0.96)</td>
<td>(0.63-0.91)</td>
</tr>
</tbody>
</table>

A multivariable Cox proportional-hazards regression model accounted for the following covariates: baseline characteristics (age, sex, BMI, duration of diabetes, smoking, alcohol abuse, hyperlipidemia, hypertension) and medication use during follow-up (statins, aspirin, NSAID, metformin, sulfonyleureas, insulin, SGLT-2i, DPP-4i, GLP-1a).

†Model 3 included model 2 covariates and further adjusted for chronic hepatitis B and C infection, cirrhosis, and liver compensation in liver cancer; gallstone, cholangitis, calculus of bile duct, and cholecystitis in biliary tract cancer; acute and chronic pancreatitis in pancreatic cancer.

ASV, average successive variability; BMI, body mass index; CI, confidence interval; DPP-4i, dipeptidyl peptidase-4 inhibitors; GLP-1a, glucagon-like peptide-1 agonists; HR, hazard ratio; IPTW, inverse probability of treatment weighting; NSAID, non-steroidal anti-inflammatory drug; PS, propensity score; SGLT-2i, sodium-glucose cotransporter-2 inhibitors.

Figure: (abstract: OS-082).
transplant survival. More data on the natural history, clinical presentation, efficacy and safety of treatments are needed to optimize the management of rHCC in the specific context of transplanted patients.

**Method:** Observational, retrospective study in 9 French transplantation centers, including all patients with rHCC after LT between 01/01/2008 and 31/12/2020. Patients’ characteristics at LT and at recurrence were collected. We evaluated factors associated with overall survival (OS) from the date of recurrence, treatment in terms of efficacy and safety, and the impact of immunosuppressive (IS) drug management.

**Results:** Two-hundred-and-fifty-five patients were included (median age 63 years, HCC/alcohol 55%). The median time between LT and recurrence was 23 months (IQR 11.8–45.4) and was predominantly only extrahepatic (60%), with bone lesions in 35% of cases. AFP at recurrence was only weakly correlated to last AFP before LT (Spearman r = 0.36). Recurrence was very early (<6 months) in 12% of cases and very late (>5 years) in 18% of cases. Early and late recurrences were similar in terms of anatomical sites. Size of the main nodule on the explant pathology (p = 0.01) and the last AFP before LT (p = 0.01) were associated with earlier recurrence.

Median OS was 18.2 months (95%CI: 15.1–21.7) from the date of recurrence. Overall 5-year post-LT survival was 45% (95%CI: 39–52). 31% of patients (n = 78) received a curative treatment (surgery or percutaneous destruction) at the first recurrence, with a subsequent 5-year recurrence-free survival of recurrence of 19% (95% CI; 11–34). When considering systemic treatments, sorafenib was the most commonly used TKI (n = 131, 86%), while the use of the atezolizumab and bevacizumab was limited (n = 6). 10-year OS post-LT was 46% (95% CI; 34–62) for patients who were amenable to curative treatment at recurrence 6% (95% CI; 3–12) for non-curate treatment. In multivariate analysis, non-curative treatment (HR 2.76, p < 0.001), recurrence later than 2 years after LT (HR 0.15, p = 0.001), WHO PS 1 (HR 1.69, p = 0.01) or >1 (HR 8.1, p < 0.001), AFP level at recurrence >100 ng/ml (HR 1.83, p = 0.03) and concomitant intra- and extra-hepatic recurrence (HR 1.54, p = 0.04) were associated with OS after HCC recurrence. Change of listing criteria for HCC in France in 2013 (Milan criteria versus AFP model) did not impact on rHCC prognosis. Forty-nine percent of patients experienced grade 3/4 toxicity, and treatment discontinuation was required in 38%. There was no significant association between mTOR inhibitors, calcineurin inhibitors or mycophenolate mofetil management with survival or safety profile of systemic treatments.

**Conclusion:** Recurrence HCC after LT is a predominantly extrahepatic disease, and 20% of recurrences occur more than 5 years after LT. OS could be improved by aggressive management in selected patients, resulting in those patients in 46% survival 10 years after LT. Timing of recurrence after LT has a major prognostic impact. TKIs have a manageable toxicity profile, no impact of IS drugs on the prognosis of the disease or on the tolerance of systemic treatments.

**OS-084-YI**

**Weakly supervised intrahepatic tumour classification from routine tumour biopsy: a proof of concept**

Paul Emile Zafar1,2, Aurélie Beaufre1,3, Nora Ouzir2, Miguel Albuquerque1, Jules Grégory2, Kévin Mondet1, Jean Christophe Pesquet2, Valérie Paradis1, 1APHP Hôpital Beaujon, Pathology FHU MOSAIC, Clichy, France; 2CentraleSupélec, France; 3Curie, U900 CBIO Team, France; 4APHP Hôpital Beaujon, Radiology FHU MOSAIC, France

Email: aurelie.beaufre@aphp.fr

**Background and aims:** Primary liver malignancies define a wide spectrum of tumours, including hepatocellular carcinoma (HCC), intrahepatic cholangiocarcinoma (iCCA) and combined hepatocellular-cholangiocarcinoma (cHCC-CCA) recognised by the presence of HCC and iCCA features. Due to cHCC-CCA’s heterogeneity, diagnosis using conventional histology with Hematein Eosin Safran (HES) staining is challenging, especially on biopsy samples. This study aims to automatically classify primary liver malignancies on biopsy samples using a weakly supervised learning method based on deep convolutional neural networks (CNN).

**Method:** We constituted 119 biopsies of primary liver malignancies (Beaujon Hospital, Clichy, France) divided into training and validation sets of 90 and 29 samples, respectively. Two liver pathologist experts examined each sample’s whole slide HES image (WSI). After annotating the tumour/non-tumour areas, tiles of 125 µm² (256 pixels) were extracted from the WSIs and used to train a ResNet18

Figure: (abstract: OS-084-YI).
Results: First, pathological reviewing classified the training and validation sets into HCC (n = 33 and n = 11), iCCA (n = 28 and n = 9), and cHCC-CCA (n = 29 and n = 9), respectively. We then analysed the results of the proposed weakly supervised method using 2 to 8 clusters. No specific cluster associated with chHCC-CCA was identified. In the case of 2 clusters, cluster 0 contained mainly HCC histological features (76% of the tiles) while cluster 1 contained mainly iCCA features (92% of the tiles) (Figure). This two-clusters model was assessed on the validation set by quantifying the proportion of clusters 0 (representative of HCC) and 1 (representative of iCCA). For HCC and iCCA, the diagnostic agreement between the pathological diagnosis and the model predictions (major contingent) was 100% for HCC (11/11 cases) and 78% for iCCA (7/9 cases). For chHCC-CCA, we observed a highly variable proportion of each cluster type (cluster 0: 5–90%; cluster 1: 9–94%). The diagnostic agreement of the major contingent in pathology predicted by the model was 89% (8/9 cases).

Conclusion: This study shows that a weakly supervised learning method applied to primary liver malignancy biopsy can identify specific morphological features of HCC and iCCA. While no specific features of chHCC-CCA were recognized, the assessment of proportion of HCC and iCCA tiles within a slide could improve the identification of chHCC-CCA in biopsies.

NAFLD: Clinical aspects

OS-085 Use of anti-diabetic and lipid-lowering medications associated with lower scores of liver fibrosis biomarkers in non-alcoholic steatohepatitis (NASH) patients

Jun Wang1, Dora Ding1, Xiaorong Shao1, Lily Ma1, Jun Xu1, Jason Melehan1, Lisa Boyette1, Timothy R. Watkins1, Catherine Jia1, Vlad Malkov1, Andrew Billin1, Shahed Iqbal1. Gilead Sciences, Inc., United States

Email: jun.wang37@gilead.com

Background and aims: The effects of anti-diabetic or lipid-lowering drug use on liver fibrosis biomarkers in NASH patients are not well documented. We investigated the associations between use of anti-diabetic or lipid-lowering drugs and blood liver fibrosis biomarkers. Additionally, we assessed if the associations vary by patient’s genetic predisposition to NASH.

Method: We conducted a cross-sectional analysis of baseline data from two completed phase III trials of NASH patients with bridging fibrosis (NCT03053050, N = 785) or compensated cirrhosis (NCT03053063, N = 864). Use of anti-diabetic (metformin, GLP-1RA, Pioglitazone, SGLT2 inhibitors and DPP4 inhibitors) and lipid-lowering (statins and fibrates) drugs were obtained from trial baseline data. Among patients who provided blood samples for sequencing (N = 1077), a polygenic risk score (PRS) for NASH was derived for those of European ancestry (N = 742) using 6 variants (Bonferroni corrected p ≤ 0.01) from prior genome-wide association or exome sequencing studies: HSD17B13, MBOAT7, LEPR, HSD17B13, MBOAT7, and LEPR. Outcomes included composite scores measured at baseline: Fibrosis 4 (FIB-4), AST to platelet ratio index (APRI) and Enhanced Liver Fibrosis (ELF). Linear regression models were used, adjusting for age, sex, race, BMI, Hba1C and triglyceride.

Results: Study participants (N = 1649) were predominantly ≥50 years old (82%), female (59%) and White (75%). About 61% (N = 1008) of patients used any anti-diabetic drugs, most of whom used Metformin alone or in combination (901/1008, 89%). Among patients who used lipid-lowering drugs (N = 750), the majority used statins (657/750, 88%). Overall, use of any anti-diabetic or any lipid-lowering drugs was inversely associated with all biomarkers and the associations were stronger among those using both types of drugs (Figure). Compared to patients who used neither drug, patients using both drugs had an average 0.34 (95% Confidence Interval [CI] = −0.47, −0.20) lower ELF, 0.53 (95%CI = −0.74, −0.32) lower FIB-4 and 0.27 (95%CI = −0.37, −0.18) lower APRI scores. Among patients of genetically inferred European ancestry (N = 742), the associations were stronger in those with high PRS (>median PRS; N = 364) than those with low PRS (≤median PRS; N = 378) for FIB-4 (interaction p = 0.01) or APRI (interaction p = 0.004). Use of both drugs was significantly associated with an average 0.50 lower FIB-4 (95%CI = −0.92, −0.07) in patients with high PRS while no such association in patients with low PRS. Similar patterns were seen for APRI. However, there was no statistically significant interaction for ELF.

Conclusion: Use of anti-diabetic and lipid-lowering drugs was inversely associated with biomarkers of liver fibrosis. Among patients of European ancestry, stronger associations were observed in those at high genetic risk of NASH development and progression. Prospective studies may provide further insights into potential benefits of these drugs.

OS-086 Stratification of liver fat content in non-alcoholic steatohepatitis patients with significant liver fibrosis using the MEFIB-Index and MRI-PDF and its association with hepatocellular carcinoma, decompensation, and mortality

Sung Won Lee1,2, Daniel Huang1,3, Veeral Ajmera1, Monica Tincopa1, Jaclyn Bergstrom1, Nabil Noureddin1, Maral Amangurbanova1, Harris Siddiqi1, Egbert Madamba2, Abdul Majzoub4, Tarek Nayfeh4, Nobuharu Tamaki5, Namiki Izumi5, Atsushi Nakajima6, Ramazan Idilman1, Mesut Gumsuoy7, Digdem Kuru Öz8, Ayse Erden9, Mazen Nourreddin10, Rohit Loomba1. University of California at San Diego, NAFLD Research Center, Division of Gastroenterology, San Diego, United States; 2College of Medicine, The Catholic University of Korea, Division of Gastroenterology and Hepatology, Seoul, Korea, Rep. of South; 3National University of Singapore, Department of Medicine, Yong Loo Lin School of Medicine, Singapore; 4Mayo Clinic, Evidence-Based Practice Center, United States; 5Musashino Red Cross Hospital, Department of Gastroenterology and Hepatology, Japan; 6Yokohama City University, Department of Gastroenterology and Hepatology, Japan; 7Ankara University School of Medicine, Department of Gastroenterology, Turkey; 8Ankara University School of Medicine, Department of Radiology, Turkey; 9Houston Liver Institute, United States

Email: roloomba@health.ucsd.edu

Background and aims: Progression of liver fibrosis in non-alcoholic steatohepatitis (NASH) patients often result in a decrease in hepatic fat to <5%. However, there are limited data on the differences in progression according to the liver fat content and fibrosis in NASH patients. Therefore, we aimed to compare the progression of patients...
stratified by liver fat content and fibrosis using the MEFIB-Index (magnetic resonance elastography [MRE] ≥3.3 Kpa + FIB-4 ≥1.6) and magnetic resonance imaging-derived proton density fat fraction (MRI-PDFF).

**Method:** A total of 456 patients from three countries with both MRE and MRI-PDFF at baseline were enrolled, and 294 patients with longitudinal follow-up were retrospectively analyzed. MEFIB-negative, MEFIB-positive + MRI-PDFF ≥5, and MEFIB-positive + MRI-PDFF <5 were defined as having no significant liver fibrosis, significant liver fibrosis with higher liver fat content (higher liver fat content group), and significant liver fibrosis with lower liver fat content (lower liver fat content group), respectively. Cox proportional hazards model was used to assess the factors associated with the composite primary outcome of hepatocellular carcinoma (HCC), decompensation, and mortality.

**Results:** In this meta-analysis of individual participants (IPDMA), the lower liver fat content group consisted of patients with older age, and higher proportion of diabetes and hypertension. Also, compared to the higher liver fat content group, the lower liver fat content group had lower alanine aminotransferase, albumin, platelet counts, and prolonged prothrombin time. The rates of decompensation, HCC, and death were highest in the lower liver fat content group with 1%, 1%, 2% occurrence in the no significant liver fibrosis group; 22%, 13%, 13% in the higher liver fat content group; 32%, 14%, 14% in the lower liver fat content group, respectively. In multivariate analysis, lower liver fat content in patients with significant liver fibrosis was associated [HR = 74.6 (95%CI: 7.2–768.4, p = 0.0003)] with the composite outcome of HCC, decompensation, and mortality.

**Conclusion:** The combination of MEFIB-Index and MRI-PDFF is a useful tool to stratify prognosis according to liver fat content and fibrosis in NASH patients. Lower liver fat content in NASH patients with significant fibrosis is associated with an increase in HCC, hepatic decompensation, and mortality.

**OS-087**

Digital pathology using stain-free imaging indices allows direct prediction of all-cause mortality, hepatic decompensation and hepatocellular carcinoma development in patients with non-alcoholic fatty liver disease

Timothy Kendall¹, Dean Tai², Gideon Ho², Yayun Ren², Elaine Chng², Jonathan Fallowfield¹. ¹University of Edinburgh, United Kingdom; ²HistoIndex Pte Ltd, Singapore

**Background and aims:** Digital quantification of scarring from either stained liver sections or stain-free imaging reduces observer-related variability in the histological assessment of non-alcoholic fatty liver disease (NAFLD). To date, computational methods have mainly provided ordinal scores analogous to those provided by a pathologist as disease outcomes are strongly correlated with stage. Direct prediction of outcomes from tissue, without using fibrosis stage as a surrogate, has not been possible due to the absence of suitable event-rich cohort data. Using SteatoSITE (https://steatosite.com/), a resource containing integrated clinical and pathological data, we undertook stain-free imaging to generate tools predictive of patient outcomes using architectural features unapparent to human observers.

**Method:** Unstained sections from a training set of 294 biopsies were imaged using second harmonic generation/two-photon excitation fluorescence microscopy. Using sequential feature selection, 10, 10 and 5 parameters were chosen out of 184 fibrosis parameters and a linear regression method was used to construct individual indices for risk of all-cause mortality, hepatic decompensation and hepatocellular carcinoma (HCC), respectively. Time-to-event analysis was performed using the Kaplan-Meier method, with death as a competing risk for decompensation and HCC, and distributions compared using the log-rank test (Fig. 1). A Cox proportional hazards model was used to estimate hazard ratios (HRs). The predictive power of the risk indices was compared with the assigned NASH-CRN fibrosis stage (F0/1/2 v F3/4) and the stain-free imaging derived qFibrosis stage (qF0/1/2 v qF3/4).

**Results:** The newly defined “Mortality Index” had greater predictive power for all-cause mortality (index >0.28 vs. ≤0.28, HR 5.33, 95% confidence intervals (CI) 3.00–9.47, p = 0.000) than either NASH-CRN or qFibrosis stage. The “ Decompensation Index” had greater predictive power for hepatic decompensation events (index >0.421 vs. ≤0.421, p = 0.0001).

**Conclusion:** The combination of MEFIB-Index and MRI-PDFF is a useful tool to stratify prognosis according to liver fat content and fibrosis in NASH patients. Lower liver fat content in NASH patients with significant fibrosis is associated with an increase in HCC, hepatic decompensation, and mortality.
0.421, HR 6.97, 95% CI 4.06–11.95, p = 0.000) than either NASH-CRN stage or qFibrosis stage. Finally, the “HCC Index” had greater predictive power for HCC development (index >0.048 vs. ≤0.048, HR 7.50, 95% CI 1.37–41.13, p = 0.020) than either NASH-CRN stage or qFibrosis stage.

Conclusion: Using liver biopsy material with linked long-term clinical outcome data, we developed tools that directly predict hard end points in patients with NAFLD and do not rely on ordinal fibrosis scores as a surrogate. These tools have greater predictive value than pathologist-assigned NASH-CRN fibrosis stage or computationally- assigned qFibrosis stage. These indices will be validated in an additional NAFLD cohort but may provide direct tissue-to-outcome predictions that aid clinical decision-making, offer more nuanced participant stratification and meaningful end points in clinical trials.

**OS-088**

**Effect of semaglutide 2.4 mg on alanine aminotransferase in adolescents with obesity: a post-hoc analysis of the STEP TEENS trial**

Daniel Weghuber1, Inge Gies2, Lise Lotte Gluud3, Aske Thorn Iversen4, Maximilian Jara5, Signe Schmidt6, Rasmus Sørg8, Martin Wabitsch2, Mazen Noureddin8,9.1. Department of Pediatrics, Paracelsus Medical University, Salzburg, Austria; 2. Department of Pediatrics, Division of Pediatric Endocrinology, Universitair Ziekenhuis Brussel, Brussels, Belgium; 3. Gastro Unit, Copenhagen University Hospital Hvidovre and Department of Clinical Medicine, University of Copenhagen, Copenhagen, Denmark; 4. Biostatistics, Novo Nordisk A/S, Søborg, Denmark; 5. Global Medical Affairs, Novo Nordisk A/S, Søborg, Denmark; 6. Medical and Science, Novo Nordisk A/S, Søborg, Denmark; 7. Division of Pediatric Endocrinology and Diabetes, Department of Pediatrics and Adolescent Medicine, Ulm University Medical Center, University of Ulm, Ulm, Germany; 8. Sherrie and Alan Conover Center for Liver Disease and Transplantation, Houston Methodist Hospital, Houston, TX, United States; 9. Houston Research Institute, Houston, TX, United States Email: NoureddinMD@houstonresearchinstitute.com

**Background and aims:** Increased body mass index (BMI) is associated with a greater incidence of non-alcoholic fatty liver disease (NAFLD) and its advanced forms, such as steatohepatitis. Weight loss can improve hepatic parameters, such as alanine aminotransferase (ALT), associated with a greater incidence of non-alcoholic fatty liver disease (NAFLD) and its advanced forms, such as steatohepatitis.

**Method:** Adolescents (aged 12 to <18 years) with obesity (BMI ≥ 85th percentile) were randomised 2:1 after a 12-week lifestyle intervention run-in phase (consisting of diet and physical activity counselling) to receive semaglutide 2.4 mg once weekly (or maximum tolerated dose) or placebo for 68 weeks, plus lifestyle intervention. Change in ALT from baseline to week 68 was a pre-specified secondary end point, assessed using a mixed model for repeated measurements using data from the on-treatment period for the trial product estimand (assessed the treatment effect if all participants remained on treatment without using rescue interventions).

**Results:** Overall, 201 participants were randomised. Mean parameters at baseline were: age 15.4 years, body weight 107.5 kg and BMI 37.0 kg/m². Participants were 62% female, 38% had elevated ALT (>25.8 U/L in males, >22.1 U/L in females) and 34% were presumed to have NAFLD (defined as BMI ≥ 85th percentile, fatty liver index ≥ 60 [a surrogate index of fatty liver based on BMI, waist circumference, triglycerides and gamma-glutamyl transferase] and elevated ALT). The geometric mean ALT level at baseline was 23 U/L vs 20 U/L in the semaglutide vs placebo groups, respectively. The change from baseline in ALT with semaglutide was significantly greater vs placebo (–18.1% vs –11%; estimated treatment difference [95% confidence interval] –17.2%–points [–28.8, –3.6]; p = 0.015). At week 68, mean ALT levels decreased from baseline levels in participants treated with semaglutide who achieved a weight loss of ≥10%, but not in those with <10% weight loss (Table). Estimated ALT changes in participants with presumed NAFLD were –15.5% vs 10.6% with semaglutide vs placebo, respectively (estimated treatment difference –23.7% (Table). Of participants with elevated baseline ALT levels, 53.8% vs 33.3% had normal levels at week 68 with semaglutide vs placebo, respectively. Participants reporting hepatic-related adverse events (mostly non-serious) were higher in the semaglutide 2.4 mg group (7.5%) than with placebo (1.5%). The imbalance was mainly driven by events reported at the day of randomisation (without exposure to semaglutide) and events in subjects with pre-existing hepatic disorders.

**Table Change in ALT parameters**

<table>
<thead>
<tr>
<th>Endpoints</th>
<th>Semaglutide 2.4 mg</th>
<th>Placebo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geometric mean ALT level at week 0, U/L (CV)</td>
<td>n = 56</td>
<td>n = 20</td>
</tr>
<tr>
<td>Mean change from baseline at week 68, %</td>
<td>–20.1</td>
<td>–20.5 (–38.5, 2.8)</td>
</tr>
<tr>
<td>Treatment difference, % points (95% CI)</td>
<td>0.50</td>
<td></td>
</tr>
</tbody>
</table>

**Participants with presumed NAFLD**

<table>
<thead>
<tr>
<th>ALT ratio to baseline at week 68 by % body weight loss, geometric mean (CV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 10% weight loss</td>
</tr>
<tr>
<td>1.00 (56.6)</td>
</tr>
<tr>
<td>≥ 10% weight loss</td>
</tr>
<tr>
<td>0.67 (65.3)</td>
</tr>
<tr>
<td>≥ 20% weight loss</td>
</tr>
<tr>
<td>0.62 (67.1)</td>
</tr>
</tbody>
</table>

**ALT levels by % body weight loss, geometric mean, U/L (CV)**

<table>
<thead>
<tr>
<th>Weight loss at week 68</th>
<th>Semaglutide</th>
<th>Placebo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>n = 53</td>
<td>n = 29</td>
</tr>
<tr>
<td>10% weight loss</td>
<td>24.7 (72.1)</td>
<td>27.4 (72.6)</td>
</tr>
<tr>
<td>≥ 10% weight loss</td>
<td>n = 81</td>
<td>n = 72</td>
</tr>
<tr>
<td>22.6 (78.3)</td>
<td>15.9 (49.9)</td>
<td>15.0 (49.5)</td>
</tr>
</tbody>
</table>
OS-089
Non-alcoholic steatohepatitis disease progression in participants from the United States TARGET-NASH real world longitudinal observational study
Claudio Sartini1, Bryan Rudolph1, Mandy Frassdorf2, Heather Morris3, Derek Gazis3, Andrea Mospan2, Michael Fried3, Michael Roden4, Brent Tetri1, Kenneth Cusi6, Philip N Newsome2,7.
1Boehringer Ingelheim, United States; 2Boehringer Ingelheim, Germany; 3Target RWE, United States; 4German Diabetes Center, Germany; 5St. Louis University, United States; 6University of Florida, United States; 7University of Birmingham, United Kingdom
Email: hmorris@targetrwe.com

Background and aims: Estimating progression rate is essential for understanding the comprehensive burden of disease and informing future clinical trial designs. The aim of this study was to describe demographic and clinical characteristics in a large multi-centre cohort of NASH participants followed in routine clinical practice and determine the occurrence of health outcomes.

Method: Adults from the US TARGET-NASH longitudinal observational study were followed from August 2016–October 2021. Participants had a biopsy or clinical NASH diagnosis with significant fibrosis (stage F2/F3/F4). Demographic and clinical characteristics were analyzed in 4 groups: non-cirrhotic NASH F2–F3, compensated cirrhosis (cF4), compensated advanced chronic liver disease (cACLD-no signs of decompensation and ≥ 1 of the following: FibroScan liver stiffness > 20 kPa, NASH F3/F4 on biopsy, gastric/esophageal varices on endoscopy, or cirrhosis and findings of portal hypertension noted on imaging) and decompensated cirrhosis (dF4).

Progression outcomes included all-cause mortality, progression from non-cirrhosis to cirrhosis, compensated to decompensated cirrhosis, and liver-related and cardiovascular events. Incidence rates and incidence proportion for all outcomes were estimated in each group.

Results: Of the 1,852 participants, median age was 59 years, BMI was 34.1 kg/m2, mostly female (59%), and non-Hispanic white (77%). 699 (38%) were classified as F2–F3, 1153 (62%) as F4 (795 cF4, 358 dF4). Among the 1,494 (81%) with no signs of decompensation, 428 (29%) were classified as F2–F3, 1153 (62%) as F4 (795 cF4, 358 dF4).

Estimating progression rate is essential for understanding the comprehensive burden of disease and informing future clinical trial designs. This is a large US multi-center study using real-world data to examine NASH disease progression longitudinally. Although rates of progression to cirrhosis were similar compared to previous studies, substantially lower mortality incidence rates were found for participants in dF3/4 subgroups. The real world evidence from our study inform the natural history of NASH and can provide additional rationale and justification in clinical trials design, including enrollment criteria, duration of the trials, and the choice of end points.

Conclusion: This is a large US multi-center study using real-world data to examine NASH disease progression longitudinally. Although rates of progression to cirrhosis were similar compared to previous studies, substantially lower mortality incidence rates were found for participants in dF3/4 subgroups. The real world evidence from our study inform the natural history of NASH and can provide additional rationale and justification in clinical trials design, including enrollment criteria, duration of the trials, and the choice of end points.

OS-090-VI
Estimating the residual risk of hepatitis B mother-to-child transmission in The Gambia, 30 years after HBV vaccine implementation
Gibril Ndow1, Rohey Bangura1, Erwan Vo Quang1, Fatoumatta Touray1, Abdoullie Jatta1, Jainaba Barry1, Sulayman Bah1, Fatou Bintou Nyyassi1, Queen Bola-Lawal1, Alhagie Touray1, Sainabou Drammeh2, Hawa Cham1, Gavin Cloherty2, Gora Lo2, Camourea Toure-Kane3, Lamin Bojang4,5, Yusuke Shimakawa6, Umberto D’Alessandro4, Maud Lemoine1.
1MRC Unit The Gambia at LSHTM, Hepatitis Group, 2Public Health - Viral Hepatitis, 3Target RWE, United States; 4German Diabetes Center, Germany; 5St. Louis University, United States; 6Imperial College London, Metabolism, Digestion and Reproduction, London, United Kingdom
Email: gndow@mrc.gm

Background and aims: Mother-to-child transmission (MTCT) of hepatitis B virus (HBV) has been a neglected public health issue in Africa with poorly documented rates of transmission. In The Gambia, the first country to have adopted hepatitis B birth dose (HepB-BD) vaccine, HBV antenatal screening and peripartum antiviral prophylaxis are not national recommendations like in many other African countries. We aimed to implement routine hepatitis B surface antigen (HBsAg) screening into antenatal care and assessed the rate of HBV MTCT among babies born to HBsAg positive women.

Method: All pregnant women attending major antenatal clinics in urban and rural Gambia were invited for HBsAg testing using a rapid diagnostic test (Abbott, USA). HBV DNA viral load (GeneXpert) and hepatitis B e antigen (HBeAg) serology (Biopanda) were assessed in HBsAg positive mothers. The rate of HBV MTCT was defined as the proportion of babies born to HBV-infected women who tested positive for HBsAg at 6 months age.

Results: Between 2020 and 2022, 9,694 pregnant women were invited for HBsAg screening; 9,692 (99.9%) accepted antenatal testing. After excluding 11 women with missing HBsAg results, 435/9,681 (4.5%) women were HBsAg positive (Figure 1). Compared to HBsAg negative women (median age 26 years (IQR 22–31), HBsAg positive women were significantly older (median age 30 (IQR 25–35), p < 0.001), 20 of 304 women (6.6%) had HBV DNA >200,000IU/ml and 14/218 (6.4%) were HBeAg positive. Women with HBV DNA viral load >200,000IU/ml were younger (median age 25 years (IQR 20–27) vs 30 years (IQR 25–35), p < 0.001) and more likely to be HBeAg positive (83.3% vs 11.1%, p < 0.001). Of the 435 HBsAg-positive pregnant women, 10 had stillbirths, 3 had abortion, 1 died and 78 were lost to follow-up. 343 women had live births with total of 351 babies, of whom 189 were successfully reassessed at age 6–9 months (figure 1). Only 67/179 (37.4%) HBV exposed babies received a timely HepB-BD vaccine. Among babies with delayed HepB-BD vaccine, 33 (18.4%), 51 (28.5%), 18 (10.1%) and 10 (5.6%) received first hepatitis B vaccine with 2–7 days, 8–28 days, 29–60 days and >60 days respectively. Among 189 exposed babies, 4 were HBsAg positive giving a rate of HBV MTCT at 2.1% (CI 0.8–5.3). Among 7 babies born to women with HBV DNA...
Determination of health variables were used. The model included clinical (diagnoses, treatments, procedures), demographic, and social factors (EHR); the cohort for model development included 295,512 patients. The model was optimized to reduce false positive cases and thus minimize pop-up alert fatigue. Model performance was evaluated in a health system that would integrate the algorithm into their clinical workflow to assess improvement in the screening to diagnosis ratio (SDR) and user adoption. Validation of the algorithm using real-world data showed an improvement (SDR = 5:1) can be achieved.

**Finding undiagnosed Hepatitis C cases: using machine learning to improve the screening-to-diagnosis ratio and improve efficiency**

Linda Chen1,2,3, John Wolf1, Bruce Kreter1, Pranava Goundan4, Qin Ye4, Ravi Ippili4, Abhinav Bansal4, Shubhankar Thakar4, Marta Lotto1, Fabrice Carrat6,7, Marc Bourliere1,8, Vincent Di Beo1, Lucia Parlati5, Fabienne Marcellin1, Celine Dorival6, Marta Lotto1, Fabrice Carrat6,7, Marc Bourliere1,8, Maria Patrizia Carri1 et al.

**Background and aims: Undiagnosed Hepatitis C Virus (HCV) is a major public health concern in the US as an estimated 45% of patients are unaware of their HCV status. The World Health Organization (WHO) and US Department of Health and Human Services (HHS) aim to eliminate viral hepatitis by 2030 by increasing screening, diagnosis, and treatment with direct acting antivirals. Gilead’s FIND-C program enables health systems to improve the screening-to-diagnosis ratio and link patients to care.**

**Method:** This study involved development of an ML algorithm using a large-scale US dataset consisting of deidentified electronic health records (EHR); the cohort for model development included 295,512 patients (HCV-positive: 50,726; HCV-negative: 245,236). A total of 32 clinical variables (diagnoses, treatments, procedures) were included. The model was optimized to reduce false positive cases and thus minimize pop-up alert fatigue. Model performance was evaluated in a health system having viral infectious disease as a core focus and sufficient digital capabilities for model integration. The test dataset contained 26,154 patients (HCV-positive: 4,848; HCV-negative: 21,306). A digital application was developed, including model output screens for the end users to track engagement and model adoption rate.

**Results:** Performance of the model algorithm trained on EHR data was: AUROC: 95%, Precision: 93%, Recall: 50%. Using health system test data, we found AUROC: 86%, Precision: 91%, Recall: 30%. Presently 20 HCV screenings result in 1 HCV diagnosis (SDR = 20:1) at this health system; using the algorithm-based model, a four-fold improvement (SDR = 5:1) can be achieved.

**Conclusion:** This HCV patient identification solution was developed within the framework of Good Machine Learning Practices advocated by global regulators. Effective implementation of this model can provide a resource-efficient, expedited identification of undiagnosed HCV patients, thereby serving as a catalyst for universal screening guidelines and a scalable solution for achievement of global elimination goals.

**OS-092-VI**

**Development of a behaviour-based score predicting hepatocellular carcinoma among patients with chronic hepatitis B virus infection in France (ANRS CO22 HEPATHER)**

Clémence Ramier1, Camelia Protopopescu1, Massimo Leverero2,3,4, Vincent Di Beo1, Lucia Parlati5, Fabienne Marcellin1, Celine Dorival6, Marta Lotto1, Fabrice Carrat6,7, Marc Bourliere1,8, Maria Patrizia Carri1 et al.

**Background and aims:** Chronic hepatitis B (HBV) is a major public health concern in the US as an estimated 45% of patients are unaware of their HBV status. The World Health Organization (WHO) and US Department of Health and Human Services (HHS) aim to eliminate viral hepatitis by 2030 by increasing screening, diagnosis, and treatment with direct acting antivirals. Gilead’s FIND-C program enables health systems to improve the screening-to-diagnosis ratio and link patients to care.

**Method:** This study involved development of an ML algorithm using a large-scale US dataset consisting of deidentified electronic health records (EHR); the cohort for model development included 295,512 patients (HCV-positive: 50,726; HCV-negative: 245,236). A total of 32 clinical variables (diagnoses, treatments, procedures, demographic, and social determinants of health variables were included. The model was optimized to reduce false positive cases and thus minimize pop-up alert fatigue. Model performance was evaluated in a health system having viral infectious disease as a core focus and sufficient digital capabilities for model integration. The test dataset contained 26,154 patients (HCV-positive: 4,848; HCV-negative: 21,306). A digital application was developed, including model output screens for the end users to track engagement and model adoption rate.

**Results:** Performance of the model algorithm trained on EHR data was: AUROC: 95%, Precision: 93%, Recall: 50%. Using health system test data, we found AUROC: 86%, Precision: 91%, Recall: 30%. Presently 20 HCV screenings result in 1 HCV diagnosis (SDR = 20:1) at this health system; using the algorithm-based model, a four-fold improvement (SDR = 5:1) can be achieved.

**Conclusion:** This HCV patient identification solution was developed within the framework of Good Machine Learning Practices advocated by global regulators. Effective implementation of this model can provide a resource-efficient, expedited identification of undiagnosed HCV patients, thereby serving as a catalyst for universal screening guidelines and a scalable solution for achievement of global elimination goals.
increase in age, then rounded. A prediction score for HCC was calculated as the sum of these points. The optimal cut-off predicting the risk of HCC was computed using Youden index on 1000 bootstrap samples. The score’s predictive performance was rated on the testing set and compared to other published scores using the area under the receiver operating characteristic curve (AUROC).

**Results:** The study population (N = 4,370) was 63% male, 65% were aged <50 years and 3.6% were infected with hepatitis Delta virus (HDV). During the 8-year follow-up (25,900 person-years), 55 patients (1.3%) developed a HCC. In the multivariable model, age, unhealthy alcohol use (≥2 and ≥3 standard units/day for women and men, respectively), tobacco smoking, HDV infection, low platelet count and receiving HBV treatment were associated with increased HCC risk. The ADAPTT score (Age, Delta, Alcohol, Platelet, Tobacco, Treatment) (Table 1) ranged from 0 to 16, a score ≥6 indicating a high risk of HCC. Comparisons with existing scores suggested higher performance for ADAPTT score (AUROC = 0.848) than for PAGE-B (AUROC = 0.783), REAL-B (AUROC = 0.787) and THRI (AUROC = 0.776) scores.

**Conclusion:** Based on easy-to-collect behavioural data and routine medical data, the ADAPTT score shows higher performance than existing scores for predicting HCC in patients with chronic HBV infection. Though further validation on other datasets is needed, this score, implementable in all settings, including primary care and decentralized areas, can facilitate follow-up of at-risk patients.

<table>
<thead>
<tr>
<th>Stroke types</th>
<th>Number of events</th>
<th>Risk of strokea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intracerebral haemorrhage</td>
<td>10,992</td>
<td>1.29 (1.16–1.44)</td>
</tr>
<tr>
<td>Ischaemic stroke</td>
<td>48,817</td>
<td>0.97 (0.91–1.03)</td>
</tr>
<tr>
<td>Subarachnoid haemorrhage</td>
<td>973</td>
<td>0.87 (0.57–1.33)</td>
</tr>
<tr>
<td>Other or unspecified stroke</td>
<td>2,964</td>
<td>1.12 (0.89–1.42)</td>
</tr>
<tr>
<td>Total stroke</td>
<td>57,691</td>
<td>1.02 (0.97–1.07)</td>
</tr>
</tbody>
</table>

aStratified by (5-year categories), sex, study site (10 sites) and adjusted for education (3 levels), smoking, alcohol, physical activity, regular fruit, meat or dairy intake, BMI, systolic blood pressure, prevalent diabetes and cancer.

**OS-094**

The first mass reactive vaccination campaign against hepatitis E in Bentiu, South Sudan: feasibility, vaccination coverage and two-dose vaccine effectiveness

Robin Nesbitt1, Vincent Kinya Asilaza2, Priscillah Gitahi2, Patrick Nkemenang2, Melat Haile3, Jetske Duncker3, Etienne Gignoux1, Manuel Albelá3, Primate Gakima3, Joseph Wamala4, Zelie Antier2, Kediende Chong5, Monica Rull3, Andrew Azman3, 4Iza Ciglenecki3, John Rumunu5, Epicentre, Paris, France; 5Medecins sans Frontieres, South Sudan; 6Doctors Without Borders, Geneva, Switzerland; 7World Health Organisation, South Sudan; 8Ministry of Health, South Sudan; 9Johns Hopkins University, Baltimore, United States

**Background and aims:** Hepatitis E (HEV) is likely the most common cause of acute viral hepatitis and jaundice worldwide, with case fatality risks of 10–25% among pregnant women. A three-dose recombinant vaccine (Hecolin®) against hepatitis E has been licensed in China since 2011 but never used for outbreak response despite a 2015 WHO recommendation. Bentiu camp in South Sudan hosts over 100,000 people displaced from conflict and flooding. Cases of hepatitis E have been reported in Bentiu since 2015. In response to an increase in cases in 2021, the MoH and MSF implemented the first...
mass reactive vaccination campaign against hepatitis E using the Hecolin® vaccine. We aimed to evaluate the feasibility, including vaccination coverage and vaccine effectiveness.

**Method:** Three vaccination rounds took place in March, April and October targeting 26,686 individuals aged 16–40 years, including pregnant women. A vaccination coverage survey was conducted using simple random sampling following the third round of vaccination. All suspected HEV cases presenting to the MSF Hospital who provided consent were enrolled in the study comprising a questionnaire, laboratory examinations and a follow-up visit after 2–4 weeks. Vaccine-eligible suspect cases were matched to community controls. We estimated two-dose VE against probable (anti-HEV IgM positive with elevated ALT, or a four-fold rise in IgG in paired samples) and confirmed (HEV RNA positive) hepatitis E using conditional logistic regression models.

**Results:** Using a combination of fixed and mobile sites, the vaccination campaign reached 91%, 95% and 113% of the target population in each round respectively. According to the survey, population coverage with one dose was 86%, 73% for two doses and 58% for the full three-dose schedule. Vaccination coverage did not differ substantially by sex, or pregnancy status among women. The most common reason for non-vaccination was temporary absence, reported by 60% of unvaccinated people. In parallel, 359 vaccine-eligible suspect hepatitis E cases were enrolled in the case-control study between 21 March and December 30, 2022, including 5 probable and 28 confirmed cases. Preliminary estimates suggest two-dose effectiveness comparable with three-dose efficacy estimated in clinical trials. Laboratory confirmation of hepatitis E infection and finalisation of VE estimates is ongoing.

**Conclusion:** The deployment of Hecolin® in a humanitarian emergency setting achieved high coverage of at least one dose. Preliminary VE estimates suggest strong short-term two-dose protection. These results could allow for broader use of the vaccine in the fight against hepatitis E epidemics.

---

**Senescence, circadian rhythm and sexual dimorphism**

**OS-095-VI**

Hepatocyte senescence is linked with extrahepatic organ injury, failure of regeneration and mortality in patients with acute indeterminate hepatitis

Mohsin Hassan1, Su Lin2, Pavitra Kumar1, Fausto Andreola2, Adrien Guillot2, Andrew Hall2, Frank Tacke3, Alberto Quaglia2, Thomas Bird2, Rajiv Jalan2, Cornelius Engelmann1,2,4, ‘Charité Campus Virchow Clinic, Department of Hepatology and Gastroenterology, Berlin, Germany; 2University College London; 3 Institute for Liver and Digestive Health, University College London, London, United Kingdom; 4University of Edinburgh, Beatson Institute, Glasgow, United Kingdom; 5Berlin Institute of Health, Berlin, Germany

Email: cornelius.engelmann@charite.de

**Background and aims:** Acute liver failure due to severe acute indeterminate hepatitis (sIAH) is a devastating illness that occurs in patients without underlying liver disease, while some patients respond to treatment and recover spontaneously, 60% of patients require liver transplantation to survive. Hepatic inflammation promotes senescence, which is known to inhibit liver regeneration. The aim of the current study was to investigate the effects of hepatocyte senescence and its clinical correlation with survival and extrahepatic organ injury in patients with sIAH.

**Method:** This study included 34 consecutive patients with acute indeterminate hepatitis admitted to a single hospital and undergoing transjugular liver biopsy or liver transplantation. Sequential cycles of multiplex immunofluorescence staining with 21 different antibodies were performed (n = 17/group) and analysed with Zen v3.4, FIJI v5.6.
OS-096-YI
DNA damage induced-senescence shifts the cellular bioenergetics capacity from glycolysis to oxidative phosphorylation in mouse hepatocytes
Pavitra Kumar1, Mohsin Hassan1, Frank Tacke1, Cornelius Engelmann2–3,1
Charité Universitätsmedizin Berlin, Department of Hepatology and Gastroenterology, Berlin, Germany;2 Berlin Institute of Health (BIH), Berlin, Germany;3 University College London, Institute for Liver and Digestive Health, London, United Kingdom
Email: cornelius.engelmann@charite.de

Background and aims: Cellular senescence is a state in which cells become resistant to growth-promoting stimuli and apoptosis, resulting in permanent cessation of cellular proliferation. This leads to a prolonged ‘zombie-like’ state, which can have detrimental effects on tissues relying on their regenerative capacity for homeostasis, such as the liver. Cells undergo a drastic metabolic shift as they adapt to senescent phenotype, potentially affecting the function of the liver. Therefore, in the present study, we aim to characterize, specifically, the link between DNA-damage-induced senescence and metabolic capacity in primary hepatocytes and hepatocyte-derived liver organoids.

Method: Primary hepatocytes, isolated by collagenase-perfused mouse liver (C57B6/J; 18–23 weeks), were cultured overnight in William’s E-medium (+2% FBS, L-glutamine, and hepatocyte growth supplements). Hepatocyte-derived organoids were developed in a 3D matrix for two weeks. Cells or organoids were treated with the DNA damage inducers, cisplatin (DNA cross-linker and alkylating agent), BIBR-1532 (telomerase inhibitor), and 5-azacytidine (DNA-methyl transferase inhibitor) for 24 hours. Senescence was assessed by SA-β-galactosidase activity.

Results: We demonstrate for the first time that the interplay of hepatic inflammation, senescence, and failed regeneration increases the risk of death in patients with sIAH and that the interplay of hepatic inflammation, senescence, and failed regeneration increases the risk of death in patients with sIAH.

Conclusion: In the present study, we demonstrate for the first time that the interplay of hepatic inflammation, senescence, and failed regeneration increases the risk of death in patients with sIAH and that the interplay of hepatic inflammation, senescence, and failed regeneration increases the risk of death in patients with sIAH.

OS-097
CLOCK19 circadian disruption primes myofibroblasts for accelerated activation and fibrotic progression
Elliot Jokl1, Jessica Llewellyn2, Kara Simpson2, Oluwatobi Adegbeye1, James Pritchett2, Leo Zeef1, Qing-Jun Meng1, Karen Piper Hanley1, Elliott Jokl1, Jessica Llewellyn2, Kara Simpson2, Oluwatobi Adegbeye1, James Pritchett2, Leo Zeef1, Qing-Jun Meng1, Karen Piper Hanley1, 1University of Manchester, United Kingdom; 2Perelman School of Medicine at the University of Pennsylvania, Philadelphia, United States; 3Manchester Metropolitan University, United Kingdom
Email: elliot.jokl@manchester.ac.uk

Background and aims: Non-Alcoholic Fatty Liver Disease (NAFLD) is an increasing health burden with an estimated incidence of around 25%. Progressive disease is associated with fibrosis, characterised by...
Deposition of extracellular matrix (ECM) proteins by hepatic stellate cells (HSCs). Circadian rhythm governs many aspects of liver physiology and its disruption exacerbates chronic disease. However, the impact of disrupted circadian rhythm in pro-fibrotic HSCs remains to be investigated. In this study we investigate whether genetic disruption of circadian homeostasis predisposes HSCs to instigate fibrotic changes in the liver.

**Method:** Circadian rhythm was disrupted in vitro and in vivo using CLOCK mutant mice (CLOCKΔ19). HSC characteristics were investigated by western blot and genomic analysis. In vivo CLOCKΔ19 livers were assessed at basal state and during CCl₄ induced fibrosis. HSC CLOCKΔ19 genomic data was integrated with ATAC-seq from WT HSCs to generate a putative CLOCK regulome.

**Results:** Livers from CLOCKΔ19 mutant mice showed a higher baseline collagen (COL1) deposition and significantly worse fibrotic injury after CCl₄-induced fibrosis. Mutant livers had significantly increased scar formation (~40%), accumulation of myofibroblasts (~50%) and increased serum liver enzymes compared to control animals. HSCs isolated from PER2:LLuc mice (displaying critical circadian rhythm measured by luciferase activity of the Per2 gene) were shown to display an intrinsic circadian rhythm. To investigate the role of circadian rhythm in HSCs further, genomic analysis demonstrated quiescent HSCs from CLOCKΔ19 mice had higher expression of RhoGDI pathway components, a suppression of genes associated with lipid metabolism, and had accelerated in vitro activation of pro-fibrotic genes on plastic. Through data integration, we discovered chromatin regions (through ATAC-seq peaks) containing CLOCK binding motifs were differentially accessible during HSC activation. Our data suggested CLOCK may act in qHSCs to suppress profibrotic genes involved in focal adhesions and promote the expression of genes involved in lipid metabolism associated with quiescence.

**Conclusion:** Taken together, our data suggests disrupted circadian rhythm primes HSCs to a profibrotic state associated with dysregulated metabolic and mechanotransduction genes. This promotes an enhanced response to fibrotic-insult, driving more rapid progression of disease. Genes involved in the CLOCK regulome that underlie the HSC primed state include several secreted ECM candidates as urgently needed biomarkers of disease progression in NAFLD.

**OS-098**

**Perturbation of rhythmicity of the circadian clock-oscillator in hepatic stellate cells is associated with liver fibrosis**

Emilie Crouchet¹, Mayssa Dachraoui¹, Frank Jühling¹, Marine Oudot¹, Clara Ponsolles¹, Laura Heydmann¹, Cloé Gadenne¹, Julien Moehlin¹, Natascha Roehlen¹, Romain Martin¹, Nicolas Brignon¹, Laurent Mailly¹, Yuji Teraoka², Hiroshi Aikata², Michio Imamura², Hiromi Abe-Chayama², Kazuaki Chayama², Fabio Del Zompo¹, Antonio Saviano¹, Sarah Durand¹, Catherine Schuster¹, Patrick Pessaux¹, Joachim Lupberger¹, Atish Mukherji¹, Thomas Baumert¹. ¹Université de Strasbourg, Inserm, Institut de
Background and aims: Hepatic fibrosis is the major factor driving hepatocellular carcinoma, a leading cause of cancer death worldwide. Liver fibrosis is characterized by overproduction of collagen from hepatic stellate cells (HSCs)/myofibroblasts, and subsequent remodeling of tissue architecture with organ failure. Approved anti-fibrotic therapies are absent and most compounds in clinical development have limited anti-fibrotic efficacy. The circadian clock (CC) is a major regulator of hepatocytic metabolism, but its role in the HSC in health and disease is unknown.

Method: We enriched HSCs from mouse livers in a circadian cycle using iodixanol gradient on non-parenchymal cell fraction and depletion of macrophages and dendritic cells, and confirmation through FACS. We then performed RNA-sequencing to establish the molecular relationship between the CC-oscillator and HSC function under physiological and fibrotic conditions. Results were validated by genetic perturbation of the CC-oscillator in human hepatic stellate cells to reveal its role in liver fibrosis and functional studies were conducted using small molecules targeting CC components.

Results: We demonstrate that mouse HSC contain a functional canonical CC-oscillator driving rhythmic gene expression. Mouse HSCs express ~2000 genes in a circadian rhythmic manner involved in several disease-relevant pathways, including TGFβ signaling and inflammation. Our analyses of recently published in vivo single-cell RNA-sequencing data confirmed the expression of CC-genes e.g., Rev-Erbα and Per1 in mouse HSC. Remarkably, under metabolic conditions inducing the pathological features of NASH and fibrosis (choline-deficient high fat diet), the rhythmicity of CC-oscillator in the enriched HSCs/non-parenchymal cells was disrupted, correlating with a dysregulation of fibrosis-relevant pathways, i.e., TGFβ and inflammation. Importantly, genetic use of CRISPR-Cas9 KO and pharmacological perturbation of CC-components in HSCs markedly inhibited fibrotic gene expression.

Conclusion: We discovered that HSC have a functional clock and that they express numerous genes in a circadian-gated manner. Moreover, the CC-oscillator function in HSC is perturbed during liver fibrosis associating with increased TGF-β and inflammatory signaling. These data suggest that perturbation of the CC oscillator in HSC/myofibroblasts contributes to fibrosis progression in patients and may provide a novel target for therapeutic intervention.

OS-099

Gender differences in repair mechanisms of chronic cholangiopathies with progressive fibrosis

Massimiliano Cadamuro1,2, Labjona Haxhiaj3, Chiara Montanaro3, Erica Villa3, Annarosa Floreni2, Nora Cazzagon3, Giovannella Baggio2, Mario Strazzabosco2, Paolo Simioni1,2,7, Luca Fabris1,6,8, Padua University-Hospital, General Internal Medicine Unit, Italy; 1University of Padua, Department of Medicine (DIMED), Italy; 2University of Padua, Italy; 3University of Modena and Reggio Emilia, Gastroenterology, Italy; 4University of Padua, DISCOG, Italy; 5Yale University, Digestive Disease Section, Liver Center, United States; 6University of Padua, Thrombotic and Haemorrhagic Disease Unit and Haemophilia Center, Department of Medicine (DIMED), Italy; 7University of Padua, Department of Molecular Medicine (DMM), Italy

Email: massimiliano.cadamuro@unipd.it

Background and aims: In chronic liver disease pathophysiology, gender dimorphism is much less characterized compared with degenerative disorders affecting other organs. Repair mechanisms are instrumental to direct fibrogenesis and progression of chronic inflammatory conditions. Therefore, we investigated the gender-specific differences in tissue repair culminating in liver fibrogenesis and sustained by activation of hepatic progenitor cells (HPC) and ductular ductular reaction (DR) in two models of diseases of the biliary epithelium (cholangiopathies) featuring progressive fibrosis. We considered the Pkhdl−/− mice and the Mdr2−/− mouse models, orthologous of the human congenital hepatic fibrosis/Caroli's disease (CHF/CD) and primary sclerosing cholangitis (PSC), respectively, and in sections of human PSC and CHF/CD.

Method: Serial sections of liver tissue specimens of PSC (n = 9 M/n = 5 F) and CHF/CD (n = 3 M/n = 1 F), along with Pkhdl−/− (n = 11 M/n = 23 F), and Mdr2−/− mice (n = 5 M/n = 3 F), were stained with Sirius Red (histological staining) and with immunohistochemistry for myofibroblasts (α-SMA), macrophages (CD68, human samples only), and RDC/DR (K19). Extent of DR, fibrosis, and number of HPC were evaluated with computer-assisted morphometry.

Results: In both mouse models and human diseases, fibrosis resulted higher in M compared with F, without significant differences in myofibroblast accumulation and HPC activation. In both Mdr2−/− mice and PSC patients, extension of DR was more prominent in M than F, whereas in Pkhdl−/− mice, dysgenetic biliary lesions were greater in F than in M. In addition, in PSC samples, the number of CD68+ macrophages was higher in M as respect to F. Similar trends were also found in human CHF/CD samples.

Conclusion: This study shows gender-specific differences in tissue repair mechanisms of the biliary epithelium in both mouse models and human samples of PSC and CHF/CD. In particular, we found more severe fibrogenesis associated with more intense inflammatory infiltrate dominated by macrophages in males compared to females, thereby providing mechanistic evidence of the more severe clinical course of chronic liver diseases affecting men as reported in viral and metabolic etiologies.

SATURDAY 24 JUNE

Cirrhosis and its complications: Portal Hypertension

OS-100-VI

Hemodynamic response determines further decomposition and survival in patients with decompensated cirrhosis

Claudia Pujol1,2, Marta García Guix1,2, Anna Brujats1,2, Edilmar Álvarado-Tapias1,2,3, Anna Huerta1,2, Berta Cuyas1,2, Maria Poca1,2,3, Xavier Torres1,2, Ángels Escorsell1,2,3, Cándid Villanueva1,2,3, Hospital Santa Creu i Sant Pau, Department of Gastroenterology, Barcelona, Spain; 4Institut de Recerca Sant Pau-Universitat Autònoma de Barcelona, Barcelona, Spain; 5Centro de Investigación Biomédica en Red de Enfermedades Hepáticas y Digestivas (CIBERehd), Instituto de Salud Carlos III, Madrid, Spain

Email: cpujol@santpau.cat

Background and aims: Different stages can be identified in decompensated cirrhosis, such as bleeding alone or with other concomitant decomposition, and ascites without bleeding. The development of further decomposition determines prognosis in each of these stages. This study investigates the influence of hemodynamic response to β-blockers on the risk of further decomposition and survival in each stage of decompenated cirrhosis.

Method: Patients admitted due to variceal bleeding (VB) were consecutively included, differentiating those who only had VB (VB Alone) from those with concomitant ascites (As) (with or without encephalopathy) (VBPlus). Patients with ascites and varices without previous bleeding (As Alone) referred during the study period for primary prophylaxis, were also investigated. An
hemodynamic study was performed before starting therapy with β-blockers and was repeated after 1–2 months to assess the response. The risk of outcomes was estimated in a competing risks (CR) framework considering death and liver transplant as competing events.

**Results:** 476 patients with decompensated cirrhosis were included, 103 with VBAlone, 186 with VBPlus and, 187 with AsAlone. During a mean follow-up of 32 months (IQR 12–58), the risk of death and of further decompensation, were higher in AsAlone group than in VBAlone group and higher in VBPlus than in the other two groups. Survival probability was significantly worse in patients with further decompensation than in those without, in each of the 3 substages (<70% at 3rd-year), and was lower in patients with VBPlus (37% at 3rd-year) than in the other groups. Among patients without further decompensation, survival probability was similar in the 3 substages (≥83% at 3rd-year). HVPG-decrease was an independent predictor of further decompen-sation and death. An HVPG-decrease ≥10% from baseline (defining HDK-response) was achieved in 43% of patients. Overall, patients with HDK-response vs those without, had lower risk of further decompen-sation (SHR = 0.31, 95%CI = 0.24–0.39), and lower risk of death (SHR = 0.23, 95%CI = 0.17–0.32). Similar results favoring HDK-responders were observed in each substage separately.

**Conclusion:** At each decapsulation of cirrhosis (bleeding, ascites or both), the risk of death is higher in patients developing further decompen-sation. With each decompen-sation, those patients achieving an HVPG-decrease ≥10% have lower risk of further decompen-sation and better survival. Our results suggest that therapies effectively decreasing HVPG (such TIPS) may be valuable in decompensated patients without HDK-response to β-blockers.

**OS-101-YI**

**Comparison of 1-day vs 3-days intravenous terlipressin in cirrhosis patients with acute variceal bleeding: open-label randomized control trial**

Manas Vaishnav1, Sagnik Biswas1, Shekhar Swaroop1, Arnav Aggarwal1, Abhinav Anand1, Piyush Pathak1, Shalimar1.

**Background and aims:** In patients with acute variceal bleeding (AVB), the optimal duration of vasoconstrictor therapy after endoscopic therapy with band ligation is unclear. Expert guidelines recommend vasoconstrictor therapy for 1-day to 5-days. We aimed to compare the efficacy of 1-day terlipressin therapy vs 3-days of terlipressin in cirrhosis patients with AVB post-endoscopic intervention. We also measured HVPG on day 1 and day 3 in both groups. The primary objective was to compare the rebleeding rates at 5-days between the two groups. The secondary objectives were to compare rebleeding and mortality at 6 weeks. We also assessed the change in HVPG between days 1 and 3 (HVPG response rate).

**Method:** In this open-label, randomized controlled trial, cirrhosis patients with AVB were randomized to receive either 1-day or 3-days of terlipressin therapy post-endoscopic intervention. Rebleeding and mortality were noted on day 5 and after 6 weeks. HVPG measurements were done after the first endoscopy and after 72 hours.

**Results:** Of the 149 patients randomized, 74 were randomized to the 1-day and 75 to 3-day group. There were no differences in baseline clinical as well as laboratory parameters between the 2 groups. Failure to control bleeding at 24 hours in the 1-day and 3-days [0 vs 2 (2.7%), p = 0.497], 5-days rebleeding rate [3 (4.1%) vs 4 (5.3%), p = 1.000], and 5-day mortality [1 (1.4%) vs 1 (1.3%), p = 1.000] were similar. At 6 weeks, rebleeding [9 (12.2%) vs 10 (13.3%), p = 0.830] and mortality [5 (6.8%) vs 4 (5.3%), p = 0.745] were similar (Figure 1a and b). HVPG response (defined as ≥10% reduction from baseline) was similar in both groups. Patients who received 3-days of terlipressin therapy experienced more adverse effects as compared to 1-day therapy [42 (45%) vs 28 (37.8%), p = 0.026].

**Conclusion:** As compared to 3 days therapy, 1 day of terlipressin was associated with similar rebleeding rates at 5-days and 6 weeks, 42-days mortality, and HVPG response rate at day 3. One-day terlipressin therapy is associated with fewer adverse effects than 3-days therapy.

**OS-102**

The new diagnostic criteria of portopulmonary hypertension identify a group of patients with cirrhosis at high risk of death

Luis Téllez1,2,3,4, Antonio Guerrero1, Jesus Donate1, Miguel Ángel Rodríguez-Gandía1,2,3, Susana del Prado5, Andrés Tenedes6, Rosa Martín-Mateos1,2,3, Rosario González Alonso1,2,3, Javier Martín1,2,3,4, Miguel García González1,2,3, Rubén Sánchez-Aldehuelo1,2, Diego Burgos Santamaría1,2,3, Beatriz Mateos Muñoz1,2,4, María Torres Guerrero1,6, Jose Luis Lledó Navarro1,2,3, Agustín Albillos1,2,3,4, 1Hospital Universitario Ramón y Cajal, Gastroenterology and Hepatology, Madrid, Spain; 2Instituto Ramón y Cajal de Investigación Sanitaria-IRYCIS, Madrid, Spain; 3Universidad de Alcalá: Facultad de Medicina y Ciencias de la Salud, Alcalá de Henares, Spain; 4CIBER-Center for Biomedical Research Network, Madrid, Spain; 5Hospital Universitario Ramón y Cajal, Cardiology, Madrid, Spain; 6Hospital Universitario Ramón y Cajal, Respiratory Diseases, Madrid, Spain

Email: luistevilla@gmail.com

**Figure:** (abstract: OS-101-YI): (a) Cumulative probability of remaining free of bleeding at 6 weeks (log rank p = 0.820) (b) Cumulative probability of survival at 6 weeks (log rank p = 0.691)
**Background and aims:** The new diagnostic criteria of pulmonary arterial hypertension (PAH) use lower cut-offs for mean pulmonary arterial pressure (mPAP) (before: 25; now: 20 mmHg) and pulmonary vascular resistance (PVR) (before: 3; now: 2 Woods Units (WU)) to define portopulmonary hypertension (PoPH). Using these criteria, we can identify a group of patients with early precapillary PAH (e-PoPH: mPAP 20–25 mmHg and PVR ≥2 WU); classic PoPH or c-PoPH (mPAP ≥25 mmHg and RVPc ≥3 WU); postcapillary PAH or post-PAH (mPAP ≥20 mmHg and pulmonary artery wedged pressure ≥15 mmHg). The variables associated with a worse prognosis (death or transplantation) were analyzed using Cox regression, and the predictors of HAPoP using binary logistic regression.

**Results:** (mean, SD). 258 patients were followed-up for 104 (28) months (72.5% male; age 58.6 (9.1) years). Non-PAH: 48.4%; e-PoPH: 20.9%; c-PoPH: 11.6%; post-PAH: 16.7%. Poorer liver function (MELD), higher portal hypertension (HPVG), and the presence of PAH were independently associated with worse overall survival and transplant-free survival (p < 0.01).

The prognosis of patients with PoPH, whether early (HR 4.5 (1.9–10.7)) or classic (HR 5.4 (2.2–13.1)), was worse (p < 0.01) than that of those without PAH or with post-PAH (overall-survival and transplant-free survival) (Figure). Those with PoPH (early or classic) had higher (p < 0.05) levels of C-reactive protein, brain natriuretic peptide (BNP), and uric acid and lower levels of albumin than those without PAH. The variables independently associated with PoPH were the existence of a portosystemic shunt (OR 6.8 (2.0–22.8)) and BNP >80 pg/ml (OR 13.1 (2.7–65.0)). Tricuspid regurgitation velocity (AUC 0.82 (0.7–0.9), p < 0.01) and right atrial area (AUC 0.86 (0.8–0.9), p < 0.01) were the echocardiographic parameters that best discriminated the presence of PoPH.

**Conclusion:** The new diagnostic criteria of PAH identify a group of patients with cirrhosis and early PoPH at high risk of death. We have identified clinical and analytical variables that allow us to suspect the existence of PoPH according to new criteria.

**OS-103-Y1 Outcomes of a therapeutic stepwise approach involving low-dose systemic thrombolysis for managing acute portomesenteric thrombosis**

Ahmed Hashim1, Aashish Pandya1, Naz Kanani Alviri1, Hannah Old1, Jonathan King1, Louise China1, Dominic Yu1, David Patch1. 1Institute for Liver and Digestive Health, Royal Free Hospital, London, United Kingdom

**Background and aims:** Acute non-malignant portomesenteric thrombosis (PMT) is challenging to manage and can often result in bowel infarction leading to high morbidity and mortality. We report a large series of patients presenting with this condition who received our novel step-wise therapeutic protocol, aiming to describe the rates of recanalization, symptom control and complications. Our protocol—published originally in 2019—adopts a step-ladder approach involving the infusion of systemic low-dose tissue plasminogen activator (L-tPa) for 72 hours initially and up to a maximum of 7 days. Depending on the clinical and radiological response, the treatment is escalated to Catheter-Directed Thrombolysis (CDT) followed by Transjugular Intrahepatic Portosystemic Shunt (TIPSS) when indicated.

**Method:** We conducted a retrospective analysis of clinical records of patients with acute PMT who undertook the stepwise regimen above at Royal Free Hospital between December 2019 and August 2022.

**Results:** The total number of patients included was 42 patients; 25 (60%) were males. The mean age was 46 (SD = 13). Hereditary thrombophilia was identified in 17 (40%) patients and acquired prothrombotic conditions were observed in 15 (36%) cases (2 had a recent COVID-19 infection and 3 received the ChAdOx1 vaccine). Three patients had underlying chronic liver disease. All patients had thrombosis of the superior mesenteric vein (SMV) on cross-sectional imaging. Main portal vein thrombosis (PVT) was found in 38 (90%) patients whereas thrombosis of all three-vessel (PVT + SMV + splenic vein) was present in 25 (60%). All patients had persistent abdominal pain despite standard anticoagulation prior to the initiation of L-tPa. The median time to initiation of L-tPa (n = 39) was 12 (IQR = 12) days of symptoms and the mean duration of L-tPa infusion was 95 (SD = 48) hours. CDT was undertaken in 21 (50%) patients, of whom, two-thirds (15/21) had the local therapy delivered through EKOS® endovascular system. TIPSS was inserted in 18 patients (43%) and remained patent at discharge in 16/18 (89%). A degree of recanalization was observed in 33 (79%). Around half of the patients (n = 20) did not require intensive or high-dependency care admission. The
majority 31 (80%) received warfarin as long-term anticoagulation (5 were maintained on Apixaban). At a median follow-up of 10 (IQR = 12) months, complete symptom resolution was achieved in 26/37 (70%). Recanalization was maintained in 26/40 (65%) and TIPSS remained patent in 14/18 (78%). Nine patients required bowel resection within a median duration of 11 (IQR = 10.5) days from presentation. The mean length of small bowel resected was 67 cm (SD = 50). One patient was discharged with a stoma and needed parenteral nutrition and another suffered an intracranial haemorrhage. Minor bleeding occurred in 10 patients. One death was recorded (due to bowel ischemia).

Conclusion: Our stepwise protocol achieved good recanalization and patency rates, and sustained symptom control was observed in the majority of patients. While some patients inevitably required surgical intervention, bowel continuity was eventually achieved in almost all cases.

OS-104
Long-term outcome following liver transplantation for patients with acute on chronic liver failure grade 3 (ACLF-3): a retrospective matched-controlled study
Florent Artru1,2, Sophie-Caroline Sacleux3, José Ursic Bedoya4, Clementine Levy2, Marion Khaldi2, Charles Le Goffic2, Eric Levesque3, Sébastien Dharancy2, Emmanuel Boleslawski2, Gilles Lebuffe2, Philippe Ichaï3, Audrey Coilly3, Eleonora De Martin2, Eric Vibert3, Samir Jaber4, Astrid Herrero5, Magdalena Meszaros4, Clement Monet4, Didier Samuel3, Philippe Mathurin2, Georges-Philippe Pageaux3, Faouzi Saliba1, Alexandre Louvet2. 1King’s College Hospital, United Kingdom; 2CHU Lille, France; 3Hopital Paul Brousse, France; 4CHU Montpellier, France
Email: florent.artru@kcl.ac.uk

Background and aims: Utility, a major principle for allocation in the context of scarce medical resources, is questioned in patients with acute-on chronic liver failure (ACLF) grade 3 who undergo liver transplantation (LT). Indeed, while the evidence is growing regarding an acceptable 1-year survival after LT, very scarce data reports long-term patients and graft survivals that are the final aim of LT. We aimed to explore long-term outcomes of patients included the 3 center retrospective French experience published in 2017.

Method: All patients with ACLF grade 3 (n = 73) as well as their matched controlled (on sex and age) with ACLF 2 (n = 145), 1 (n = 119) and no ACLF (n = 292) that have participated in the princeps study published in J Hepatol were included. We explored 5- and 10-year patient and graft survivals, causes of death and their predictive factors.

Results: Patients with ACLF grade 3 were male in 70% with a median age of 57 years old. Alcohol was the main cause of cirrhosis (53%) and septic shock (49%) the main primary reason for admission in intensive care unit. At time of LT, MELD score was 40 and CLIF-C ACLF 67. Median follow-up was 9 years. In patients with ACLF 3, 2, 1 and no ACLF, 5- and 10-year patient survivals were respectively 73% vs. 71% vs. 76% vs. 79% (p = 0.3) and 57% vs. 58% vs. 59% vs. 65% (p = 0.3). In cox-regression analysis ACLF grade was not associated with 5- (RR 1.1, 95%CI:0.95–1.29, p = 0.16) and 10-year survival (RR 1.1 95%CI:0.97–1.22, p = 0.11). 5- and 10-year graft survivals were respectively 67% vs. 68% vs. 74% vs. 73% (p = 0.4) and 50% vs. 53% vs. 58% vs. 60% (p = 0.3). At 10 years in ACLF 3 patients, 30 died and 5 were retransplanted. The leading causes of death were infections (33%), and cardiovascular events (23%) and reasons for retransplantation were chronic rejection (60%) and biliary complications (40%). Multivariable analyses identified Charlson comorbidity index (CCI) (RR 1.59, 95%CI: 1.12–2.26, p = 0.009 and RR 1.37, 95%CI: 1.05–1.78, p = 0.019) at LT and the number of RBC packs transfused (RR 1.18, 95%CI: 1.10–1.34, p = 0.0001 and RR 1.17, 95%CI: 1.07–1.27, p = 0.0003) as independently associated with 5- and 10-year patients’ survival while age, etiology of cirrhosis, MELD score, sarcopenia, donor-risk index were not.

Figure: (abstract: OS-104): 5-year patients (A) and graft (B) survival, and 10-year patients (C) and graft (D) survivals in patients with ACLF 3 (n = 73) and their matched controls with ACLF 2 (n = 145), 1 (n = 119) and no ACLF (n = 292).
OS-105
Hepatic nerve endings are rewired by cholestatic injury to connect inflamed lymphatics to sites of ductular remodelling
Luke Noon1,2,3, Anne-Laure Cattin2, Jemima Burden2, Luigi Aloia2, Giulia Casal2, Marina Berenguer4, Judith Pérez4, Alison Lloyd2,3,4

Background and aims: Hepatic nerves regulate blood flow, metabolism, and hepatic regeneration, yet we have almost no understanding of the structure, function, or cell-specificity of nerve endings in liver. In this study we set out to map the “connectome” of peripheral nerves in murine liver, taking a cross-scale approach to visualize, quantify and reconstruct nerve terminals using correlative light and electron microscopy (CLEM) and 3D-electron microscopy (EM).

Method: Plp-EGFP transgenic mice were used to identify hepatic nerves in portal tracts by EGFP fluorescence and hone in on the ultrastructural features of the neural niche by CLEM. Array tomography-based scanning EM (SEM) was then used to scale-up sampling around nerves and compare “healthy” adult liver to that of “injured” mice fed 0.1% 3,5-diethoxycarbonyl-1,4-dihydrocollidine (DDC). The resulting volume (v)EM image database was annotated, segmented and 3D-rendered using the Webknossos open source platform.

Results: We identified 187 individual axonal contacts in “healthy” liver (n = 3) and 208 in “injured” liver (n = 3) from a total tissue volume of 165835 μm3. Our survey of hepatic nerve endings revealed Schwann cells in portal tracts support a wider network of “naked” axons protruding into the surrounding stroma, making multitude contacts with fibroblasts (21.5% of total), macrophages (6.4%), and the basal lamina of blood vessels (36.9%) and bile ducts (2.7%). Axons also formed prominent varicosity-like contacts abutting hepatocytes of the limiting plate (31.6%). Remarkably, we observed a close physical association between hepatic nerves and lymphatic vessels, that was confirmed in human liver. Nerve terminals contacting lymphatics in healthy liver were rare (0.53%), but their density increased dramatically with injury (8.79-fold) indicating axonal remodelling. Axon synaptic contacts with fibroblasts (21.9% of total), macrophages (6.4%), and the limiting plate (31.6%). Remarkably, we observed a close physical association between hepatic nerves and lymphatic vessels, that was confirmed in human liver. Nerve terminals contacting lymphatics in healthy liver were rare (0.53%), but their density increased dramatically with injury (8.79-fold) indicating axonal remodelling.

Figure:

Conclusion: We showcase a new workflow that enables quantitative mapping and visualization of peripheral nerve connectomes in liver at the ultrastructural level, revealing multiple novel features of hepatic nerve endings. Our analysis uncovers local circuitry connecting regenerative epithelial surfaces in series with nearby lymphatic tissue, raising the extraordinary possibility that the detection/response to injury is coordinated between inflamed lymphatic tissue and progenitor cells by hepatic nerves.

OS-106-VI
The silencing of Sox9 impairs ductular reaction expansion while enhancing the differentiation of DR cells into hepatocytes
Arthur de Schaetzen1, Maxime De Rudder1, Isabelle Leclercq1,2,3

Background and aims: After acute damage or liver resection the liver regenerates and each cell compartment proliferates to repopulate the cells that were lost. In chronic liver disease, hepatocytes are found in a state of replicative senescence and are no longer able to duplicate. In such a setting, cholangiocytes proliferate and invade the parenchyma, in a phenomenon called the ductular reaction (DR). Cells of the ductular reaction have the ability to differentiate in hepatocytes, offering an alternative path for regeneration. Observations in animal models show nevertheless that DR cells generate only a modest fraction of hepatocytes. Hence strategies to enhance DR-derived regeneration are needed to significantly support liver function in chronic diseases.

Sox9 is a transcription factor that determines the biliary fate of the bipotential precursor to cholangiocytes and hepatocytes during embryogenesis. Sox9 ectopic expression is proposed to direct liver epithelial cells towards the biliary lineage. Here we hypothesize that the silencing of Sox9 in cells of the ductular reaction will ease their shift towards the hepatocyte lineage, thereby enhancing their contribution to liver regeneration.

Method: We used OpnCreERT2: Rosa26R-YFP: Sox9floxed transgenic mice in which the injection of Tamoxifen drives the constitutive expression of YFP and the silencing of Sox9 in cholangiocytes alone. Any cell expressing YFP is a cholangiocyte or its progeny. Sox9flox KO and controls with intact Sox9 expression received carbon tetrachloride (CCL4) for 6 weeks to cause chronic hepatocellular damage. In a separate experiment, we first treated mice with CCL4 to induce DR and then operate Sox9 silencing in cholangiocytes, followed by a 2 weeks recovery period before harvest.

Results: In response to tamoxifen injection, we observed expression of YFP in 71% (± 1.9%) of cholangiocytes together with deletion of Sox9 in 100% of them in Sox9flox KO mice. In controls mice 82% (± 3.5%) of cholangiocytes expressed YFP and all of them expressed Sox9. After 6 weeks of CCL4, the magnitude of the ductular reaction, as measured by the area of Ck19+ cells, was significantly lower in Sox9flox KO than in controls. Patches of YFP+/HNF4alpha+ hepatocytes generated from the DR were present in all animals, but similar in density in Sox9flox KO and in controls, this regardless whether the

Liver failure and regeneration

Conclusion: 5- and 10-year patients and graft survivals in ACLF 3 patients were not significantly different from their matched controls with lower ACLF grade or absence of ACLF 5-year patients’ survival is higher than that of the 50%–70% threshold defining the utility of liver graft. To further improve outcomes efforts should focus on candidates’ selection (CCI associated with long-term survival) and prevention of infection and cardiovascular events standing as the main causes of death.
ductular reaction was weak (Sox9Chol KO) or vigorous (controls), supporting that Sox9 deletion favors differentiation of DR cells. To further support this, we silenced Sox9 after the induction of the DR in chronic hepatocellular injury, and examined livers after a 2 weeks recovery period. We confirmed that tamoxifen injection effectively induced YFP expression and silenced Sox9 in 68% and 100% of DR cells respectively in Sox9Chol KO and in 83% and 0% of DR cells in controls. The number of YFP+ hepatocytes was significantly increased in Sox9Chol KO compared to controls (figure).

Figure: Livers with homozygous deletion of Sox9 (Sox9f/f) and with heterozygous deletion of Sox9 (Sox9f/+), compared with livers with wild type Sox9 alleles (Sox9+/+). Statistical analysis: one-way anova

Conclusion: We generated a model for inducible and cholangiocyte-specific YFP expression along with Sox9 silencing: the Opn1CreERT2; Rosa26RYFP; Sox9floxed mice. With this model, we showed that the silencing of Sox9 impairs the expansion of DR cells. Furthermore, the silencing of Sox9 in DR cells enhances their hepatocytic differentiation.

OS-107-YI
Bio-molecular map of albumin identifies signatures of severity and early mortality in acute liver failure
Neha Sharma1, Jaswinder Maras2, Sushmita Pandey1, Manisha Yadav1, Babu Mathew1, Vasundhra Bindal1, Nupur Sharma1, Gaurav Tripathi1, Sadam H Bhat1, Rakhi Maiwall2, Shivetan Karmakdi1, Shiv Kumar Sarin2. 1Institute of Liver and Biliary Sciences, Molecular and Cellular Medicine, New Delhi, India; 2Institute of Liver and Biliary Sciences, Hepatology, New Delhi, India. Email: jassi2param@gmail.com

Background and aims: Acute liver failure (ALF) has high mortality and corresponds to changes in plasma albumin levels and functions. Whether the bio-molecular analysis of albumin could identify signatures of the severity of the hepatic injury and early mortality in ALF is unknown.

Method: A total of 225 subjects (200 ALF and 25 healthy controls) were enrolled in the study protocol. Albumin was purified and analysed in the training cohort (ALF Non-Survivors; n = 32, ALF-Survivors; n = 8 and Healthy Controls; n = 5) for modification, functionality, and bounded multi-omics signatures (Proteins, Lipids, Metabolites, and bacterial peptides) followed by validation in a test cohort of 160 ALF patients using machine learning (ML) approach.

Results: Albumin oxidative state, plasma oxidation, and glycosylation were higher in ALF, specifically in ALF-non-survivors (p < 0.05). Purified albumin from non-survivors showed significant multi-omics alterations as indicated by multivariate Partial least squares-discriminant analysis (PLS-DA) and alpha/beta-diversity indices (p < 0.05). Albumin bio-molecular profile of non-survivors showed a significant (p < 0.05) increase in bound biomolecules linked to inflammation, Advance Glycation End-products (AGE) signaling, amino-acid (arginine, proline) metabolism, bile acids, mitochondria breakdown (carnitines and beta-oxidation) and bacterial peptides of phylum Proteobacteria, Firmicutes, Verrucomicrobia, and others. Increased bacterial taxa (Listeria, Clostridium, and others) functionality correlated with serum Triglyceride; TG (4:0/12:0/12:0), Phosphatidylserine; PS (39:0) and metabolites (Porphobilinogen, Nicotinic Acid, and others) in non-survivors (R² > 0.7, p < 0.05). Multiomics signature-based probability of detection (POD) for non-survivors was significantly higher than survivors (p < 0.05).

Figure: Albumin-bounded Biomolecule shows ongoing mitochondrial failure and hyperinflammation state in ALF Patients
survival in ALF was >90% and correlated with albumin functionality and clinical parameters ($R^2 > 0.85$). POD metabolites showed diagnostic efficiency of 98% (AUC = 0.98 [0.95–1.0]) for early mortality prediction in ALF ($p < 0.05$). Specific increase in binding of L-acetylcarnitine, L-carnitine, N-(-3ydroxybutanoyl)-L homoserine lactone (linked to mitochondrial failure), nicotinic acid (a by-product of tryptophan metabolism) and pregnenolone lactone (a pantothenate kinase inhibitor) to albumin were seen in non-survivors. It was validated using five machine learning algorithms in test cohort 1 (plasma and paired one drop blood) and showed >98% accuracy for early mortality prediction.

**Conclusion:** Albumin bio-molecular composition is hyperoxidized and deranged in ALF patients. Novel albuminome signatures can segregate ALF patients who are likely to have early mortality or require emergency liver transplantation.

**OS-108-YI Investigating the PD-1/PD-L pathway and macrophage responses in acute-on-chronic liver failure**

Dimitrios Patseas1, Eoin Mitchell1, Emilio Flint2, Tong Liu1, Sujit Mukherjee1, Lucia Possamai1, Mark J W McPhail3, Christine Bernsmeier2, Evangelos Triantafyllou1. 1Imperial College London, Department of Metabolism, Digestion and Reproduction, London, United Kingdom; 2University of Basel, Department of Biomedicine, Basel, Switzerland; 3King’s College London, Department of Inflammation Biology, London, United Kingdom

**Email:** e.triantafyllou@imperial.ac.uk

**Background and aims:** Macrophage dysfunction and bacterial infections are common in acute-on-chronic liver failure (ACLF) and contribute to mortality. PD-1/PD-L related adaptive immune dysfunction has been documented in alcoholic hepatitis, HBV/HCV infection, and anti-PD- (L)1 therapy is approved for HCC. We also found that PD-1/PD-L axis therapy impaired macrophage antimicrobial responses in murine acute liver injury. However which inflammatory cues trigger this axis’ upregulation, and how it modulates macrophage function, remain unknown. We explored this using human tissue samples, cell culture, and in vivo models.

**Method:** WT male mice were intraperitoneally (i.p.) treated with CC4 (0.4 ml/kg), twice-weekly for 6 weeks, and then were i.p. dosed with saline, TLR2-L (Pam3CSK4; 20 ug) or TLR4-L (LPS; 100 ug) ligand for 24 h before culling. FFPE murine liver tissue was histologically examined, and phenotyping of myeloid cells was performed by flow cytometry. Liver tissue sections of ACLF patients and pathological controls were imaged using multiplex immunofluorescent (mIF) staining. Effects of TLR-ligand (TLR-L) 24 h treatment on human monocyte-derived macrophage (MoMF) PD-L1 were assessed by flow cytometry. In additional experiments, MoMF were primed for 24 h with TLR4-L (100 ng/ml; LPS) and then treated for 24 h with Ig control, PD-1, PD-L1 or PD-L2 Fc proteins (5 ug/ml) to activate the PD-1/PD-L axis. Macrophage *E. coli* pHrodo uptake, ROS production, and cytokine secretion levels were assessed by flow cytometry and Meso Scale Discovery kit.

**Results:** We found that TLR4-L, TLR5-L and TLR9-L (but not TLR2, TLR3, or TLR7-L) agonism upregulated PD-L1 expression on human MoMF [TLR4: 38,054 vs TLR5: 43,120 vs TLR9: 32,806 vs CTRL: 9,048; (MFI), all $p < 0.05$]. Also, our in vivo analyses revealed that TLR4-L (LPS) treated CCl4 mice were characterized by increased liver inflammation and Kupffer cell (Fig. A–B) or MoMF (not shown) PD-L1 levels, in comparison with TLR2-L and saline treated CCl4 mice (Fig. A–B). Human liver tissue mIF showed that ACLF patients had higher numbers of CD68+ PD-L1+ macrophages and CD8+ PD-1+ cells (Fig. C). We found that PD-1 axis’ agonism on human LPS-primed MoMF with PD-1 or PD-L1 proteins (but not PD-L2) resulted in altered pro-inflammatory cytokine secretion (Fig. D) and reduced bacterial uptake and ROS production (Fig. E).

**Conclusion:** Our findings show that macrophage PD-L1 is differentially induced by microbial toxins (TLR-L) such as LPS, both in vitro and in experimental liver fibrosis and ACLF. Mechanistically, we found that PD-1 axis’ activation on LPS-primed macrophages causes negative “back-signaling” by reducing their bactericidal functions.

**Figure:** (abstract: OS-108)
Future work will evaluate PD- (L)1 and/or TLR-directed immunomodulatory therapeutic approaches for improving hepatic macrophage antimicrobial responses in ACLF.

**OS-109-YI**

**Neutrophils promote chronic liver injury resolution**

Silvia Ariño1, Laura Sererols-Viñas1, Beatriz Aguilar-Bravo1, Raquel A Martínez-García de la Torre1, Iván Ballesteros2, Andrea Rubio-Ponce2, Daniela Cerezo-Wallis3, Alex Guillamon1, Juanjo Lozano4, Andrés Hidalgo2,3, Pau Sancho-Brú1,4, 1Institut d’Investigacions Biomèdiques August Pi Sunyer (IDIBAPS), Spain; 2National Center for Cardiovascular Research Carlos III, Spain; 3Vale University School of Medicine, United States; 4Centro de Investigación Biomédica en Red de enfermedades hepáticas y digestivas (CIBERehd), Spain

**Email:** sarinom@recerca.clinic.cat

**Background and aims:** Advanced chronic liver injury is characterized by the loss of hepatocyte function, fibrosis accumulation, ductular reaction expansion and neutrophil recruitment. Previous results from our group have shown that neutrophils participate in chronic liver injury progression. However, neutrophils’ contribution to chronic liver damage repair remains elusive. Therefore, the aim of the present study is to investigate the role of neutrophils in chronic liver injury resolution and regeneration.

**Method:** Injury regression was evaluated by immunohistochemistry and serum transaminase levels in a mouse model treated for 3 weeks with DDC diet which was followed by resolution periods of 1, 3 or 5 days of standard diet administration. To investigate neutrophils’ role, neutrophils were depleted using a transgenic mouse in which the diphtheria toxin receptor is expressed under the neutrophil specific promoter Mrp8. Depletion impact was evaluated during 5 days of regression by immunohistochemistry and gene expression. Finally, we performed bulk-sequencing analysis of isolated neutrophils from healthy liver, injured liver after 3 weeks of DDC and injury resolution after 3 days of regression.

**Results:** We observed an imminent decrease of transaminase levels after 24 hours of DDC diet withdrawal. At histological level, hepatocyte proliferative peak was achieved at 3 days of resolution. However, a significant decrease of neutrophils and ductular reaction and fibrosis regression were not observed until day 5 of resolution. The specific depletion of neutrophils during a 5-days resolution period showed a reduced ductular reaction and fibrosis regression. Moreover, there was a lower number of proliferative hepatocytes in the neutopenic model, suggesting the participation of neutrophils in hepatocyte regeneration in the context of injury resolution. Finally, neutrophil sequencing analysis showed that liver neutrophils from injury resolution recover the expression of pathways related to interferon type 1, apoptosis and autophagy, which were lost in DDC liver-injured neutrophils. Moreover, liver neutrophils from injury resolution were enriched in pathways related to LPS-response, cell migration and mitogenic factors (IL6 and TNFa) secretion when compared to healthy and DDC liver neutrophils.

**Conclusion:** Our study shows the participation of neutrophils in chronic liver injury resolution. Moreover, our data indicate that neutrophils are a plastic cell population and suggest their capacity to acquire a pro-resolutive phenotype and to promote liver regeneration.

**OS-110**

**Spatial proteo(trans)criptomics identifies macrophage heterogeneity in patients with at-risk non-alcoholic steatohepatitis**

Dina Tinikos1,2, Asier Attoranz-Martinez2, Trieu My Van2, Daniel Newhouse3, James Clark1, Ann K Daly1, Tania Roskams3, Quentin Ansee3,4, 1Newcastle University, Translational and Clinical Research Institute, Faculty of Medical Sciences, United Kingdom; 2National and Kapodistrian University of Athens, Dept of Pathology, Aretaieio Hospital, Greece; 3IKU Leuven and University Hospitals Leuven, Department of Imaging and Pathology, Translational Cell and Tissue Research, Belgium; 4NanoString Technologies, United States; 2Newcastle upon Tyne Hospitals NHS Trust, Newcastle NIHR Biomedical Research Centre, United Kingdom

**Email:** olivier.govaere@kuleuven.be

**Background and aims:** Patients with “at-risk” NASH (NAS ≥ 4 + F ≥ 2) are a key recruitment group for drug trials as they are more likely to progress to cirrhosis. Besides lobular inflammation and hepatocellular ballooning at an advanced fibrosis stage, the biopsies of these patients often exhibit lipogranuloma and monocyte-derived macrophages infiltration in the portal tract. The dynamics between the response of Kupffer cells to parenchymal damage and the influx of circulating immune cells, are still poorly understood. In this study, we aimed to resolve the spatial heterogeneity of the macrophage population in at-risk NASH and their relationship to histopathological features.

**Method:** GeoMx Human Whole Transcriptome Atlas profiling was performed on 8 biopsies from patients with NASH fibrosis stage 3. Regions of interest were selected based on (1) the presence of portal inflammatory infiltration, (2) steatosis with lobular inflammation and/or lipogranulomas, and (3) parenchyma without steatosis. Fluorescent CD68, CD45 and pan-keratin markers were used to segment the different macrophage, immune cell and epithelial cell populations from each region. A total of 80 segments were processed for high throughput RNA sequencing. The clinical relevance of the identified differentially expressed genes were explored in extant bulk RNA sequencing data from 206 NAFLD patients. Key targets were validated on protein level using the Multiple Iterative Labelling by Antibody Neodeposition method. All samples were scored by an expert liver pathologist according to the semi-quantitative NASH-CRN Scoring System.

**Results:** Comparison of parenchymal steatohepatitis-associated (SH-) macrophages with portal (PT-) macrophages and Kupffer cells from parenchyma without steatosis identified 352 and 218 differentially expressed genes respectively. PT-macrophages displayed a typical immature/monocyte phenotype, lacking the expression of scavenger receptors (MSR1, CD36, CD163), and expressing lymphocyte-regulatory genes (CCL19, CCL21, CD48, IL7R, CCL5). Compared to Kupffer cells in areas without steatosis, SH-macrophages showed features of both monocytes (high expression of LSP1, glycoprotein NMB and lysozyme) and mature macrophages (high MSR1 expression). In addition, SH-macrophages displayed an increase in metabolic- and phagocytosis-related genes. Exploring the clinical relevance of key markers in bulk RNAseq data showed that CCL19 expression was linearly correlated with the fibrosis stage, lobular inflammation and hepatocyte ballooning scores, but not with the steatosis grade. In contrast, GPNMB and lysozyme mRNA expression reflected predominantly NASH activity, as it was significantly associated with steatosis, lobular inflammation and hepatocyte ballooning scores, but not with fibrosis. At the protein level, GPNMB-positive macrophages were observed in steatotic areas with active inflammation and lipogranulomas.
Conclusion: This study identified a steatohepatitis-associated macrophage subpopulation in patients with at-risk NASH, with unique characteristics compared to portal macrophages and Kupffer cells from non-steatotic liver parenchyma highlighting macrophage heterogeneity. Furthermore, we showed the clinical relevance of steatohepatitis-associated macrophages in the grading and staging of the NAFLD spectrum.

OS-111 Intestinal Angptl4 perturbs gut barrier function in NAFLD
Damien Chua1, Hong Sheng Cheng1, Nguan Soon Tan1,2, 1Lee Kong Chian School of Medicine, Singapore, Singapore; 2Nanyang Technological University, Singapore, School of Biological Sciences, Singapore
Email: NSTAN@ntu.edu.sg

Background and aims: The disruption of the gut-liver axis, which involves a complex interplay of intestinal and hepatic processes, contributes to the onset and progression of liver diseases. The gut barrier functions are compromised in NAFLD patients, which increases the exposure of the liver to pathogen-mediated microbial patterns and microbial-derived metabolites. The identification of the elements of the gut-liver axis primarily damaged in NAFLD offers possibilities for intervention. Early studies have implicated angio-protein-like 4 protein (Angptl4) as a potential link between gut microbiota and adiposity. However, the role of intestinal Angptl4 in the gut-liver axis is poorly understood. Here, we examined the role of intestinal Angptl4 as a prime pathological player of gut-liver axis in NAFLD.

Method: We developed a human-relevant diet-induced NAFLD mouse model based on thioeneutrition, LIDPAD (Liver Disease Progression Aggravation Diet) and a control diet of defined ingredients. Intestinal epithelium-specific Angptl4 deleted (Angptl4fl/fl−/−) mice were fed NASH-inducing LIDPAD and control diet. Liver histology and CellROX were performed to assess the liver damage and oxidative stress. RNA-seq of liver and intestinal epithelium and gene ontology analyses were performed. Liver histology and CellROX were performed to assess the liver damage and oxidative stress. Gut permeability was assessed using a FITC-dextran permeability assay and qPCR of tight junctions proteins. Whole-mount immunofluorescence imaging was performed to reveal alteration in the spatial distribution of the intestinal structure and vasculature.

Results: Angptl4fl/fl−/− mice developed hepatic steatosis at 1–4 weeks of LIDPAD that progressed to NASH by 8–12 weeks. Fibrosis was prevalent in 90% of LIDPAD-fed Angptl4fl/fl−/− mice from 12 weeks onwards. Hepatic transcriptomic and gene ontology analyses to identify early events that underpin NAFLD onset revealed acute-phase response and hepatic response to LPS between weeks 1–4. Functional hepatic analysis revealed increased hepatocyte oxidative stress and lipid peroxidation in the liver as early as 2 weeks after diet feeding, before the presentation of NASH. Consistently, Angptl4fl/fl−/− mice had reduced gut permeability and hepatic oxidative stress damages compared with Angptl4fl/fl mice. Furthermore, LIDPAD-fed Angptl4fl/fl mice gained more body weight with larger liver and epididymal adipose tissue than Angptl4fl/fl−/− mice.

Conclusion: Our observations suggest an integral role for intestinal Angptl4 in regulating gut barrier functions associated with early diet-induced liver injury and adiposity associated with diet-induced NAFLD.

OS-112 The transcriptional function of TCF7L2 is spatially restricted in liver and regulates zonated metabolic pathways that contribute to NAFLD
Irisicilla Ayala1, Skanda Hebbale1, Christopher Shannon2, Ivan Valdez3, Luis Cruz-Moreno3, Terry Bakewell1, Marcel Fourcaudot1, Sami Heikkinen4, Luke Norton1, 1University of Texas Health San Antonio (UTHSA), United States; 2University College Dublin, Ireland; 3University of Texas Southwestern Medical Center (UTSW), United States; 4University of Eastern Finland, Finland
Email: norton1@uthscsa.edu

Background and aims: The prevalence of non-alcoholic fatty liver disease (NAFLD) is approximately 40%–80% in people with Type 2 Diabetes (T2D). Single nucleotide polymorphisms in the transcription factor 7-like 2 (TCF7L2) gene are significantly associated with T2D, but the metabolic function of TCF7L2 remains to be fully elucidated. TCF7L2 is a transcriptional effector of the WNT/beta-catenin signaling pathway, and we previously demonstrated that it regulates key zonally expressed metabolic genes in hepatocytes. Here we investigated the spatial transcriptional role of TCF7L2 in mouse liver using multimodal single nuclei genomics, and determined the impact of TCF7L2 transcriptional inactivation on zonated metabolic pathways and the development of severe NAFLD.

Method: Using single nuclei RNA-Seq and ATAC-Seq, we examined the spatial expression and DNA binding activity of TCF7L2 across the mouse liver lobule. We visualized TCF7L2 transcriptional activity in liver using TCF/Wnt signaling reporter mice, which express eGFP downstream of the conserved TCF/LEF DNA binding site. The transcriptional activity of TCF7L2 was ablated in liver by breeding mice with a floxed Tcf7l2 exon 11, which encodes part of the DNA binding domain (DBD), to albumin-Cre mice to create liver specific TCF7L2 mutant mice (Hep-TCF7L2DBD). The impact of TCF7L2 inactivation on the development of fibrosis in NAFLD was investigated in Hep-TCF7L2DBD mice fed a choline-deficient amino acid-defined high fat (CDAHFD) diet for 8-weeks. In liver samples harvested from these mice, we examined the disruption to zonated metabolic pathways including cholesterol, bile and glutamine/glutamate metabolism.

Results: Our multimodal single nuclei methodology reliably isolated distinct hepatocyte populations in mouse liver. We found that the expression of Tcf7l2 mRNA was ubiquitous across the liver lobule, but that the presence of the consensus TCF/LEF DNA binding motif in ATAC peaks was significantly enriched in zone 3 pericentral hepatocytes. Consistent with this, immunofluorescence analysis of TCF/Wnt reporter mice revealed GFP staining that was highly restricted to zone 3 hepatocytes. In Hep-TCF7L2DBD mice, the expression of zone 3 marker genes was abolished, and was associated with disruptions to cholesterol and bile acid metabolism, and glutamine/glutamate homeostasis. Following the CDAHFD, Hep-TCF7L2DBD mice developed more severe fibrosis, and expressed elevated levels of genes involved in fibrogenesis, collagen synthesis and TGF-beta signaling.

Conclusion: Our findings suggest that under normal conditions, TCF7L2 activity is spatially regulated in mouse liver, and that its transcriptional activity is required for pericentral hepatocyte function. We also demonstrated that disrupted pericentral zonation may contribute to the development of severe NAFLD by interfering with several zonated metabolic pathways.

OS-113 Macrophage-derived osteopontin protects from non-alcoholic steatohepatitis
Hui Han1, Xiaodong Ge1, Sukanta Das1, Romain Desert1, Zhulon Song3, Dipti Athavale1, Wei Chen1, Sai Komakula1, Daniel Lantvit1, Grace Guzman1, Natalia Nieto1, 1University of Illinois at Chicago, Pathology, Chicago, United States
Email: nnieto@uic.edu

Figure:

Conclusion: Our observations suggest an integral role for intestinal Angptl4 in regulating gut barrier functions associated with early diet-induced liver injury and adiposity associated with diet-induced NAFLD.
**Background and aims**: Osteopontin (OPN, encoded by the SPP1 gene) is an immunomodulatory protein involved in chronic liver disease. The expression of OPN in macrophages (MFs) from healthy liver is relatively low; however, it markedly increases in non-alcoholic steatohepatitis (NASH). Our aim was to determine whether MF-derived OPN is protective or pathogenic in NASH.

**Method**: Spp1 KI knock-in and knock-out mice in myeloid cells (Spp1 KI Mφ and Spp1 ΔMφ) and liver MFs (Spp1 KI Mf) were generated. Mice were fed a NASH-inducing or an isocaloric control diet for 6 months. Livers were pathologically evaluated by HandE staining and immunohistochemistry. RNA-seq, lipidomics and metabolomics analyses were done in total liver. MFs were isolated and RNA-seq was performed. Fatty acid metabolism was analyzed with the Seahorse. The crosstalk between MFs and hepatocytes (HEPs) was studied using a co-culture system.

**Results**: Both genders of Spp1 KI Mφ mice were fully protected from NASH. The NASH activity score, liver triglycerides (TGs) and cholesterol were significantly decreased in Spp1 KI Mφ compared to control and Spp1 ΔMφ mice. The latter presented the worst phenotype. Spp1 KI Mf recapitulated the protection achieved in Spp1 KI Mφ mice. Metabolomics and lipidomics analyses revealed that livers from Spp1 KI Mφ mice showed less saturated fatty acid-containing TGs, which correlated with up-regulation of urea cycle metabolites. Gene expression enrichment analysis revealed that mitochondrial arginase-2 (Arg2) but not cytosolic arginase-1 (Arg1), was up-regulated mainly in HEPs from Spp1 KI Mφ mice. The increase in ARG2 was associated with higher NAD+/NADH ratio and ATP levels in total liver. HEPs from Spp1 KI Mφ showed higher mitochondrial respiration and fatty acid oxidation (FAO), which were reduced by ablation of Arg2 in HEPs. Transcriptomics and gene network analyses revealed that Oncostatin-M (OSM) was induced in Spp1 KI MFs regardless of diet. Treatment of HEPs with OSM induced Arg2 and FAO while they were blocked by co-treatment with a STAT3 inhibitor.

**Conclusion**: MF-derived OPN protects from diet-induced NASH in mice. The ARG2-mediated increase in mitochondrial respiration and FAO is responsible for the protective effect. OSM induced in MFs from Spp1 KI Mφ mice up-regulates ARG2 in HEPs through STAT3. Future work will focus on delineating how OPN induces OSM in MFs.

**OS-114-YI**

Dissecting NAFLD pathomechanisms using primary mouse liver and blood cells in a microfluidic perfusable compartmentalized liver-on-a-chip model

Hanyang Liu1, Marlene Kohlhepp1, Guo Yin1, Jana Hundertmark1, Felix Heymann1, Kehinde Aina2, Alexander Mosig2, Frank Tacke1, Adrien Guillot1. 1Charité Universitätsmedizin Berlin, Department of Hepatology and Gastroenterology, Berlin, Germany; 2University Hospital Jena, Center for Sepsis Control and Care and Institute of Biochemistry II, Jena, Germany

Email: hanyang.liu@charite.de

**Background and aims**: Non-alcoholic fatty liver disease (NAFLD) is a chronic liver condition defined by lipid accumulation in liver parenchymal cells (steatosis) associated with varying degrees of lipotoxicity, hepatocellular injury, inflammation and fibrosis. The liver sinusoids are lined by liver sinusoidal endothelial cells (LSECs) and represent the interface between circulating blood and liver resident macrophages (Kupffer cells, KCs) on one hand, liver epithelial cells (mainly hepatocytes) and hepatic stellate cells (HSCs) on the other hand. Thus, the liver sinusoid microenvironment includes all cellular players involved in NAFLD pathogenesis. Current in-vivo mouse NAFLD models present ethical challenges, and traditional in-vitro approaches cannot recapitulate the complex cellular interplay and the involvement of circulating cells. In this project, we aim at establishing and testing a primary cell biochip-based liver sinusoid model for the study of NAFLD driving mechanisms.

**Method**: Our liver-on-chip model consists of two distinct seeding chambers separated by a porous membrane. A microfluidic system can differentially perfuse both chambers. Primary mouse hepatocytes, HSCs, KCs and LSECs are isolated from fresh liver tissues, while peripheral blood mononuclear cells (PBMCs) were isolated from the vena cava of the same animal. Free fatty acids (palmitic and oleic acids) were used to induce hepatic steatosis. Lipid deposition, cellular lipotoxicity and inflammation were evaluated by lipid droplet and live/dead immunostaining, or immune cell tracking and flow cytometry. NAFLD-relevant markers were measured by qRT-PCR. The pan-PPAR agonist lanifibranor was used to test the relevance of our model for therapeutic agent testing. Acetaminophen (paracetamol) was used as a model of acute drug-induced injury.

**Results**: Five cell types were successfully isolated from mouse livers, and seeded in the biochip system, followed by PBMC perfusion for 48 hours. We found that FFA stimulation resulted in hepatocellular lipid deposition, cell injury and immune cell mobilization, as well as the induction of NAFLD-associated inflammatory cytokines. Lanifibranor treatment attenuated the FFA-induced observations. Similarly, acetaminophen induced acute hepatocyte injury and immune cell activation.

**Conclusion**: Our data demonstrate the relevance of the liver-on-chip model to study NAFLD and acute liver injury, suggesting that it is an innovative tool for functional and molecular studies.
Public Health - Except viral hepatitis

OS-115-YI
Who is safe from chronic liver disease? A population-based approach for early detection in the US
Nakia Chung1, Ajitha Mannalithara1, Vivek Charu1, W. Ray Kim1.
1Stanford University School Medicine, Stanford, United States
Email: wrkim@stanford.edu

Background and aims: Non-invasive tests have received much attention recently as a clinical tool to identify patients with non-alcoholic fatty liver disease (NAFLD) with liver fibrosis—as an indicator of current and future morbidity and mortality from chronic liver disease. However, the current approach is limited to patients who have already received a diagnosis of NAFLD. Based on population-based data, we develop an algorithm with which US adults may be screened for chronic liver disease with or without NAFLD.

Method: The Steatosis-Associated Fibrosis Estimator (SAFE) score, consisting of age, body mass index, diabetes, AST, ALT, platelets and globulin, has been developed and validated as a tool to detect clinically significant (≥stage 2) fibrosis in patients with NAFLD in primary care (Hepatology 2023;77:256–267). We applied the score to the examinees of the National Health and Nutrition Examination Survey for 2017–2020, a sample designed to be representative of the non-institutionalized, civilian population of the US. The data set included broad demographic, clinical, and laboratory data, including transient elastography of the liver.

Results: There were 7,156 subjects that had complete data for the analysis. The proportions of subjects with steatosis (CAP score >274 dB/m) and significant fibrosis (LSM > 8.0 kPa) projected to the US adult population were 42.7% (95% confidence interval [CI]: 41.0–44.3%) and 8.9% (95%CI: 7.6%–10.2%), respectively. In addition, 11.3% (95%CI: 10.2%–12.5%) reported significant amount of alcohol use, 2.3% (95%CI: 1.4%–3.3%) had evidence of hepatitis B or C, and 5.4% (95% CI: 4.6%–6.2%) had elevated serum ferritin levels. The enclosed table describes the characteristics of the subjects by the SAFE tiers, designed to stratify patients with NAFLD according to the probability of significant fibrosis. The proportions with SAFE ≥100, 0–99, and <0 were 11.2%, 27.5% and 61.3%, respectively. The proportions of LSM > 8.0 kPa (with or without NAFLD) in the general population were 31.2% (95%CI: 25.3%–37.0%), 11.1% (95%CI: 8.7%–13.4%) and 3.9% (95%CI: 3.1%–4.7%), respectively. SAFE ≥100 was associated with significantly higher prevalence of steatosis, elevated ferritin and hepatitis B or C.

<table>
<thead>
<tr>
<th>SAFE Score Categories</th>
<th>&lt;0</th>
<th>0–99</th>
<th>≥100</th>
</tr>
</thead>
<tbody>
<tr>
<td>% in the US population</td>
<td>61.3%</td>
<td>27.5%</td>
<td>11.2%</td>
</tr>
<tr>
<td>Steatosis (CAP &gt; 274 dB/m)</td>
<td>33.6%</td>
<td>52.6%</td>
<td>68.0%</td>
</tr>
<tr>
<td>Significant fibrosis (LSM &gt;8 kPa)</td>
<td>3.9%</td>
<td>11.1%</td>
<td>31.2%</td>
</tr>
<tr>
<td>Significant alcohol usea</td>
<td>12.4%</td>
<td>9.2%</td>
<td>10.8%</td>
</tr>
<tr>
<td>Viral hepatita</td>
<td>1.2%</td>
<td>2.9%</td>
<td>7.0%</td>
</tr>
<tr>
<td>Elevated ferritina</td>
<td>3.4%</td>
<td>6.8%</td>
<td>12.9%</td>
</tr>
<tr>
<td>None of the above</td>
<td>53.7%</td>
<td>35.8%</td>
<td>15.0%</td>
</tr>
</tbody>
</table>

a≥2 drinks/day for men and >1 drink/day
bHBSAg+, HCV RNA+ or anti-HCV+ with no HCV RNA

Conclusion: The SAFE score, designed to stratify patients with NAFLD according to their risk of significant fibrosis, is also powerful in detecting subjects at risk of chronic liver disease from all causes in the general population. This may indicate that NAFLD plays a primary or contributory role in liver fibrosis at large in the current era. These data support incorporating the SAFE score in public health algorithms to reduce the burden of chronic liver disease on the population level.

OS-116-YI
Increased risk of hepatocellular carcinoma among first-degree relatives of patients with biopsy-proven NAFLD – a multigenerational nationwide cohort study
Fahim Ebrahim1,2, Tracey Simon3, Hannes Hagström4, Jangwei Sun5, David Bergman5, Bjorn Roelstraete1, Jonas Ludvigsson1,5,6, Karolina Institutet, Department of Medical Epidemiology and Biostatistics (MEB), Stockholm, Sweden; 2Clarunis–University Center for Gastrointestinal and Liver Diseases Basel, Gastroenterology and Hepatology, Basel, Switzerland; 3Harvard Medical School, Gastroenterology and Hepatology, Boston, United States; 4Karolinska University Hospital, Division of Hepatology, Stockholm, Sweden; 5Örebro University Hospital, Department of Pediatrics, Örebro, Sweden; 6Columbia University, Department of Medicine, New York, United States
Email: f.ebrahim@outlook.com

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is the fastest growing cause of hepatocellular carcinoma (HCC). First-degree relatives (FDR) of patients with NAFLD are at substantially increased risk to develop NAFLD themselves, however little is known about their risk for HCC.

Method: We conducted a nationwide, population-based cohort study including all Swedish adults with biopsy-proven NAFLD in Sweden 1966–2017 (n = 11,924), who were matched to ≤5 population controls (n = 56,634) by age, sex, calendar year and county of residence. Leveraging the Swedish Total Population Register, we identified all first-degree relatives (fathers, mothers, siblings, offspring) (n = 48,032) and spouses (n = 9,406) of patients with NAFLD and of controls (n = 248,463; and n = 47,718 respectively). All first-degree relatives and spouses were followed from the time of NAFLD diagnosis or matching in their relative or from 18 years of age, whichever occurred last. We used Cox proportional hazards model to calculate multivariable adjusted HRs (aHRs) and 95% confidence intervals (CIs) for the risk of incident HCC.

Results: Over a median of 17.2 years, 86 (0.22%) NAFLD FDRs were diagnosed with incident HCC, compared to 285 (0.14%) control FDRs, yielding a significantly increased relative risk (13.0 vs. 8.4/100,000 PY; difference = 4.6/100,000 PY; aHR = 1.74, 95% CI = 1.32 to 2.28). The excess risk for HCC did not differ across generations: parents (36.9/100,000 PY, aHR = 2.01, 95% CI = 1.24 to 3.26), siblings (15.9/100,000 PY, aHR = 1.73, 95% CI = 1.04 to 2.88), offspring (5.3/100,000 PY, aHR = 1.46, 95% CI = 0.84 to 2.56). The risk was highest among FDRs of NAFLD patients with histological confirmation of fibrosis or cirrhosis (aHR = 2.77, 95% CI = 1.50 to 5.14) when compared to FDR of those with simple steatosis or NASH without fibrosis (aHR = 1.56, 95% CI = 1.15 to 2.12). There was no difference in HCC risk between NAFLD spouses and control spouses (17.9 vs. 14.4/100,000 PY), aHR = 1.30, 95% CI = 0.80 to 2.12).
Conclusion: First-degree relatives of patients with NAFLD, but not patient spouses were at increased risk of HCC, indicating that shared biological or early environmental factors might contribute to these elevated risks. Screening for risk factors of HCC—such as underlying NAFLD—might be considered in first-degree relatives of patients with NAFLD, especially when the patient already has signs of fibrosis or cirrhosis.

OS-117
Socioeconomic disparities and primary liver cancer incidence between 2006 and 2016: analyze by subtypes, a French population-based study
Nga Nguyen1, Bertille Comoz1, Joséphine Bryere2, Anne-Marie Bouvier3, Jean Baptiste Nousbaum4, Guy Launoy5, Veronique Bouvier1, Isabelle Ollivier-Hourmand1. 1CHU de caen, Calvados, Caen, France; 2Centre Francois Baclesse, Calvados, Caen, France; 3INSERM UMR 1231, France; 4CHU de Brest, France
Email: bertille.comoz@hotmail.fr

Background and aims: Hepatocellular carcinoma (HCC) and intrahepatic cholangiocarcinoma (iCCA) are the two most frequent histological subtypes of primary liver cancer (PLC). Despite different risk factors, these two types of cancer are often pooled in most epidemiological studies, as they are coded in databases under the common code C22 according to the ICD-10 classification. The aim of this study was to measure the association of socio-economic disparities on the incidence of these two subtypes of PLC.

Method: Data provided from FRANCIM the French cancer registry network, which covers 20% of the French territory, between 2006 and 2016. HCC was defined by topographic code C22.0 and morphological codes 8000, 8001 and 8170–8175. iCCA was defined by topographic code C22.1 and morphological codes 8000, 8001, 8050, 8140–8141, 8160–8161, 8260, 8440, 8480–8500 and 8570–8572. Each patient’s address was geolocalized and assigned to an IRIS, the smallest geographic unit in France. The socio-economic environment was assessed by the European deprivation index (EDI). The EDI based on the 2011 national census was used for each IRIS. Crude and standardized Incidence rates with 95% confidence intervals (CI) were estimated as the number of newly diagnosed cancer cases per 100,000 inhabitants. These were given for each IRIS, sex and age and over. Incidence rates by national quintiles were calculated, with quintile 1 (Q1) characterizing the most affluent areas and quintile 5 (Q5) characterizing the most deprived areas. A Poisson regression by subtypes was performed to model the impact of deprivation on the incidence of HCC and iCCA separately, using the continuous EDI.

Results: Between 2006 and 2016, the study population included 22 249 cases of PLC: 17 732 men and 4 517 women, over the period. HCC accounts for 79.64% of PLC with a male/female ratio of 5.6 and a mean age at diagnosis of 71 years. iCCA accounts for 16.97% of PLC with a male/female ratio of 1, 44 and a mean age at diagnosis of 69 years. iCCA accounts for 79.64% of PLC with a male/female ratio of 5.6 and a mean age at diagnosis of 71 years. iCCA accounts for 16.97% of PLC with a male/female ratio of 1, 44 and a mean age at diagnosis of 69 years. iCCA accounts for 79.64% of PLC with a male/female ratio of 5.6 and a mean age at diagnosis of 71 years. iCCA accounts for 16.97% of PLC with a male/female ratio of 1, 44 and a mean age at diagnosis of 69 years.

Conclusion: This population-based study showed that HCC account for the vast majority of PLC. Its incidence is lower in most affluent areas, and the risk of HCC is related to socioeconomic disparities, contrary to the risk of iCCA. This reinforces the need to study separately, HCC and iCCA, and to adjust public health measures to each subtype of PLC.

Key words: Epidemiology, cancer registries, socioeconomic inequalities, deprivation index, hepatocellular carcinoma, intrahepatic cholangiocarcinoma.

OS-118
Metabolic dysfunction associated fibrosis-5 (MAF-5) score to identify at-risk liver fibrosis and to predict prognosis in a population-based setting
Laurens van Kleef1, Seen Francque2, Jhon Prieto-Ortiz3, Milan Sonneveld1, Carlos B Sanchez Luque2, Robin G Prieto-Ortiz3, Wilhelmus Kwanten2, Luisa Vonghia6, An Verrijken6, Christophe De Block2, Zohir Gadi2, Harry La Janssen3, Robert De Knecht1, Willem Pieter Brouwer1, 1Erasmus MC University Medical Centre Rotterdam, Gastroenterology and Hepatology, Netherlands; 2UZA, Gastroenterology and Hepatology, Belgium; 3Center for Liver and Digestive Diseases (CEHYD), Bogota, Colombia
Email: w.p.brouwer@erasusmc.nl

Background and aims: There is an unmet need for non-invasive tools to improve case-finding and aid primary care professionals in referring patients at high risk of advanced liver disease.

Method: A metabolic dysfunction associated fibrosis (MAF-5) score was developed: an age-independent anthropometric-based non-invasive test, using the NHANES 2017 ≥8 kPa in an elderly population with metabolic dysfunction (Rotterdam study, N = 2,699), with shear-wave elastography (SWE ≥9.3 kPa) and biopsy-proven NAFLD according to META VIR (Bogota cohort, N = 231) and with biopsy-proven NAFLD according to NASH-CRN (Antwerp cohort, N = 562). Finally the score was tested for prognostic performance against all-cause mortality in participants from the NHANES III with metabolic dysfunction (N = 9,679).

Results: The MAF-5 score comprised waist circumference, BMI, diabetes, AST and platelets. With this score, 60.3% was predicted at LSP ≥ 8.0 kPa. Diagnostic accuracy was evaluated in the entire group and clinically relevant subgroups and compared to the FIB-4, NFS and SAFE. The score was externally validated with LSP ≥ 8.0 kPa in an elderly population with metabolic dysfunction (Rotterdam study, N = 2,699), with shear-wave elastography (SWE ≥9.3 kPa) and biopsy-proven NAFLD according to META VIR (Bogota cohort, N = 231) and with biopsy-proven NAFLD according to NASH-CRN (Antwerp cohort, N = 562). Finally the score was tested for prognostic performance against all-cause mortality in participants from the NHANES III with metabolic dysfunction (N = 9,679).

Conclusion: This population-based study showed that HCC account for the vast majority of PLC. Its incidence is lower in most affluent areas, and the risk of HCC is related to socioeconomic disparities, contrary to the risk of iCCA. This reinforces the need to study separately, HCC and iCCA, and to adjust public health measures to each subtype of PLC.

Key words: Epidemiology, cancer registries, socioeconomic inequalities, deprivation index, hepatocellular carcinoma, intrahepatic cholangiocarcinoma.

Table 1. Socioeconomic disparities in liver cancer incidence in French registries between 2006 and 2016 by subtypes

<table>
<thead>
<tr>
<th>PLC</th>
<th>Total</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCC</td>
<td>0.0111</td>
<td>(0.0079–0.144)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>iCCA</td>
<td>0.0033</td>
<td>(0.0062–0.0204)</td>
<td>0.0022</td>
</tr>
<tr>
<td>IRI</td>
<td>0.0021</td>
<td>(0.0085–0.0157)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

*The β coefficient is significant if different from the value and positive, there is an increase in cancer risk for the most deprived areas. *R* is significant and negative, the risk of cancer is higher for the deprived areas.
well as for SWE ≥9.3 kPa. MAF-5 was significantly associated with the presence of liver fibrosis according to both NAS-CRN (median MAF-5 for stages F0/F1/F2/F3/F4: 0.8/2.3/3.4/4.2, p < 0.001) and META VIR (median MAF-5 0.66/1.12/2.57/3.5, p < 0.001). Finally, MAF-5 score >1 was associated with increased risk of all-cause mortality in both unadjusted and adjusted models (HR 1.65, 95% CI 1.51–1.79).

Conclusion: The MAF-5 score is an inexpensive tool to identify individuals with metabolic dysfunction at high risk of liver fibrosis and all-cause mortality in a primary care setting, using only easily obtainable variables. Given the MAF-5 outperforms other first-line non-invasive tests, it can prevent unnecessary referrals and avoid extra diagnostic expenses.

**OS-119-YI**

Machine learning models are superior to FIB-4 as a first line stratification tool for liver disease in the community

Huw Purssell1,2, Mohamed Mostafa3, Lucy Bennett4, Richard Hammersley3, Oliver Street2, The ID LIVER Consortium2, Karen Piper Hanley2, Joanne Patel1, Neil Hanley1,2, Neil Guha3, Varinder Athwal1,2, Manchester University NHS Foundation Trust, Manchester, United Kingdom; 3University of Manchester, Faculty of Biology, Medicine and Health, Manchester, United Kingdom; 4Jiva.AI, Cardiff, United Kingdom; 5Nottingham University Hospitals NHS Foundation Trust and the University of Nottingham, NIHR Nottingham Biomedical Research Centre, United Kingdom

Email: Huw.Purssell@nmt.nhs.uk

**Background and aims:** Improving diagnostic tools for detecting early but significant liver disease remains a key challenge for reversing poor outcomes for chronic liver disease. Current testing regimens differ worldwide and are often opportunistic in nature leading to inequitable healthcare delivery. Machine learning (ML) has potential to improve diagnostics by revealing new insights and reducing resource utilisation through automation. We compared the performance of a ML derived model, based on routine clinical and laboratory variables, with the validated FIB-4 score in a UK community population with risk factors for CLD.

**Method:** Clinical and sociodemographic data from 2053 patients with risk factors for non-alcoholic liver disease (NAFLD) and alcohol related liver disease (ARLD) recruited to two different UK based cohorts was used; the Scarred Liver Project in Nottingham and the ID LIVER project in Manchester. All patients were over 18 years old and underwent transient elastography and bloods tests including aetiological screen and serum based fibrosis risk assessments. 78 common variables of routine demographic and laboratory data for both datasets were extracted. Transient elastography was used as the ground truth to indicate whether the patient had clinically significant liver fibrosis. The combined cohort was split randomly into training, validation and test cohorts. The FIB-4 score was calculated for all patients from the whole cohort. 1035 (50.4%) were obese and 885 (43.1%) had type 2 diabetes. The median alcohol consumption was 14.5 units per week. 377 (18.4%) had liver stiffness measurements greater than 8.0 kPa. 377 (18.4%) had liver stiffness measurements greater than 8.0 kPa. Training (n = 1395 (68.0%)), validation (n = 411 (20.0%)) and test (n = 247 (12.0%)) cohorts were matched to gender, BMI, ethnicity, alcohol units, presence of diabetes and median liver stiffness measurement. The FIB-4 score had sensitivity 89% specificity 11%, AUC 0.54 at predicting liver stiffness measurements greater than 8.0 kPa. In the ML algorithm, the 6 most important variables identified were Body Mass Index, Alanine Aminotransferase, Aspartate aminotransferase, Albumin, Mean Corpuscular Volume, Platelet count and Haemoglobin A1C. The ML Catboost model performed best of 9 models (Sensitivity 88% Specificity 53% AUC 0.81) in the unseen test cohort. Figure 1 shows the performance of this in comparison to FIB-4 score.

**Results:** 2053 patients with risk factors for liver disease were included in the whole cohort. 1035 (50.4%) were obese and 885 (43.1%) had type 2 diabetes. The median alcohol consumption was 14.5 units per week. 377 (18.4%) had liver stiffness measurements greater than 8.0 kPa. Training (n = 1395 (68.0%)), validation (n = 411 (20.0%)) and test (n = 247 (12.0%)) cohorts were matched to gender, BMI, ethnicity, alcohol units, presence of diabetes and median liver stiffness measurement. The FIB-4 score had sensitivity 89% specificity 11%, AUC 0.54 at predicting liver stiffness measurements greater than 8.0 kPa. In the ML algorithm, the 6 most important variables identified were Body Mass Index, Alanine Aminotransferase, Aspartate aminotransferase, Albumin, Mean Corpuscular Volume, Platelet count and Haemoglobin A1C. The ML Catboost model performed best of 9 models (Sensitivity 88% Specificity 53% AUC 0.81) in the unseen test cohort. Figure 1 shows the performance of this in comparison to FIB-4 score.

**Conclusion:** Machine learning derived algorithms that include patient demographics and routinely available variables out-performs Fib-4 and results in improved stratification of CLD in a community setting.

---

**Rare liver diseases**

**OS-120**

Fazirsiran reduces liver Z-alpha-1 antitrypsin synthesis, decreases globule burden and improves histological measures of liver disease in adults with alpha-1 antitrypsin deficiency: a randomized placebo-controlled phase 2 study

Virginia Clark1,2, Charlton Strange3, Pavel Strnad4, Antonio Sanchez5, Paul Yien Kwo6, Vitor Magno Pereira7, Bart Van Hoek8, Igor Barjaktarevic9, Angelo Guido Corsico10, Monica Pons11, Monica Goldklang12, Meagan Gray13, Brooks Kuhn14, Hugo Vargas15, John M. Vierling16, Raj Vuppalanchi17, Mark Brantly1, Naomi Kappe4, Ting Chang18, Thomas Schluep18, Min Yi18, James Hamilton18, Javier San Martin18, Rohit Loomba19, 1University of Florida, Gainesville, FL, USA, United States; 2University of Florida, Gainesville, United States; 3Medical University of South Carolina, Charleston, SC, USA, United States; 4University Hospital Aachen, Aachen, Germany, United States; 5University of Iowa, Iowa City, IA, USA, United States; 6Stanford University, Stanford, CA, USA, United States; 7Funchal Central Hospital, Funchal, Madeira, Portugal, United States; 8Leiden University Medical Center, Leiden, Netherlands, Netherlands; 9University of California Los Angeles, CA, USA, United States; 10Foundation IRCCS San Matteo Hospital and Pavia University, Pavia, Italy, Italy; 11Vall d’Hebron University Hospital, Barcelona, Spain, United States; 12Columbia University Medical Center, New York, USA, United States; 13University of Alabama at Birmingham, Birmingham, AL, USA, United States; 14UC Davis Medical Center, Sacramento, CA, USA, United States; 15Mayo Clinic in Arizona, Phoenix, AZ, USA, United States; 16Baylor College of Medicine, Houston, TX, USA, United States; 17Indiana University School of Medicine, IN, USA, United States; 18Arrowhead Pharmaceuticals, Pasadena, CA, USA, United States; 19UC San Diego Medical Center, San Diego, CA, USA, United States

Email: virginia.clark@medicine.ufl.edu

**Figure:** Comparison of performance of FIB-4 score with cut off 1.3 with machine learning model

---

**ORAL PRESENTATIONS**
Background and aims: Alpha-1 antitrypsin (AAT) deficiency, caused by homozygous protease inhibitor ZZ (PiZZ) mutations, results in production of mutant Z-proteins (Z-AAT) that aggregate in hepatocytes, leading to progressive liver dysfunction and fibrosis. Fazirsiran, an investigational RNA interference therapeutic, degrades liver Z-AAT messenger RNA to reduce Z-AAT synthesis. This study evaluated safety, pharmacodynamic and histologic effects of fazirsiran in adults with PiZZ AAT deficiency.

Method: This ongoing, placebo (PBO)-controlled, phase 2 study (NCT03945292) randomized participants (PIT) to subcutaneous PBO or fazirsiran 25/100/200 mg doses. The primary end point was change from baseline (BL) in serum Z-AAT concentration at week (wk) 16. PTP with biopsy-proven liver fibrosis underwent liver biopsy at BL and received treatment on day 1, wk 4, and then every 12 wks, and underwent a second liver biopsy at or after wk 48. PTP without liver fibrosis received 2 treatment doses on day 1 and wk 4. Three blinded central pathologists scored and adjudicated histological parameters, including hepatic globule burden (periodic acid-Schiff (PAS)+D staining (score 0–9), portal inflammation (score 0–3), and fibrosis score (F0–F4 METAVIR staging). Change from BL in serum and total liver Z-AAT concentrations were measured using liquid chromatography-tandem mass spectrometry.

Results: Forty PTP were enrolled (PBO [n = 14]; fazirsiran 25 mg [n = 9], 100 mg [n = 8], 200 mg [n = 9]). Fazirsiran reduced serum Z-AAT levels in a dose-dependent manner at wk 16 compared with PBO (p < 0.001), with mean relative reductions of 92% in the 200 mg group. Sustained reductions in serum Z-AAT up to wk 52 were observed with fazirsiran treatment. At post-BL liver biopsy, median reduction in liver Z-AAT was 94% with fazirsiran, compared with a median increase of 26% with PBO. Concomitant reduction from BL in hepatic PAS+D globule burden was observed with fazirsiran (mean [standard deviation (SD)] score of 5.9 [2.24] at BL and 2.3 [2.24] at post-BL visit), compared with no change with PBO (mean [SD] score of 6.9 [1.76] at BL and 6.6 [2.13] at post-BL visit). In PTP with BL score >0, portal inflammation improved in 5/12 PTP in the fazirsiran group vs. 0/8 PTP in the PBO group. In PTP with adjudicated liver fibrosis >F0 at BL, ≥ 1-point improvement in META VIR score occurred in 7/14 PTP in the fazirsiran group vs. 3/8 PTP in the PBO group. Fazirsiran was well tolerated without any adverse events leading to study/drug discontinuation and no treatment-associated decline in pulmonary function.

Conclusion: Fazirsiran reduced serum and liver concentrations of Z-AAT and hepatic PAS+D globule burden in all treated PTPs compared with PBO, leading to improved liver portal inflammation. These results support further development of fazirsiran in larger phase 3 studies.

OS-121-YI
Performance of spleen stiffness measurement by vibration-controlled transient elastography to rule out high-risk varices in patients with porto-sinusoidal vascular disorder
Lucile Moga1,2, Valérie Paradis2, Koushik Gundavalli3, Joel Silva4,5,6, Antonio Colechía7,8, Federico Ravioli9,10, Oana Nicoara-Farcau11,12, Giulia Tosetti1,13, Annalisa Berzigotti14, Bogdan Procopet15, Macarena Simón-Taler16, Laura Turco16, Francisco Capini17, Laura Elkrief18, Jose Alberto Ferrusquia Acosta19, Odile Gorria20, Lorenz Balcar21, Lannes Adrien22,23, Vincent Mallet24, Teresa Monllor-Nunell19, Giovanni Vitale20, Carlos Noronha Ferreira17, Laure Elkrief18, Jose Alberto Ferrusquia Acosta19, Odile Goria20, Lorenz Balcar21, Lannes Adrien22,23, Vincent Mallet24, Teresa Monllor-Nunell19, Giovanni Vitale20, Carlos Noronha Ferreira17, Jude Vidal-González15, Andreea Fodor11, Antonina Antonenko14, Riccardo Caccia13, Fanny Turon13, Elton Daflu16, Filippo Scopelian13, Federica Indullti6, Guilherme Macedo16,8, Sai Prasanth Rampally4, Audrey Payancé1,2, Castera Laurent19, Arun Valsan14, Aurélie Plessier1, Pierre-Emmanuel Rautou1,2,1, Hôpital Beaujon-Assistance Publique-Hôpitaux de Paris, Hepatology-Centre de Référence des Maladies Vasculaires du Foie, Clichy, France; 2Inserm, Centre de recherche sur l'inflammation-UMR 1149, Paris, France; 3Hôpital Beaujon-Assistance Publique-Hôpitaux de Paris, Département d’Anatomie Pathologique, Clichy, France; 4Anritta Institute of Medical Sciences, Hepatology and Transplantation Unit, Department of Gastroenterology, Kochi, India; 5Centro Hospitalar Universitário de São João, Gastroenterology Department, Porto, Portugal; 6Facultad de Medicina da Universidade do Porto, Porto, Portugal; 7University Hospital of Modena, Gastroenterology Unit, Department of Medical Specialties, Modena, Italy; 8University of Modena and Reggio Emilia, Modena, Italy; 9University Hospital of Bologna, Department of Medical and Surgical Sciences, Bologna, Italy; 10University of Bologna, Bologna, Italy; 11University of Medicine and Pharmacy “Iuliu Hatieganu,” 3rd Medical Clinic and Regional Institute of Gastroenterology and Hepatology “Prof. Dr. Octavian Fodor,” Hepatology Department, Cluj-Napoca, Romania; 12Hospital Clinic, Hepatic Hemodynamic Department, Liver Unit, Barcelona, Spain; 13Foundation IRCCS Ca ’ Granda Ospedale Maggiore Policlinico, Division of Gastroenterology and Hepatology, Milan, Italy; 14Inselepsital, Universitätsklinik für Viszerale Chirurgie und Medizin, Bern, Switzerland; 15Hospital Vall d’Hebron, Liver Unit, Department of Internal Medicine, Barcelona, Spain; 16IRCCS Azienda Ospedaliero-Università di Bologna, Internal Medicine Unit for the Treatment of Severe Organ Failure, Bologna, Italy; 17Centro Hospitalar Universitário Lisboa Norte, Serviço de Gastroenterologia e Hepatologia, Lisboa, Portugal; 18CHRU de Tours-Hôpital Trousseau, Service d’Hépato-Gastro-Entérologie, Tours, France; 19Hospital Universitari Parc Taulí, Liver Unit, Sabadell, Spain; 20Hôpital Charles Nicolle-CHU de Rouen, Service d’Hépato-gastroentérologie et Oncologie digestive, Rouen, France; 21Medical University of Vienna, Department of Medicine III-Division of Gastroenterology and Hepatology, Vienna, Austria; 22CHU Angers, Hépatogastro-entérologie et oncologie digestive, Angers, France; 23CHU Angers, Maine et Loire, ANGERS, France; 24Hôpital Cochin-Assistance Publique-Hôpitaux de Paris, Gastro-entérologie et hépatologie, Paris, France; 25Hôpital Saint-Antoine-Assistance Publique-Hôpitaux de Paris, Hepatologie, Paris, France; 26Hôpital Pitié Salpêtrière-Assistance Publique-Hôpitaux de Paris, Hepatogastroenterology Department, Liver Intensive Care Unit, Paris, France; 27Inserm, Centre de recherche Saint-Antoine-UMR-S 938, Paris, France; 28Hôpital Pontchaillou-CHU de Rennes, Centre hépato-digestif-Maladies du foie, Rennes, France; 29Changi General Hospital, Department of Gastroenterology and Hepatology, Singapore, Singapore; 30Hôpital Beaujon-Assistance Publique-Hôpitaux de Paris, Hépatologie, Clichy, France. Email: lucile.moga@gmail.com

Background and aims: Spleen stiffness is associated with the severity of portal hypertension in patients with cirrhosis. Baveno VII consensus suggests that screening endoscopy can be safely avoided in patients with cirrhosis and a spleen stiffness measurement (SSM) by vibration-controlled transient elastography (VCTE) ≤40 kPa as they have a low probability of high-risk varices (HRV). In portosinusoidal vascular disorder (PSVD), endoscopic screening for varices is recommended in all patients. Whether SSM could also avoid endoscopies in patients with PSVD is currently unknown. This study aims to evaluate the performance of SSM by VCTE to rule out high-risk varices (i.e. large varices, or red spot signs, or previous variceal band ligation) in patients with PSVD.

Method: All the patients with PSVD, according to Baveno VII definition, and at least one sign of portal hypertension, who underwent a liver biopsy between 2012 and 2022 at our center, and SSM by VCTE using FibroScan® performed within two years before or after an endoscopy, have been included. Patients with cavernoma or complete portal vein thrombosis at the time of liver biopsy, prior TIPS, or tense ascites at the time of SSM by TE, have not been included. Performance of SSM by VCTE was externally validated in a cohort of PSVD patients from 21 VALDIG centers, using the same inclusion and non-inclusion criteria.
Results: 154 patients were included in the derivation cohort: 56% men, median age 53, 75% with ≥1 condition known to be associated with PSVD. Median INR was 1.08 (IQR 0.99–1.24), median serum bilirubin 14 µmol/L (IQR 9–22), and median serum creatinine 70 µmol/L (IQR 61–86). A history of variceal bleeding was present in 16% of the patients, and 46% had HRV. Median SSM was 46.8 kPa (IQR 30.0–70.3). By univariate analysis, platelet count, serum bilirubin, serum albumin, spleen size, portosystemic collaterals, partial occlusion of portal venous axis, LSPS, and SSM by VCTE were associated with HRV status. By multivariate logistic regression analysis, only serum bilirubin (p = 0.003) and SSM by VCTE (p < 0.0001) remained associated with HRV. SSM by VCTE ≤40 kPa had a sensitivity of 87% to rule out HRV. This cutoff would avoid 45% of screening endoscopies, but with 13% of HRV missed, and a negative predictive value (NPV) of 87%. SSM by VCTE ≤40 kPa combined with serum bilirubin <17 µmol/L had a sensitivity of 96% to rule out HRV, and could avoid 34% of screening endoscopies, with 4% of HRV missed, and a NPV of 94%. In the validation cohort including 207 patients with similar characteristics, the combination of SSM and serum bilirubin could avoid 17% of screening endoscopies, with 4.7% of HRV missed, and a NPV of 86%.

Conclusion: This study gathering a total of 361 patients with PSVD showed that SSM by VCTE ≤40 kPa combined with serum bilirubin <17 µmol/L identifies patients with PSVD with very low risk (<5%) of HRV, in whom screening endoscopy can be avoided.

OS-122
Final results from a phase 1/2, 48-month, open-label extension study of givosiran in patients with acute intermittent porphyria
Eliane Sardh1, Manisha Balwani2, David Rees3, Karl Anderson4, Gang Jia5, Marianne T Sweetser5, Bruce Wang6. 1Karolinska University Hospital, Karolinska Institutet, Stockholm, Sweden; 2Icahn School of Medicine, Department of Genetics and Genomic Sciences, New York, United States; 4King’s College Hospital, United Kingdom; 5University of Texas Medical Branch, United States; 6University of California San Francisco, Department of Medicine and UCSF Liver Center, San Francisco, United States

Background and aims: Acute hepatic porphyrias (AHPs) are rare genetic disorders that can lead to accumulation of the neurotoxic intermediates 5-aminolevulinic acid (ALA) and porphobilinogen (PBG). The clinical presentation of AHPs, including the most common AHP, acute intermittent porphyria (AIP), is characterized by acute neurovisceral attacks, chronic symptoms, and long-term complications. Givosiran is an RNA interference therapeutic for AHP. In a phase 1 study in AIP (NCT02452372), once-monthly givosiran treatment led to sustained reductions in ALA and PBG levels and a lower annualized rate of porphyria attacks and hemin use versus placebo. We report final results from a phase 1/2 open-label extension study (NCT02949830) of the safety and efficacy of up to 48 months of givosiran treatment.

Method: Patient eligibility criteria for this multicenter study were AIP diagnosis, completion of the phase 1 trial, and absence of a prophylactic hemin regimen. Patients received givosiran 2.5 mg/kg once monthly, 5.0 mg/kg once monthly, or 5.0 mg/kg once every 3 months; eventually, all patients transitioned to 2.5 mg/kg once monthly.

Results: Of 16 patients enrolled, 14 completed the study. Mean (SD) age was 37.4 (12.0) years. Most patients were White (81%) and female (88%). Fourteen patients (88%) reported at least 1 adverse event (AE) related to study drug. The most common treatment-related AEs were injection-site erythema (N = 6; 38%) and injection-site pruritus (N = 4; 25%); most were mild or moderate in severity, and none led to treatment discontinuation. One (6%) patient experienced a serious treatment-related AE of anaphylaxis, leading to study withdrawal. Two patients experienced AEs of elevated alanine aminotransferase, and 1 experienced elevated blood homocysteine. Long-term treatment with givosiran 2.5 mg/kg once monthly led to a sustained improvement in ALA and PBG levels and an annualized rate of porphyria attacks.

Figure 1. Performance of spleen stiffness measurement by vibration-controlled transient elastography combined with serum bilirubin to rule out high-risk varices in patients with porto-sinusoidal vascular disorder

Figure: (abstract: OS-121-YI)
reduction in composite porphyria attacks, with a mean annualized attack rate of 0.4 (98% reduction), as well as a decrease in the mean rate of hemin use, from 33.1 doses/year during run-in to 0.9 dose/year (97% reduction) during this study. Sustained reductions in ALA and PBG levels were also observed. Exploratory assessments showed that quality-of-life scores improved over time.

**Conclusion:** This longest follow-up (up to 48 months) of patients receiving monthly givosiran treatment demonstrated acceptable safety, durable clinical response, and improvements in quality-of-life scores.

**OS-123-YI**

**Porto sinusoidal vascular liver disorder: natural history and long-term outcome**

Martina Magaz1, Héloïse Giudicelli-Lett2, Juan Albradles3, Gána Nicoara-Farcău4, Neil Rajoraya5, Ashish Goel5, Karlien Raymenants6, Sophie Hilaire7, Luís Téllez8, Laure Elkrief8, Lara Orts9, Akash Shukla2, Hélène Larrue10, Helena Degroote10, Victoria Aguileran10, Elba Llop11, Laura Turco15, Stefania Gioia16, Giulia Tosetti17, Nicolò Bitto17, Chiara Becchetti17, Edilmar Alvarado-Tabiap19, Cristina Roig20, Raquel Diaza20, Michael Praktiknjo21, Anna-Lena Konik21, Guillem Soya22, Pol Olivas21, Jose Ignacio Fortea22, Helena Masnou22, Angela Puente22, Alba Ardevol23, Mari Carmen Alvarez-Navascues24, Marta Romero-Gutiérrez25, Bernhard Scheinert26, Georg Semmler26, Mathias Mandorfer27, Filipe de Sousa Damião27, Anna Baiges28, Fanny Turon2, Macarena Simón-Talero28, Carlos González-Alayón28, Alba Diaz29, Maria Angeles García-Criado30, Andrea de Gottardi30, Joan Nesca31, Olivier Roux31, Carlos Noronha Ferreira32, Thomas Reiberger33, Manuel Rodriguez33, Rosa M Morillas33, Sarah Shalby34, Javier Crespo35, Jonel Trebicka36, Rafael Bahares37, Cándid Villanueva38, Annalisa Berzignati39, Massimo Primignani39, Vincenzo La Mura37, Olivier Riggi34, Filippo Scheips34, Federica Indutili35, Bogdan Procopet36, Xavier Verhelst37, José Luis Calleja Panero38, Christophe Bureil2, Filipe Gaio Castro Nery39, Agustin Albillos50, Frederik Nevens49, Virginia Hernez-Garea1, Dhíraj Tripathi2, Pierre-Emmanuel Rauté41, Juan Carlos Garcia Pagan41, Hepatic hemodynamic lab, Barcelona, IDIBAPS, CIBEREHD, ERN-Liver, Spain.2, Service d’Hépatologie, Centre de Référence des Maladies Vasculaires du Foie, DHU Unity, Pôle des Maladies de l’Appareil Digestif, Hôpital Beaujon, AP-HP, Clichy, France, France.4, Liver Unit, Division of Gastroenterology, University of Alberta, Edmonton, AB, Canada, Canada.5, Regional Institute of Gastroenterology and Hepatology “Ottavano Fodor”, Hepatology Department and “Iuliu Hatieganu” University of Medicine and Pharmacy, 3rd Medical Clinic, Cluj-Napoca, Romania., Romania.6, “The Liver Unit, University Hospital Birmingham NHS Foundation Trust, Birmingham, UK, United Kingdom, Department of Gastroenterology and Hepatology, University Hospital KU Leuven, Leuven, Belgium, Belgium.7, Department of Gastroenterology and Hepatology, Hospital Universitario Ramón y Cajal, IRYCIS, CIBEREHD, Universidad de Alcalá, Madrid, Spain., Spain.8, Service d’Hépatogastroentérologie, CHU de Tours, France. Université de Paris, Centre de recherche sur l’inflammation, Inserm, U1149, CRNS, ERL8252, F-75018 Paris, France, France.9, Hospital Clinic, Spain.10, Seth GS Medical College and KEM Hospital, Sion, Mumbai, India, India.11, Department of Gastroenterology, Rangueil Hospital, CHU Toulouse, University Paul Sabatier of Toulouse, France, France.12, Department of Gastroenterology and Hepatology, Ghent University Hospital, Ghent, Belgium, Belgium.13, Liver Transplantation and Hepatology Unit, Hospital Universitari i Politècnic La Fe, Valencia, Spain. CIBEREhd (Centro de Investigación Biomédica en Red En Enfermedades Hepáticas y Digestivas, Valencia Spain), Instituto de Salud Carlos III, Spain.14, Liver Unit, Hospital U. Puerta de Hierro. Universidad Autónoma de Madrid, CIBEREhd, Madrid, Spain., Spain.15, Department of Gastroenterology and Hepatology, University of Modena and Reggio Emilia and Azienda Ospedaliero-Universitaria di Modena, Italy, Italy.16, Department of Gastroenterology and Hepatology, Centre for the Diagnosis and Treatment of Portal Hypertension, “Sapienza” University of Rome. Rome, Italy, Italy.17, Foundation IRCCS Ca Granda Ospedale Maggiore Policlinico, Division of Gastroenterology and Hepatology, CRC “A.M.and A.Migliaiavacca” Center for Liver Disease, Milan, Italy, Italy.18, University Clinic for Visceral Surgery and Medicine, Inselspital, Bern University Hospital, University of Bern, Bern, Switzerland.19, Liver Unit, Department of Gastroenterology Hospital Sant Pau, Barcelona, Autonomous University, Barcelona, Spain. Centro de Investigación Biomédica en Red de Enfermedades Hepáticas y Digestivas (CIBEREhd), Barcelona, Spain, Spain.20, Department of Gastroenterology and Hepatology, University Gregorio Marañón Hospital, IISCM, CIBEREhd, Barcelona, Spain., Spain.21, Department of Internal Medicine I, University Hospital Bonn, Bonn, Germany., Germany.22, Liver Unit, Digestive Disease Department, Marqués de Valdecilla University Hospital, Santander, Cantabria University, Spain., Spain.23, Liver Unit, University Hospital Germans Trias i Pujol, Badalona, Spain. Centro de Biomedical Research in Liver and Digestive Diseases Network (CIBEREhd), Spain.24, Liver Unit, Department of Gastroenterology and Hepatology, Hospital Universitario Central de Asturias, University of Oviedo, Oviedo, Spain., Spain.25, Liver Unit, Department of Gastroenterology, Hospital Virgen de la Salud, Toledo, Spain., Spain.26, Vienna Hepatic Hemodynamic Lab, Medical University of Vienna, Vienna, Austria, Austria.27, Department of Gastroenterology and Hepatology, Hospital de Santa María-Centro Hospitalar Universitario Lisboa Norte, Lisbon, Portugal., Portugal.28, Liver Unit, Department of Internal Medicine, Hospital Universitari Vall d’Hebron, Vall d’Hebron Research Institute (VHIR), Vall d’Hebron Barcelona Hospital Campus, CIBEREhd, Universitat Autònoma de Barcelona, Barcelona, Spain., Spain.29, Liver Unit, Department of Gastroenterology and Hepatology, Hospital Universitario de Canarias. Tenerife, Spain., Spain.30, Department of Histopathology, Hospital Clinic, Institut de Investigacions Biomèdiques August Pi i Sunyer (IDIBAPS), University of Barcelona, Barcelona, Spain., Spain.31, Department of Radiology, Hospital Universitari Vall de Hebron, Barcelona, Spain, Spain.32, Service di Gastroenterologia e Epato-Paticologia, Ente Ospedaliero Cantonale, Università della Svizzera Italiana, Lugano, Switzerland., Switzerland.33, Foundation IRCCS Ca’ Granda Ospedale Maggiore Policlinico, Division of Gastroenterology and Hepatology, CRC “A.M.and A.Migliaiavacca” Center for Liver Disease, Milan, Italy, Italy.34, Department of Gastroenterology and Hepatology, University of Modena and Reggio Emilia and Azienda Ospedaliero-Universitaria di Modena, Italy., Italy.35, Liver Unit, Centro Hospitalar do Porto, Hospital Sto Antonio, Porto, Portugal, Portugal Email: martamagz@gmail.com

**Background and aims:** The natural history and prognostic factors in portosinusoidal vascular disorder (PSVD) are not well understood. Aim: to describe the natural history of and prognostic factors in PSVD patients with portal hypertension (PH).

**Method:** Retrospective multicentric study of patients with PSVD and PH prospectively registered in 28 European centres. PSVD patients without an associated condition, or with an associated condition that usually impacts on life expectancy (e.g. autoimmune hypothyroidism), or with a controlled associated condition were classified as having "no or mild associated conditions." The remaining PSVD patients with an active associated condition known to potentially negatively impact life expectancy, (e.g. severe lupus with kidney involvement), were classified as having a “severe associated condition.” Cox analysis was performed to identify variables with an independent predictive value for transplant-free survival.

**Results:** A total of 587 patients (38% women) were identified. At PSVD diagnosis, median age was 47 (33;59) years: 377 (64%) were asymptomatic. 210 patients had a PH complication as first manifestation: 87 (41%) variceal bleeding, 92 (43.8%) ascites, 25 (12%) variceal bleeding plus ascites, 11 (5%) hepatic encephalopathy (HE; 4 of them together with variceal bleeding and in 7 coexistent with ascites) and 13 (6%) dyspnea (seven of them coexisting with ascites). Median Child-Pugh at diagnosis was 5 (6;11), MELD 8 (7;11), total serum bilirubin 1 (0.6;1.4) mg/dL, INR 1.1 (1.12). Associated conditions
ORAL PRESENTATIONS

included: autoimmune (23%), hematologic (9%), HIV (9%), azathioprine (8%), oxaliplatin (7%), prothrombotic (8%), hereditary (4%), others (1%), while 32% had no other conditions (idiopathic). In 157 patients, the associated persistent condition was considered severe. Median follow-up was 68 [1–469] months. Fifty (9%) patients were transplanted and 109 (19%) died (59 non-liver related death). Transplant-free survival was 97%, 93%, 83%, and 72% at 1, 2, 5, and 10 years, respectively. We developed a predictive model based on multivariable Cox regression analyses for transplant free survival including age, ascites, serum bilirubin, creatinine and albumin at diagnosis, and the severity of the associated underlying condition that showed good discrimination and calibration (bootstrapped c-statistic: 0.82, Integrated calibration index at 3 and 6 years: 0.008 and 0.011) (nomogram). An accurate HVPG was available in 327 patients (4;11). In this subgroup of patients, HVPG improved the predictive value of the model.

Figure:

Conclusion: Prognosis of patients with PSVD and PH is strongly determined by the presence of associated diseases. If diagnosis is made at the time of preserved liver function, long-term prognosis is good reinforcing the need of early diagnosis and management in centers of expertise.

OS-124-YI
Diagnosis by liver stiffness measurement of sinusoidal obstruction syndrome/veno-occlusive disease after hematopoietic stem cell transplantation: results from the Italian multicentric prospective study (ELASTOVOD)

Federico Ravaioli1,2,3, Antonio Colecchia2, Francesco Barbato1, Jacopo Peccatori1, Anna Grossi1, Barbara Sarina4, Maurizio Pompili7, Simona Sica2, Franco Locatelli8, Simone Cesarò6, Chiara Nozzi10, Anna Paola Iori11, Lucia Prezioso12, Stella Santaroni13, Franca Fagioli14, Attilio Olivieri15, Ester Vanni16, Giorgina Specchia17, Edoardo Benedetti18, Francesco Zalloi19, Fabrizio Pane20, Francesca Carobolante1, Maria Cristina Menconi12, Fabio Benedetti12, Francesca Patriarca14, Michele Malagola25, Riccardo Valladu26, Francesco Onida27, Vincenzo Pavone28, Amanda Vestitti2, Luigi Colecchia1, Elton Dajti1, Luigina Vanessa Alemann1, Giovanni Marasco1, Fabio Ciceri4, Arcangelo Prete1, Andrea Pession1, Davide Festi1, Francesca Bonifazi1, 1IRCCS Azienda Ospedaliero-Università di Bologna, Bologna, Italy, Italy; 2Gastroenterology Unit, Department of Medical Specialities (CHIMOMO), University of Modena and Reggio Emilia, Modena, Italy, Italy; 3Alma Mater Studiorum-Università di Bologna, Department of Medical and Surgical Sciences, Bologna, Italy; 4Unit of Hematology and Bone Marrow Transplantation, Division of Regenerative Medicine, Stem Cells and Gene Therapy, IRCCS San Raffaele Scientific Institute, Milan, Italy, Italy; 5ASST Papa Giovanni XXIII, Bergamo, Italy, Italy; 6Bone Marrow Unit, Humanitas Cancer Center, Rozzano, Milan, Italy, Italy; 7Department of Hematology Catholic University of Sacred Heart, Rome, Italy, Italy; 8Department of Hematology/Oncology, IRCCS Ospedale Pediatrico Bambino Gesù, Rome, Italy; 9Department of Gynecology/Obsetrics and Pediatrics, Sapienza University, Rome, Italy, Italy; 10Oncoematologia Pediatrica, Azienda Ospedaliera Universitaria Integrata, Verona, Italy, Italy; 11Department of Cellular Therapies and Transfusion Medicine, Careggi University Hospital, Florence, Italy, Italy; 12Department of Translational and Precision Medicine, Division of Allogeneic Transplantation, “Sapienza” University of Rome, Rome, Italy, Italy; 13Hematology and BMT Unit, Azienda Ospedaliero-Universitaria di Parma and Department of Medicine and Surgery, University of Parma, Italy, Italy; 14Department of Hematology, Transfusion Medicine and Biotechnologies, Ospedale Civile, Pescara, Italy, Italy; 15Pediatria Onco-Hematoma, Città della Salute e della Scienza di Torino, Turin, Italy, Italy; 16Clinica di Ematologia Azienda Ospedaliero-Universitaria, Ospedali Riuniti di Ancona, Ancona, Italy, Italy; 17Gastroenterology Unit, Città della salute e della scienza, Turin, Italy, Italy; 18Department of Emergency and Organ Transplantation (D.E.T.O.), Hematology Section, University of Bari, Italy, Italy; 19Hematology Unit, Department of Oncology, University of Pisa, Italy, Italy; 20Hematology Department, SS Antonio and Biagio and C. Arrigo Hospital, Alessandria Italy, Italy; 21UOC di Ematologia e Traintanti di Midollo, Azienda Ospedaliera Universitaria Federico II di Napoli, Napoli, Italy; 22Hematology Unit, Department of Medicine and Chirurgia, Università di Napoli Federico II, Napoli, Italy; 23UOC Ematologia, Ospedale dell’Angelo, Venezia, Mestre, Italy, Italy; 24Pediatric Oncohaematology Unit, Azienda Ospedaliera Universitaria Pisana, Pisa, Italy, Italy; 25Department of Clinical and Experimental Medicine, Hematology and Bone Marrow Transplant Unit, University of Verona, Verona, Italy, Italy; 26Clinica Ematologica, Azienda sanitaria Universitaria Integrata, DAME, Università di Udine, Udine, Italy, Italy; 27Unit of Blood Diseases and Stem Cell Transplantation, ASST-Spedali Civili di Brescia, Department of Clinical and Experimental Sciences, University of Brescia, Brescia, Italy, Italy; 28IRCCS Policlinico San Martino IST, Genova, Italy, Italy; 29Hematology and Bone Marrow Transplantation Center, Fondazione IRCCS Ospedale Maggiore Policlinico/University of Milan, Milan, Italy, Italy; 30A.O. C. Panico, U.O.C Ematologia e Trapianto, Tricase, Italy, Italy; Email: f.ravaioli@unibo.it

Background and aims: Sinusoidal obstruction syndrome (SOS), also known as veno-occlusive disease (VOD), remains a serious complication for patients undergoing hematopoietic stem cell transplantation (HSCT). Improving diagnosis with non-invasive methods needs to be urgently investigated. Consequently, we aimed to evaluate the diagnostic role of the measurement of liver stiffness (LSM), assessed to be urgently investigated. Consequently, we aimed to evaluate the diagnostic role of the measurement of liver stiffness (LSM), assessed with different ultrasound elastography techniques, for diagnosing SOS.

Method: This interventional prospective multicenter clinical trial, from April 2018 to December 2021, consecutively and prospectively examined 1089 patients from 25 Italian centres undergoing HSCT. Sixty-nine (6.3%) patients were excluded for inadequate data quality; among the remaining 1020 patients, 80 did not perform at least one LSM assessment after HSCT and were consequently excluded. Patients were followed according to the protocol by a dense clinical, laboratory, and imaging program during hospitalization for HSCT and until the diagnosis of SOS, death, or +100-day follow-up. LSM was performed before the HSCT (T0), on days +9/10 (T1), +15/17 (T2), and +22/24 (T3) after the. The diagnosis of SOS was performed clinically by each participating centre. The primary end point of the study was the diagnostic role for SOS by LSM assessed by different elastography methods (ClinicalTrials.gov-number-NCT03426358).

Results: Among the 941 patients, 774 were adults, and 167 were children. Characteristics of the populations enrolled were reported in Table. Sixty per cent of patients were male with a mean age of 43.7 (SD 20.25) at the time of HSCT; the main HSCT indication was AML (40.3%), ALL (16.9%), NHL (7.1%), and myelofibrosis (6.6%). Most HStCs
were allogeneic (95%) from peripheral blood stem cell sources (79.2%) and myeloablative intensity conditioning (63.3%). The +100-days overall survival was 96.5% [95%CI 90.2–100] in the whole population and 75.0% [95%CI 53.3–100] in the SOS group (78.6% [95%CI 39.2–100] in mild and moderate and 50.0% [95%CI 18.4–100] in very severe). LSM was measured in kilopascals (kPa) in 90.9% and meter-second (m/sec) in 9.1% of cases and evaluated by transient elastography (FibroScan, Echosens, Paris), 2D shear wave elastography (2D-SWE), and point shear wave elastography (p-SWE) in 76%, 12.9%, and 11.1%, respectively. Median LSM values prior-HSCT (T0) were 4.9 kPa [IQR 3.9–12.9%, and 11.1%, respectively. LSM was measured in kilopascals (kPa) in 90.9% and meter-second (m/sec) in 9.1% of cases and evaluated by transient elastography (FibroScan, Echosens, Paris), 2D shear wave elastography (2D-SWE), and point shear wave elastography (p-SWE) in 76%, 12.9%, and 11.1%, respectively. Median LSM values prior-HSCT (T0) were 4.9 kPa [IQR 3.9–6.13] and 1.18 m/sec [IQR 1.01–1.4] with no significant difference (p value 0.350) according to SOS occurrence both by kPa (4.9vs5.0) and by m/sec (1.19vs1.02). LSM time point by time point (Fig1A), LSM values increased significantly in patients who developed SOS and differed between SOS severity grades (Fig1B). LSM values on the day of clinical diagnosis were significantly (p < 0.0001) associated both with SOS (OR 1.424 [95%CI 1.308–1.549]) and showed good diagnostic performance with a c-statistic of 0.975 [95%CI 0.948–1.000]. Comparable results were observed when LSM was evaluated in adults and paediatrics cohorts and by m/sec. Combination of the rule-in (25 kPa) and rule-out (6 kPa) cut-offs with deltaLSM (2x) in a stepwise algorithm achieved high values of PPV (84.2–98) and NPV (95–99) in all cohorts.

Conclusion: LSM, regardless of the elastography modality, has proven to be an accurate diagnostic tool for SOS. This non-invasive method can support the multidisciplinary team formed by hepatologists and haematologists and allows for diagnosing SOS/VOD.

Viral hepatitis C

OS-125
Outcomes of early vs late treatment initiation in solid organ transplantation from HCV NAT+ donors to HCV-uninfected recipients: results from the HCV-TARGET study

Wesam Aleyadeh1, Elizabeth Verna2, Hany Elbeshbeshy3, Mark S Sulikowski4, Coleman I. Smith5, Jama Darling6, Richard Sterling7, Andrew Muir8, Lucy Akushevich6, Danie La1, Michael W. Fried1, Jordan J. Feld1, 1Toronto General Hospital, Toronto Center for Liver Disease, Toronto, Canada; 2Columbia University Irving Medical Center, New York, United States; 3Saint Louis University School of Medicine, St. Louis, United States; 4The Johns Hopkins University School of Medicine, Baltimore, United States; 5MedStar Georgetown University Hospital, Washington, United States; 6University of North Carolina at Chapel Hill, Chapel Hill, United States; 7VCU Health System Authority, Richmond, United States; 8Duke University Medical Center, Durham, United States

Email: jordan.feld@uhn.ca

Background and aims: In North America (NA), the ongoing opioid overdose crisis has led to increasing organ transplantation from hepatitis C (HCV)-infected donors to HCV-uninfected recipients (D+R-). While early treatment is recommended in societal guidelines, the optimal timing of antiviral therapy remains unclear. We compared the safety and efficacy of early vs late HCV treatment initiation in D+R- non-liver solid organ recipients.

Method: Enrolled patients were treated with direct-acting antiviral (DAA) regimens per local standard of care at 10 NA sites. We compared efficacy and safety of HCV treatment between those who started before/within 7 days of transplant (Early) and those treated >7 days post-transplant (Late). The primary end point is sustained virological response (SVR12), defined as HCV RNA negativity 12 weeks post-treatment completion.

Results: 56 patients received Early treatment which included glecaprevir/pibrentasvir ± ezetimibe (GLE/PiB ± E) (n = 48) and sofosbuvir/velpatasvir (SOF/VEL) (n = 8). Treatment was initiated immediately before transplantation in GLE/PiB ± E, and by median day 5 and 4 in GLE/PiB and SOF/VEL, respectively. 102 participants received Late treatment which included SOF/VEL (n = 45), GLE/PiB (n = 49) and other regimens (n = 6). Two patients in the Late group did not start DAA treatment. Late treatment was initiated a median of 31 (range 8–114) days post-transplant. Median total treatment days was 8 (range 7–93) in Early vs 85 (range 51–111) in Late (p < 0.0001). There were 79 kidney, 50 lung, 23 heart, and 6 mixed transplants with similar distribution between groups. The proportion who achieved SVR12 was 92.9% (95% CI: 82.7–98.0) in the Early and 91.0% (95%CI: 83.6–95.8) in the Late groups, respectively. No participant in Early treatment group experienced non-response or relapse. In the Late group, 2 patients did not respond to treatment and 3 had post-treatment relapse. Of those with available virologic outcomes (n = 148) 100% (95% CI: 93.2–100.0) in Early and 94.8% (95%CI: 88.3–98.3) in Late groups achieved SVR12, respectively. Acute cellular rejection occurred in 11 (19.6%) recipients in the Early and 25 (25.0%) in the Late group, with 7 (12.5%) and 5 (4.9%) cases of biopsy-proven rejection requiring treatment. There were 11 patient deaths: all unrelated to HCV or HCV therapy: 8 in the Early group (1 during treatment), and 4 in the Late group (1 pre- and 3-post-treatment). HCV treatment was well tolerated in both groups.

Figure 1:
**Conclusion:** Solid non-liver organ transplantation in D+/R- recipients was safe with excellent graft and patient survival. Early treatment led to a non-significant lower rate of virological failure despite shorter duration treatment with numerically fewer episodes of acute rejection than with delayed therapy, supporting guideline recommendations for prompt treatment initiation.

**OS-126**

**Unusual HCV subtypes and retreatment outcomes in a cohort of European DAA-experienced patients**


**1Department of Internal Medicine I, Goethe University Hospital, Frankfurt, Germany (Vermehren@em.uni-frankfurt.de)**

**2Department of Gastroenterology, Hepatology, and Infectiology, University Hospital Tübingen, Tübingen, Germany (christoph.berg@med.uni-tuebingen.de)**

**3Department of Gastroenterology, Hepatology and Endocrinology, Medizinische Hochschule Hannover, Hannover, Germany (Port.Kerstin@mh-hannover.de, deterding.katja@mh-hannover.de)**

**4Institute for Interdisciplinary Medicine I, Goethe University Hospital Frankfurt, Germany (Vermehren@em.uni-frankfurt.de)**

**5Division of Hepatology, Department of Medicine II, University Hospital Würzburg, Würzburg (Geier_A2@ukw.de)**

**6Department of Medicine III, University Hospital Aachen, Aachen, Germany (tbruns@ukaachen.de)**

**7Department of Gastroenterology, Hepatology, and Infectiology, University Hospital Tübingen, Tübingen, Germany (christoph.berg@med.uni-tuebingen.de)**

**8Department of Gastroenterology, Hepatology, and Infectiology, University Hospital Leipzig, Leipzig, Germany (Thomas.Berg@medizin.uni-leipzig.de)**

**9Department of Gastroenterology, Hepatology, and Infectiology, University Hospital Zürich, Zürich, Switzerland (andreas.kremer@usz.ch, beat.muellhaupt@usz.ch)**

**10Swiss Hepato-Pancreato-Biliary Center and Department of Gastroenterology and Hepatology, University Hospital Zürich, Zürich, Switzerland (andreas.kremer@usz.ch, beat.muellhaupt@usz.ch)**

**11St. Josefs-Hospital, Wiesbaden, Germany Email: julia.dietz@em.uni-frankfurt.de**

**Background and aims:** The global HCV elimination targets could be achieved with highly effective direct acting antivirals (DAAs) for treatment of hepatitis C virus (HCV) infection. However, studies showed that unusual HCV genotypes (GT) that are uncommon in industrialised countries are associated with lower SVR (sustained virologic response) rates and second generation DAAs are not available in all countries. This study aimed to describe the prevalence of unusual GT and resistance-associated substitutions (RASs) among European DAA-failure patients.

**Method:** We have identified 1314 patients who had failed IFN-free DAA treatment in the European Resistance database between 2014 and 2022. NS3, NS5A and NS5B were amplified and population sequenced and RASs that had >2-fold increased DAA susceptibility were analysed. All HCV geno- and subtypes were re-evaluated sequence-based.

**Results:** Overall, 4% (58/1314) of DAA-failure patients were infected with an unusual subtype. We found different frequencies of unusual GT among DAA treatment failures, namely 46% (27/58) GT4 (4b, 4c, 4f, 4n, 4o, 4r, 4v), 24% (14/58) GT3 (3b, 3g, 3h, 3i, 3k), 12% (7/58) GT6 (6e, 6f, 6n, 6r), 10% (6/58) GT1 (1c, 1e, 1l) and 4% (2/58) each of GT2k and GT5a. The majority of patients with unusual GT (79%, 46/58) had failed to first-generation DAAs (LDV/SOF, DCV/SOF, 2D/3D, SOF/RBV, GZR/EBR) and only 21% (12/58) had failed to second-generation DAAs such as VEL/SOF or G/P.

**Conclusion:** We found unusual HCV GT in 4% of DAA-failure patients, mainly after failure to first generation DAA regimens. Retreatment with second generation DAAs was effective with 95% SVR. The lack of global availability of second generation DAAs could lead to the global HCV elimination targets not being met.

**Figure:** (abstract: OS-125) Recipient characteristics and outcomes
OS-127-YI
The risks of first hepatic decompensation and HCC remain constant during long-term follow-up and can be stratified by a one-time assessment after HCV-cure.

Georg Semmler1,2, Sonia Alonso Lopez3,4,5, Monica Pons6, Sabela Lenz7, Efthimios Daji8, Maria Griemsmann9, Alberto Zanetto10, Lukas Burghart11, Stephanie Hametner-Schreil12, Lukas Hartl1,2, Adriana Ahumada3, Sergio Rodriguez-Tajes7, Paola Zanaga8, Michael Schwarz1,2,11, Clara Uson3, Mathias Jachs1,2, Anna Pocurull7, Maria Luisa Manzano Alonso13, Dominik Ecker12, Daniel Riado14, Beatriz Mateos Muñoz15, Michael Gschwantler11, Francesco Paolo Russo10, Francesco Azzaroli7, Benjamin Maasoumy9, Thomas Reiberger1,2, Xavier Forns1, Joan Genesca10, Rafael Bahares1,2,3, Mathias Mandorfer1,2,1; Medical University of Vienna, Division of Gastroenterology and Hepatology, Department of Internal Medicine III, Vienna, Austria; 2Medical University of Vienna, Vienna Hepatic Hemodynamic Lab, Division of Gastroenterology and Hepatology, Department of Internal Medicine III, Vienna, Austria; 3Hospital General Universitario Gregorio Marañón, Liver Unit, Madrid, Spain; 4Instituto De Investigación Sanitaria Gregorio Marañón (ISCM), Madrid, Spain; 5Universidad Complutense de Madrid, Madrid, Spain; 6Vall d’Hebron University Hospital, Voll d’Hebron Institute of Research (VHIR), Vall d’Hebron Barcelona Hospital Campus, Universitat Autònoma de Barcelona, Liver Unit, Barcelona, Spain; 7Hospital Clinic, Universitat de Barcelona, Liver Unit, Barcelona, Spain; 8University of Bologna, Department of Medical and Surgical Sciences (DIMEC), Bologna, Italy; 9Hannover Medical School, Department of Gastroenterology, Hepatology and Endocrinology, Hannover, Germany; 10Padua University Hospital, Gastroenterology and Multivisceral Transplant Unit, Department of Surgery, Oncology, and Gastroenterology, Padua, Italy; 11Klinik Ottakring, Department of Internal Medicine IV, Vienna, Austria; 12Ordensklinikum Linz Barmherzige Schwestern, Department of Internal Medicine IV, Linz, Austria; 13Hospital Universitario 12 De Octubre, Liver Unit, Madrid, Spain; 14Hospital Universitario Fundación Alcorcón, Liver Unit, Madrid, Spain; 15Hospital Universitario Ramón y Cajal, Liver Unit, Madrid, Spain; 16Centro de Investigación Biomédica En Red de Enfermedades Hepáticas y Digestivas (CIBERehd), Instituto de Salud Carlos III, Madrid, Spain

Email: mattias.mandorfer@meduniwien.ac.at

Background and aims: The number of individuals who will be treated for and cured from HCV infection worldwide is expected to exceed 1 million per year for the next decade. In those with compensated advanced chronic liver disease (cACLD), the risks of de-novo hepatocellular carcinoma (HCC) and hepatic decompensation are decreased but not completely abolished by HCV-cure. Thus, risk stratification is key to decrease resource utilization by individualizing post-treatment management. We evaluated whether the incidences of HCC and hepatic decompensation decrease with time after HCV-cure and whether the discriminatory ability of a one-time post-treatment assessment is maintained during long-term follow-up.

Method: We retrospectively analyzed cACLD patients with paired liver stiffness measurement (LSM) and platelet count (PLT) before and after HCV-cure by interferon-free therapies from 7 European regions. Cumulative incidence curves were used to estimate the incidence of hepatic decompensation/HCC over time in the overall group and throughout previously defined risk strata (i.e., Baveno VII criteria for clinically significant portal hypertension after HCV-cure and Semmler et al, J Hepatol 2022 for HCC).

Results: 2347 patients (mean age 60 ± 12 years, 60% male, 21% obese, 21% diabetes) with a median LSM of 16.3 kPa (IQR: 12.1–24.5, 25% ≥25 kPa) before HCV-cure were followed for a median of 6.0 years after treatment. Interestingly, the incidence of first hepatic decompensation was strictly linear with 65 patients (2.8%) developing hepatic decompensation before eventually being diagnosed with HCC (incidence rate 0.57/100 patient years, incidence at 6 years: 3.1%, Figure-panel A). Similarly, incidence of HCC was also linear with 184 patients (7.8%) developing HCC (incidence rate 1.60/100 patient years, incidence at 6 years: 8.3%). Stratifying the risks for hepatic decompensation according to Baveno VII (Figure-panel B) and for HCC according to Semmler et al (algorithm based on age, LSM, albumin and alcohol consumption, Figure-panel C) after HCV-cure identified subgroups with a distinct prognosis during long-term follow-up, even after limiting prediction to events occurring >3 years after HCV-cure.

Conclusion: In patients with cACLD, the risks of hepatic decompensation, and more importantly, HCC remain constant after HCV-cure, even in the long-term (>3 years). A one-time post-treatment risk stratification based on non-invasive criteria conveys important prognostic information that is maintained during long-time follow-up, as the hazards over time remain proportional.

OS-128
Achieving a hepatitis C cure in those with hepatocellular carcinoma is associated with an improvement in overall survival: real world data

Maria Guerra Veloz1, Sital Shah1, James Lok1, Riham Soliman1, Almuthana Mohamed1, Mary D Cannon1, Paul Ross2, Ivana Carey1, Kosh Agarwal1, King’s College Hospital, Institute of Liver Studies, London, United Kingdom; 2Guy’s and St Thomas’ NHS Foundation Trust, Oncology, London, United Kingdom

Email: maria.guerraveloz@nhs.net

Background and aims: Achieving sustained virological response (SVR) has proved to improve clinical outcomes/survival rates in patients with chronic hepatitis C and HCC. However, the optimal time frame for delivering antiviral therapy in those with active infection remains unclear. The aim of this study was to provide real-world data on virological response and overall survival in patients with hepatitis

Figure:
C related HCC who were treated with direct acting antiviral (DAA) therapies at different time points.

**Method:** This retrospective cohort study included hepatitis C virus (HCV) positive patients who were diagnosed with HCC and managed at King’s College Hospital between January 2015 and 2020. Follow-up data was collected until death, liver transplantation or April 2022, whichever came first. Patients with historical or active HCC were included and information about tumour stage and treatments modality were collected. The latter was defined as curative (ablation, resection or liver transplantation) or non-curative (TACE, SIRT, SBRT or systemic therapy). The primary outcome was to compare the SVRs in both HCC groups, and the secondary outcome was to measure the overall survival.

**Results:** Of the 98 patients included, 82.7% (81) had active HCC at the time of DAA therapy and 17.3% (11) had a historical HCC. The majority (84.7%) were cirrhotic with compensated liver disease and 52% received curative HCC therapy. The overall SVR rate was 81.6%, but decreased to 75.7% in patients with active HCC. In the multivariate analysis, the presence of active HCC at the time of HCV therapy (HR, 5.46; 95% CI, 1.25–23.82, p = 0.024) and the number of HCC nodules (2.19 CI 95% 1.08–4.41, p = 0.029) were the only factors associated with not achieving SVR. Failure to achieve SVR (HR, 9.9; 95% CI, 2.16–46.01, p = 0.003), the presence of more advanced chronic liver disease (i.e. Child Pugh B/C HR 3.7: 95% CI 1.46–9.58) and administration of non-curative treatments (HR 3.2: 95% CI 1.19–8.44) were associated with mortality. The overall survival was higher in those who achieved SVR (130 m 95% CI 85–174) and this was consistently irrespective of treatment timing (historical HCC 119 m, 95% CI 102–135; active HCC 78 m, 95% CI 67–88), tumor stage (BCLC A 164 m, 95% CI 137–191; BCLC B/C 60 m, 95% CI 63–85) and treatment intent (curative 117 m 95% CI 107–128) and non-curative 75 m 95% CI 59–91) (log-rank test p = 0.003).

**Conclusion:** Treating Hepatitis C in patients with HCC is feasible with acceptable SVR rates. Failure to achieve SVR is one of the main factors associated with mortality. Overall survival was higher in those who achieved SVR and this was independent of tumor stage or treatment modality.

---

**OS-129-YI**

Real-world effectiveness of voxilaprevir/velpatasvir/sofosbuvir in hepatitis C patients with prior failure to DAA treatment

Christiana Graf1, Elisabetta Degasperi2, Roberta D’Ambrosio3, Jordi Llanasas4, Johannes Vermehren5, Georg Dultz5, Nils Wetzstein4, Eva Herrmann2, Stefan Zeuzem1, Mario Buri3, Pietro Lampertico2, Julia Dietz1, Christoph Sarrazin1,6.

1University Hospital Frankfurt, Department of Internal Medicine I, Frankfurt, Germany; 2Foundation IRCCS Ca’ Granda Ospedale Maggiore Policlinico, Division of Gastroenterology and Hepatology, Milan, Italy; 3University Hospital Vall d’Hebron, Department of Medicine of the UAB (Universitat Autònoma de Barcelona), Barcelona, Spain; 4University Hospital Frankfurt, Department of Internal Medicine, Infectious Diseases, Frankfurt, Germany; 5Goethe University Frankfurt, Institute of Biostatistics and Mathematical Modeling, Frankfurt, Germany; 6St. Joses-Hospital, Medizinische Klinik II, Wiesbaden, Germany

**Background and aims:** Voxilaprevir/velpatasvir/sofosbuvir (VOX/VEL/SOF) is approved for hepatitis-C-virus (HCV) retreatment of direct-acting antiviral agents (DAA)-experienced patients. However, data on its clinical use especially in difficult-to-treat patients remain scarce. The aim of the study was to analyze the effectiveness of VOX/VEL/SOF in a real-world setting.

**Method:** All consecutive patients with HCV retreated with VOX/VEL/SOF after DAA failure were enrolled between 2016 and 2021 in 227 centers of the European Resistance study group in Germany, Italy and Spain. Sustained virological response (SVR) was defined as undetectable HCV RNA 12 (SVR12) weeks after the end-of-treatment.

**Results:** A total of 746 patients were included: median age was 55 (21–84) years and 79% were male. The majority of patients were infected with HCV genotype 1 (56%) and 3 (32%), 87% of patients carried resistance associated substitutions (RAS) in the NS3, NS5A and NS5B region. Prior treatment failure to LDV/SOF, VEL/SOF and G/P was observed in 29% (n = 213), 17% (n = 123) and 8% (n = 58) of patients, respectively. Overall, per protocol (PP) SVR was 95.4% (683/716). Treatment effectiveness was significantly affected by advanced liver disease (SVR 12: 91%; p < 0.001), hepatocellular carcinoma (HCC).
(SVR 12: 86%; p < 0.001), higher baseline alanine aminotransferase (ALT) levels (p = 0.02), HCV GT 3 (SVR12: 91; p < 0.001) and prior VEL/SOF experience (SVR12: 90%; p = 0.01). However, in a multivariate analysis only HCV GT 3, HCC and liver cirrhosis turned out to be independent predictors of a treatment failure. RASs as well as the presence of rare genotypes did not impact treatment outcome of VOX/VEL/SOF. Ribavirin (RBV) was added in 8% of treatment courses and increased overall SVR rates (97%) as well as SVR rates in difficult-to-treat patients with HCV GT 3a (100%), liver cirrhosis (92.6%) and liver cancer (90%) insignificantly. Moreover, treatment effectiveness of rescue therapy with glecaprevir/pibrentasvir and sofosbuvir (G/P +SOF), which was initiated in 9 patients after VOX/VEL/SOF failure, was found to be high (SVR 12: 95%).

**Conclusion:** VOX/VEL/SOF represents an effective standard therapy for patients with prior DAA treatment failure. The addition of RBV or alternative retreatment with G/P+SOF, which was found to be effective in VOX/VEL/SOF treatment failures, may be considered in difficult-to-treat patients with HCV GT 3a, liver cirrhosis and liver cancer.
Late-breaker Posters

WEDNESDAY 21 TO SATURDAY 24 JUNE

LBP-01
HCV and HBV prevalence and associated risk factors among people who inject drugs in Kenya
Matthew Akiyama1, Lindsey Riback1, Mercy Nyakowa2, Chenshu Zhang2, Sarah Masryuko2, Rose Wafula2, Nazila Ganatra2.
1 Albert Einstein College of Medicine/Montefiore Medical Center, Medicine, Bronx, United States; 2 Kenya Ministry of Health, Kenya
Email: makiyama@montefiore.org

Background and aims: Injection drug use is an important risk factor for viral hepatitis in sub-Saharan Africa, but factors associated with seropositivity are poorly understood. Understanding the prevalence and transmission risk factors is critical to reducing prevalence and incidence among people who inject drugs (PWID). We assessed factors associated with hepatitis C antibody (anti-HCV) and hepatitis B (HBV) positivity among PWID in Kenya.

Method: We are recruiting 3,500 PWID from needle and syringe programs sites in Kenya. Participants are recruited using respondent driven sampling, complete biobehavioral surveys and receive HCV, HBV, and HIV testing. We conducted this analysis using chi-square tests for categorical values and t-tests for continuous variables.

Results: Among the 1526 participants enrolled, participants are mainly male (89.9%) and 34.4 years old (SD = ±8.6) on average. Roughly one-fifth, 314 (20.6%) are anti-HCV positive; regional prevalence is highest in the Coast (175/589, 29.7%), followed by Nairobi (137/589, 23.3%), and Western Region (2/348, 0.6%). HBV surface antigen (HBsAg) follows a similar gradation to HCV moving inland. Overall HBsAg prevalence is 1.4%; 13/589 (2.2%), 6/589 (1.0%) and 2/348 (0.6%), respectively.

Conclusion: Rising anti-HCV prevalence in Kenya (20.6% vs 13.0% in our previous survey) could be attributable to high engagement in risk behaviours such as shared injection equipment, suggesting a need to expand harm reduction interventions and include targeted approaches among PWID with sexual partners who also inject. Due to differing risk factors for HCV and HBV, once size fits all intervention may not be optimal. While preliminary, we anticipate these data will inform policy makers and programs on identifying viral hepatitis elimination and prevention strategies among PWID. Next steps include performing next generation HCV sequencing and phylogenetic analysis to characterize transmission networks and determine factors associated with transmission and cluster membership. We anticipate the latter will be leveraged for targeted elimination strategies to reduce viral hepatitis among PWID with potential for generalizability to other resource limited settings.

LBP-02
Using FIB-4’s parameters an explainable black-box machine learning model outperforms FIB-4 index on the diagnosis of advanced fibrosis of non alcohol related fatty liver disease patients in three cohorts from China, Malaysia and India
Athanasios Angelakis1,2,3, Tianlu Chen4,5,1 Amsterdam Public Health Research Institute, Netherlands; 2 University of Amsterdam, Netherlands; 3 Amsterdam University Medical Centers, Netherlands; 4 Shanghai Jiao Tong University, China; 5 Sixth People’s Hospital, China
Email: a.angelakis@amsterdамunc.nl

Background and aims: Non-alcoholic fatty liver disease (NAFLD) affects over 25% of the general population. FIB-4 index for liver fibrosis is an important non-invasive test which can be used to distinguish advanced fibrosis (F012 vs. F34 in metavir score). Our aim is to tune an explainable machine learning model using as features FIB-4’s variables which outperforms FIB-4 on the diagnosis of early/advanced fibrosis of patients with NAFLD.

Method: We use three cohorts from China (train), Malaysia (test1) and India (test2) consisting of 540 (early/advanced fibrosis) 391/149, 147 (116/31) and 97 (65/32) patients with liver biopsy validated hepatic fibrosis. The features of the datasets are: age, sex, alanine transaminase (ALT), aspartate transaminase (AST), platelet (PLT), the ratio AST/PLT and the FIB-4 score. For training the machine learning model on the train dataset and we test it on the test1 and on the test2. For tuning we use 10-fold cross validation (10CV) in order to gain more confidence in our machine learning model regarding its robustness. Even though the number of data instances of our train set is relatively low, we use categorical gradient boosted trees (catboost) which has shown great performance on similar size tabular datasets; it hardly overfits and it is robust. We use feature engineering in order to add more dimensions to our features’ space taking powers of products of the initial features. Tuned catboost’s parameters’ values are: iterates: 111, learning_rate: 0.12 and depth: 16; all other parameters have default values. From explainable artificial intelligence we use shapley values in order to understand the weight of features regarding the predictability of catboost.

Results: We compare our catboost’s performance with the FIB-4 score. Catboost on the training set using 10CV, on the test1 and one the test2 achieved the following performance: 10CV: Spec: 0.9301 ± 0.0616 C195[0.8235, 1.000], Sens: 0.5546 ± 0.1005 C195[0.3226, 0.75], AUC: 0.7950 ± 0.0616 C195[0.6809, 0.8902], test1: Spec: 0.9576, Sens: 0.4576, AUC: 0.7976, test2: Spec: 0.7759, Sens: 0.4872, AUC: 0.643. The performance of the FIB-4 using 1.3 as cutoff value was the following on the training set 10CV: Spec: 0.8500 ± 0.0744 C195[0.7436, 0.9667], Sens: 0.4893 ± 0.0855 C195[0.3750, 0.6667], AUC: 0.6997 ± 0.0692 C195[0.5691, 0.7871], test1: Spec: 0.9109, Sens: 0.4783, AUC: 0.7514, test2: Spec: 0.7414, Sens: 0.4359, AUC: 0.5964.
Using our method we observe a relative big improvement of the AUC on the train, test1 and test2 datasets regarding the performance of FIB-4, namely: 13.41%, 6.15% and 7.81%. Using shapey values we observe that the ten most important features regarding the predictability of catboost are: PLT*11, PLT*8, ALT*11, PLT*9, ALT*10, FIB4*3, Age*11, FIB4*2, FIB4*7, FIB4*5. None of this belongs to the initial features.

Figure:

Conclusion: Using data science approach, catboost, feature engineering and as features sex and FIB-4’s variables, we achieve better performance and more robust solution, than the FIB-4. Using explainable artificial intelligence we identify the importance of powers of the variables of FIB-4 which could lead to an improved version of FIB-4. In addition, we think we should start considering that the classification of NAFLD patients to early versus advanced fibrosis is not a problem which could be approached by linear cut-off values only. It is a more complicated problem and data science using explainable artificial intelligence could help.

LBP-03
Safety and efficacy of continuous infusion terlipressin (BIV201) in patients with decompensated cirrhosis and refractory ascites: a phase 2, randomized, controlled, open-label study
Jasmohan Bajaj1, Ethan Weinberg2, K. Rajender Reddy2, Andrew Keaveny3, Michael Poryako3, David Koch4, Paul Thuluvath5, Douglas Simontone6, Paolo Angelii7, Sujit Janardhan7, Eric Orman7, Sammy Saab7, Jeffrey Zhang7, Susan Clausen7, Penelope Markham7, 1Mayo Clinic, Rochester, United States; 8University of Padova, Italy; 7Mayo Clinic, Rochester, United States; 8University of Padova, Italy; 11Division of Infectious Diseases, Lausanne University Hospital, University of Bern, Bern, Switzerland; 12BioVie Inc., United States

Background and aims: Patients with cirrhosis and refractory ascites have a poor quality of life. The standard of care (SOC), which includes regular large-volume therapeutic paracentesis (TP), provides only temporary relief and is associated with significant medical complications. Terlipressin, an analog of vasopressin, improves renal perfusion and excretion. BIV201 (terlipressin administered as a continuous infusion by a small ambulatory pump) is being evaluated for reduction of ascites accumulation and related complications in a prospective, phase 2b, open-label, randomized trial.

Method: Fifteen, out of a total of 30, adult patients with diuretic-resistant ascites due to decompensated cirrhosis and 3 to 9 TP’s within the previous 60 days were enrolled, monitored for 14-28 days, and randomized 2:1 to receive either continuous infusion of BIV201 (3 mg/day; dose-adjusted to 2-4 mg/day) for two 28-day cycles plus SOC, separated by an up to 56-day washout period, or SOC alone, respectively, for a total of 180 days, followed by a 180-day, long-term follow-up phase. Here we report interim data analysis for safety, change in ascites accumulation (total ascites volume removed by TP), and related parameters.

Results: Mean age of the 15 enrolled patients was 61.3 years, mean MELD-Na was 15.4, and the mean CTP score was 8.7. 10 patients were randomized to receive BIV201 plus SOC and 5 patients received SOC alone. Five (50%) patients in the BIV201 group completed both 28-day infusion cycles; 5 patients discontinued during or at the end of treatment cycle 1. One patient in the SOC-only group withdrew consent at randomization. Patients who completed both treatment cycles of BIV201 plus SOC (n = 5) experienced mean reductions of 43% (p = 0.063) in ascites accumulation and 47% (p = 0.021) in the mean number of monthly TP’s, during the 3 months of treatment, compared with 3 months prior to treatment, vs respective mean reductions of 13% (p = 0.561) and 21% (p = 0.263) in the SOC-only group. In these patients, after 28 days of treatment, BIV201 treatment was associated with significant improvements in ascites-related symptoms scores (p = 0.006), pharmacodynamic measures related to ascites pathophysiology (reduction in serum creatinine [p = 0.019] and plasma renin activity [p = 0.048]), and health-related quality of life measured by the Chronic Liver Disease Questionnaire ([p = 0.002]), mainly driven by improvements in the abdominal domain. Treatment was generally well tolerated with 1 treatment-related serious adverse event (hyponatremia), which resolved upon treatment withdrawal.

Conclusion: These data indicate that treatment with BIV201 plus SOC may significantly reduce ascites accumulation and its associated symptoms compared with SOC alone. If confirmed in future studies, the current safety profile of BIV201 may support its use for outpatient administration in the treatment of refractory ascites.

LBP-04
Long-term trends of circulating hepatitis B virus RNA and hepatitis B core-related antigen levels in persons with HIV and functional hepatitis B cure during tenofovir therapy
Lorin Begre1,2, Anders Boyd3, Marie-Laure Plissonnier4, Barbara Testoni4, Franziska Suter-Riniker5, Charles Béguélin1, Jürgen Rockstroh6, Huldrych Günthard1,6, Alexander Calmy1, Matthias Cavassini1,6, Hans Hirsch1,6, Massimo Leverro1,6, Gilles Wandeler1, Fabien Zoulim1,2, Andri Rauch2, Department of Infectious Diseases, INSelpal, Bern University Hospital, University of Bern, Bern, Switzerland; 3Department of Infectious Diseases, Lausanne University Hospital, University of Lausanne, Lausanne, Switzerland; 4Department of Infectious Diseases and University of Claude Bernard Lyon 1 (UCLB1), Lyon, France; 5Department of Infectious Diseases, University Hospital Bonn, Bonn, Germany; 6Department of Infectious Diseases, University Hospital Zurich, Zurich, Switzerland; 7Institute of Medical Virology, University of Zurich, Zurich, Switzerland; 8Division of Infectious Diseases, University Hospital Geneva, University of Geneva, Geneva, Switzerland; 9Division of Infectious Diseases, Lausanne University Hospital, University of Lausanne, Lausanne, Switzerland; 10Division of Infectious Diseases and Hospital Epidemiology, University Hospital Basel, University of Basel, Basel, Switzerland; 11Hepatology Department, Hospices Civils de Lyon and University of Claude Bernard Lyon 1 (UCLB1), Lyon, France

Email: lorinaaron.begre@insel.ch

Background and aims: Patients with HBV-related cirrhosis and liver failure may experience viral breakthrough during antiviral therapy. In this study, we aimed to evaluate the long-term trends of circulating hepatitis B virus RNA and hepatitis B core-related antigen levels in persons with HIV and functional hepatitis B cure during tenofovir therapy.
therapy. We aimed to compare long-term trends of HBcAg and circulating HBV RNA levels in persons with HIV and HBV treated with tenofovir disoproxil fumarate or tenofovir alafenamide in the Swiss HIV Cohort Study.

**Method:** We included 29 participants experiencing functional HBV cure during tenofovir-containing antiretroviral therapy (ART) and 29 participants without functional HBV cure matched 1:1 based on age, sex, prior treatment with lamivudine and CD4+ T-cell count. We defined functional HBV cure as a quantitative hepatitis B surface antigen (qHBsAg) level <0.05 IU/ml. We measured qHBsAg, HBV DNA, HBcAg and HBV RNA every six months during the first two years after the initiation of tenofovir and annually thereafter. We assessed the cumulative proportion of participants with undetectable HBV DNA, HBV RNA and HBcAg levels using Kaplan-Meier estimators in the cumulative proportion of participants with undetectable HBV DNA <20 IU/ml on tenofovir (p = 1.00). Among participants with functional HBV cure, 23/29 (79%) ever achieved HBcAg ≤3 log10 U/ml and 17/49 (35%) had HBV RNA levels ≤3 log10 U/ml and all achieved HBV RNA <10 copies/ml before or at the time of the first qHBsAg <0.05 IU/ml. In comparison, 23/29 (79%) participants without cure achieved HBcAg ≤3 log10 U/ml (p = 0.02) and 14/29 (48%) achieved HBcAg ≤3 log10 U/ml (p = 0.03). The cumulative proportions of participants with HBV DNA <20 IU/ml and HBcAg levels ≤3 log10 U/ml and HBV RNA <10 copies/ml in persons with and without functional HBV cure are depicted in the Figure.

**Conclusion:** HBV RNA levels decreased to undetectable levels in all persons with HIV and functional HBV cure, whereas a fifth of the persons without cure had detectable HBV RNA levels on long-term tenofovir-containing ART despite HBV DNA suppression. HBcAg levels decreased during tenofovir therapy, but remained detectable in approximately 20% of persons with and 50% of persons without functional HBV cure.

**LBP-05**

Dramatic reductions in hepatic steatosis accompanied by improved HbA1c following a 4-week treatment of obese/diabetic/NAFLD patients with DD01, a novel long-acting GLP-1/glucagon receptor agonist

Adam Bell1, Dennis To1, Subbu Karanth1, Svetlana Sosnovtseva1, Yen-Huei Lin1, Jaehee Shin2. 1DandD Pharmatech, Neuromy, Inc, Gaithersburg, United States; 2DandD Pharmatech, Seongnam-si, Korea, Rep. of South

**Background and aims:** DD01 is a novel, long-acting dual agonist of the GLP-1 and glucagon receptors. In rodent and non-human primate models, DD01 improved glycemic control, reduced hepatic steatosis, and resulted in weight loss. In rodents the effect on liver fat was more significant than achieved with a comparable dose of semaglutide, consistent with the expected effect of increased hepatic lipolysis achieved through activation of the glucagon receptor. Based on these pharmacologic effects, DD01 was evaluated for safety and its effect on diabetes, obesity, and NAFLD in humans.

**Method:** A Phase 1 study was conducted in subjects with overweight/obese subjects with type 2 diabetes and NAFLD. Doses from 1-80 mg were evaluated in both single-ascending and multiple-ascending (4 once-weekly doses) cohorts of 8. Safety, tolerability, and PK were assessed for all dose groups. Fasting and post-prandial glucose,
insulin, and glucagon were measured periodically during the dosing period and during a mixed-meal tolerance tests conducted at baseline and after the last dose was administered for each cohort. Liver fat was measured by MRI-PDFF on Day -1 and Day 36. HbA1c and body weight were assessed pre-dose and at the end of 4 weeks dosing.

**Results:** DD01 treatment resulted in rapid, clinically significant reductions in hepatic steatosis. Reductions in HbA1c were observed at lower and overlapping doses and this was accompanied by reductions in caloric intake and weight loss. DD01 was generally safe and well tolerated. Adverse events were as expected for a GLP-1 R agonist and primarily GL-related. DD01 has a half-life of 7-8 days. Following only 4 once-weekly treatments with DD01, up to 100% of patients achieved ≥30% reduction in liver fat as assessed by MRI-PDFF. In the high dose group, all subjects achieved at least a 40% reduction in liver fat with a mean reduction of 52% whereas the change from baseline liver fat in the placebo group was only 2.8%. Substantial reductions in liver fat were observed at doses with minimal effect on body weight underscoring the importance of direct lipogenic action achieved through the glucagon receptor in the liver. Meaningful and rapid improvements in steatosis were observed at well-tolerated doses that did not cause significant weight loss, potentially uncoupling the need for weight loss to precede or coincide with significant improvements in liver health. Over the 4-week treatment period, improved HbA1c, decreased meal-related glucose, and mild weight loss accompanied dose-dependent reductions in hepatic steatosis. DD01 is a dual-pathway GLP-1R agonist augmenting the benefits of the incretin pathway through activation of the glucagon pathway.

**Figure:**

**Conclusion:** DD01 acts through the GLP-1 receptor and glucagon receptor pathways to improve glucose control and rapidly reduce hepatic steatosis. Weight loss is observed at higher doses and it appears that rapid resolution of hepatic steatosis can be achieved independent of weight loss. The combined effects of DD01 may be useful in the treatment of NASH and NASH with and without co-occurring diabetes.

**LBP-06**

Preventing liver disease with policy measures to tackle alcohol consumption and obesity: a microsimulation study

Lise Retat1, Laura Webber1, Peter Jepsen2, Helena Cortez-Pinto3, Markijan Mitchyn4, Jeffrey Lazarus5, Alexander Martin1, Federico Piñero1, Quirino Lai2, Charlotte Costentin3, Andreas Schnitzbauer4, Helena Degroote5, Edward Geissler6, Christophe Duvoux7,1, Hospital Universitario Austral, Austral University, Liver Unit. Academic Department, Buenos Aires, Argentina; 2General Surgery and Organ Transplantation Unit, Sapienza University of Rome, Italy, Italy; 3Grenoble Alpes University; Institute for Advanced Biosciences, Research Center UGA/Inserm U 1209/CNRS 5309; Gastroenterology, hepatology and GI oncology department, Digidune, Grenoble Alpes University Hospital; La Tronche, France, France; 4HPB and transplant surgery, University Hospital Frankfurt, Germany, Germany; 5Department of Hepatology and Gastroenterology, Ghent University Hospital, Belgium., Belgium; 6Department of Hepatology, Medical Liver Transplant Unit, Hospital Henri Mondor AP-HP; University of Paris, France

Email: fpinerof@cas.austral.edu.ar

**Background and aims:** Hepatocellular carcinoma (HCC) recurrence risk after liver transplantation (LT) has been evaluated with different prediction models following pathology explant analysis. The inclusion of alpha-feto protein (AFP) in these models, such as the novel R3-AFP score (1), have significantly improved risk stratification of HCC recurrence post-LT. The SILVER trial (NCT00355862) evaluated the efficacy of mTOR inhibitors (Sirolimus–Group B) compared to mTOR-free based immunosuppression (Group A) to reduce post-LT HCC recurrence (2). Here, we aimed to validate the prognostic and predictive discrimination power of R3-AFP scoring on the...
intention-to-treat population (ITT) included in the SiLVER trial (NCT00355862).

**Method:** We included the intention-to-treat (ITT) patient population from the SiLVER Study. Cox proportional hazard survival analysis was performed, estimating hazard ratios (HR) and 95% confidence intervals (95% CI). Discriminant function was evaluated using the Harrell’s c-index. A competing risk regression analysis was also conducted estimating sub-HR. Calibration was conducted through expected versus observed events estimating the baseline hazard.

**Results:** Overall, 528 patients signed written informed consent of which 20 were excluded for the intention-to-treat analysis (Group A, n = 256; Group B, n = 252). The 5-year recurrence rate in the ITT population was 18.7% (95% CI 15.3-22.6; n = 88 recurrences). The frequency distribution of the R3-AFP score was 42.6% low risk group (n = 216), 35.7% (n = 181) intermediate risk, 19.5% high risk group (n = 99), and 2.2% very high risk group (n = 11). The R3-AFP score correctly stratified HCC recurrence risk (Figure 1) (reference: low risk group): intermediate risk group SHR 1.80 (95% CI 1.02;3.18), high risk group SHR 4.20 (2.41;7.31), and very high risk group SHR 9.55 (3.66;24.92). Discrimination power for the R3_AFP model was 0.75 (95% CI 0.69;0.81) in the ITT population; lower in the mTOR group [Group B 0.67 (0.59-0.75) vs Group A 0.75 (CI 0.69-0.81); P = 0.048]. No significant differences were observed between expected and observed events across R3-AFP strata.

**Conclusion:** The R3-AFP score has been validated in the ITT population of the SiLVER trial, a high-quality evidenced-based data, showing good performance. The model had lower discrimination of the risk of recurrence in exposed subjects with mTOR immunosuppression. This should lead to further hypothesis testing.
LBP-08
High prevalence of short telomeres in patients with idiopathic porto-sinusoidal vascular disorder
Alexander Coukos1, Chiara Saglietti2, Monika Haubitz3, Christine Sempoux1, Jean-Marc Good2, Thomas Greuter2,4, Darius Moradpour1, Lorenzo Alberio2, Gabriela Baerlocher2, Montserrat Fraga Christinet1. 1Lausanne University Hospital, Gastroenterology and hepatology, Lausanne, Switzerland; 2Lausanne University Hospital, Lausanne, Switzerland; 3Department for BioMedical Research of University of Bern (Mu35), Bern, Switzerland; 4CZO Spital Wetzikon, Wetzikon, Switzerland; 5Lausanne University Hospital, Hematology and central hematology laboratory, Lausanne, Switzerland
Email: alexcoukos@gmail.com

Background and aims: Telomeres are repetitive DNA sequences on chromosomal ends which naturally shorten during mitosis, preventing loss of coding DNA. Monogenic loss-of-function mutations in telomere-maintenance genes cause excessive telomeric shortening, leading to cellular senescence and consequently systemic organ dysfunction, a condition referred to as short telomere syndrome (STS). One hepatic manifestation documented in STS is porto-sinusoidal vascular disorder (PSVD). Because the etiology of many cases of PSVD remains unknown, this study aimed to explore the extent to which short telomeres are present in patients with idiopathic PSVD.

Method: This single-center study included patients with idiopathic PSVD and characterized them in depth after histological review and confirmation. Telomere length in six peripheral blood leukocyte subpopulations was assessed by multicolor flow cytometry.

Results: In total, 28 patients were included of whom 19 (68%) had short (12/29) or very short (7/29) telomeres, while nine (32%) had telomere length in the middle part of the age-adjusted reference range (shown as percentiles) calculated from healthy individuals. Seventeen (61%) had clinically significant portal hypertension. The shortest telomeres were found in granulocytes compared to other cell subtypes. Short telomeres were more frequent in males (p = 0.006), in patients with portal hypertension (p = 0.026) as well as in patients with concomitant interstitial lung disease (p = 0.001), chronic kidney disease (p = 0.002) and erythrocyte macrocytosis (p = 0.001). Low serum albumin (p = 0.004), low platelets (p = 0.048), hyperbilirubinemia (p = 0.029) and a dysmorphic liver on imaging studies (p = 0.012) were also associated with short telomeres.

Conclusion: Short telomeres were present at a remarkably high rate in all six cell lines in patients with idiopathic PSVD. This reinforces the hypothesis that they may play a role in the pathogenesis of vascular liver disease. Studies investigating the genetic basis in our patient cohort are ongoing.

LBP-09
Further decompensation as a new prognostic stage in cirrhosis. Results of a large multicenter cohort study supporting Baveno VII statements
Gennaro D’Amico1, Guadalupe Garcia-Tsao2, Alexander Zipprich3, Cándid Villanueva4, Juan Antonio Sorda5, Rosa M Morillas6, Matteo Gargovich7, Montserrat García-Retortillo8, Javier Martinez9, Paul Cales10, Mario D’Amico11, Matthias Dollinger12, María García-Guix4, Esteban Gonzalez Ballerga2, Emmanuelle Tschatzis7, Isabel Cirera8, Agustín Albillos9, Guillame Roquin10, Linda Pasta1,13, Alan Colomo14, Nuria Cañete Hidalgo8, Jerome Boursier10, Marcello Dallio14, Antonio Gasbarrini15, Iacobellis Angelo16, Giulia Gobbo17, Manuela Merli18, Alessandro Federico19, Gianluca Svegliati-Baroni20, Pietro Pozzoni21, Luigi Addario22, Luchino Chessa23, Lorenzo Ridola24, Andrew Burroughs7. 1Azienda Ospedaliera Ospedali Riuniti Villa Sofia-Cervellono, Gastroenterology, Palermo, Italy; 2Yale University School of Medicine, Digestive Disease Section, New Haven, United States; 3Jena University Hospitals, Internal Medicine IV, Jena, Germany; 4Hospital de la Santa Creu i Sant Pau, Gastroenterology Unit, Barcelona, Spain; 5Hospital de Clínicas “José de San Martín”, Facultad de Medicina, Sección Hepatología-División Gastroenterología, Buenos Aires, Argentina; 6Hospital Germans Trias i Pujol, Liver Unit, Badalona, Spain; 7Royal Free Hospital, London, United Kingdom; 8Hospital del Mar, Parc de Salut MAR, Liver section, Servei de Digestiu, Barcelona, Spain; 9Hospital Universitario Ramon y Cajal, Universidad de Alcalá de Henares, Centro de Investigacion Biomédica en Enfermedades hepáticas y Digestivas (CIBEREHD), Madrid, Spain; 10Centre Hospitalier Universitaire d’Angers; Laboratoire HIFIH, UPR53859, SFR 4208, 13. Service d’Hépato-Gastroentérologie et d’Oncologie Digestive, Angers, France; 11Ospedale
Civco Di Cristina Benfratelli, Interventional Radiology Unit, Palermo, Italy; 12 Klinikum Landshut, Department of Medicine I, Landshut, Germany; 13 Casa di Cura Serena, Medicina, Palermo, Italy; 14 University of Campania Luigi Vanvitelli, Department of Hepato-Gastroenterology, Department of Precision Medicine, Napoli, Italy; 15 Catholic University of Sacred Heart, Fondazione Policlinico Universitario A. Gemelli IRCCS, Rome, Italy; 16 Casa Sollievo della Sofferenza, Gastroenterology and Endoscopy, San Giovanni Rotondo, Italy; 17 IRCCS Policlinico San Donato, Internal Medicine Unit, Milan, Italy; 18 Università Sapienza, Translational and Precision Medicine, Italy; 19 University of Campania Luigi Vanvitelli, 16. Department of Hepato-Gastroenterology, Department of Precision Medicine, Napoli, Italy; 20 Politechnic University of Marche, Liver Injury and Transplant Unit, Ancona, Italy; 21 Presidio Ospedaliero Azienda Socio Sanitaria Territoriale di Lecco, General Medicine Unit, Lecco, Italy; 22 Cardarelli Hospital, Hepatology Unit, Napoli, Italy; 23 Università degli Studi di Cagliari, Department of Medical Sciences and Public Health, Cagliari, Italy; 24 ASL Latina, Department of Translational and Precision Medicine—Sapienza University of Rome—Gastroenterology Unit, Latina, Italy.

Email: gedamico@libero.it

**Background and aims:** The development of a stage of “further” decompensation in cirrhosis is assumed to be associated with worse survival. However, this has been based on clinical observation rather than on scientific evidence. We investigated the incidence of further decompensation and its impact on mortality in cirrhosis.

**Method:** Multicenter (Europe and Argentina) prospective cohort study. The cumulative incidence of further decompensation was assessed by competing risk analysis in 2028 patients presenting with their first decompensation of cirrhosis (variceal bleeding, ascites, hepatic encephalopathy or jaundice). At inclusion patients' characterization was based on MELD and Child-Pugh scores and on clinical stage defined as follows: stage 3, variceal bleeding alone; stage 4, any non-bleeding event (ascites encephalopathy or jaundice); stage 5, any combination of 2 or more events. Further decompensation was defined as any new ascites, encephalopathy, (re)bleeding or jaundice or complications of ascites (need of large volume paracentesis, spontaneous bacterial peritonitis, acute kidney injury-hepatorenal syndrome). The impact of further decompensation on mortality was assessed by the cause-specific Cox model.

**Results:** Etiology was viral in 31.5% (mostly untreated), alcoholic 38.6%, alcoholic/viral 10.7%, NASH 8.8%, autoimmune/cholestatic 5.2%. In a mean follow-up of 43 months, 1192 patients developed further decompensation and 649 died. Corresponding 5-year cumulative incidences were: further decompensation 52% and mortality 35%, respectively. The most common further decompensating event was ascites/complications of ascites. Five-year survival was significantly lower in patients with further decompensation compared to the 836 patients who did not develop further decompensation: 35% vs. 50%; P < 0.0001; median survival 273 vs. 767 days, p < 0.0001. This significant reduction in survival was observed independent of the stage of first decompensation, including patients whose first decompensation presented with two or more decompensating events. After variceal bleeding further decompensation decreased survival when occurred after 5 days from bleeding. Compared to first decompensation, the hazard ratio for death after further decompensation, adjusted for MELD and other prognostic indicators, was 2.05 (p < 0.0001).

**Conclusion:** In cirrhosis, further decompensation occurs in approximately 60% of patients after the first decompensating event and significantly increases mortality. We propose that further decompensation be considered a more advanced prognostic stage of cirrhosis, beyond first decompensation.
fibrosis), ≥SAF-A3-grade activity and ≥SAF-S3-grade steatosis. Obuchowski weighted-AUROC (wAUC) were also compared to take into account the spectrum effects. Intention to diagnose (ITD) was used to adjust the AUCs according to applicability and liability of NITs.

Learning and validation subsets of T2D-modified NITs used a k-fold randomization.

**Results:** Between 2018 to 2022, 713 outpatients were investigated in four diabetes clinics (NCT03624098), and 402 with interpretable biopsy were included, median age 59 years, 63% male, 58% NASH, 39% bridging. Results are detailed in Table 1 for the diagnosis of Bridging fibrosis. Due to lower applicability and liability the VCTE performance decrease by more than 5% vs the 3 other NITs when ITD method is used (p < 0.05). SWE, FT-T2D and VCTE AUROCs (0.795, 0.778 and 0.758) were not significantly different for Bridging (p > 0.19) and all three higher than FIB4 (0.704;P<0.01). For the diagnosis of activity grades ≥SAF-A3-grade, the bAUC in ITD of NT2-T2D was 0.759, and 0.709 for AST alone. For the diagnostic of steatosis grades ≥SAF-S3-grade, the bAUC in ITD of ST2-T2D was 0.748, 0.718 for SWE-HR and 0.655 for CAP.

**Conclusion:** For the first time four fibrosis NITs were directly compared in ITD in a prospective study of T2D outpatients using a more specific definition of advanced fibrosis. SWE, new FT-T2D and VCTE performances were not significantly different for the diagnostic of Bridging (p > 0.19) and all three higher than FIB4 score.

**LBP-11**

Virological and clinical outcomes of patients with HDV-related compensated cirrhosis treated with Bulevirtide monotherapy: the retrospective multicenter European study (Save-D)


**Background and aims:** Bulevirtide (BLV) has been conditionally approved by EMA for treatment of chronic compensated hepatitis D University of Athens, Athens, Greece; 4Hepatology Unit and Laboratory of Molecular Genetics and Pathology of Hepatitis Viruses, Reference Center of the Tuscany Region for Chronic Liver Disease and Cancer, University Hospital of Pisa, Pisa, Italy; 5Department of Medical and Surgical Sciences, Unit of Infectious Diseases, “Alma Mater Studiorum” University of Bologna, S. Orsola-Malpighi Hospital, Bologna, Italy; 6Department of Medical Sciences, University of Turin, Gastroenterology Division of Città della Salute e della Scienza di Torino, University Hospital, Turin, Italy; 7INSERM U1052 Cancer Research Center of Lyon (CRC), Lyon, France; 8Liver Unit, Fondazione IRCCS “Casa Sollievo della Sofferenza”, San Giovanni Rotondo, Italy; 9Service d’hépato-gastro-entérologie, CHU Grenoble-Alpes, Grenoble, France; 10Department of Medical and Surgical Sciences, Infectious Diseases Unit, University of Foggia, Foggia, Italy; 11Department of Mental Health and Public Medicine-Infectious Diseases Unit, University of Campania Luigi Vanvitelli, Naples, Italy; 12Liver Unit, San Camillo Hospital, Department of Transplantation and General Surgery, Rome, Italy; 13Hepato-Biliary Center, AP-HP Hôpital Universitaire Paul Brousse, Paris-Saclay University, Research INSERM-Paris Saclay Unit 1193, Villejuif, France; 14Hôpital de la Source Orleans, France; 15Service d’Hépato-Gastroentérologie CHU de Tours, France; 16Department of Digestive Diseases, Hospices Civils de Lyon, Edouard Herriot hospital, France; 17Claus Bernard Lyon 1 University, France; 18AP-HP, Avicenne Hospital, Hepatology Department, Bobigny, France; 19Centre Hospitalier Annecy Genevois, Annecy, France; 20Department of Hepatogastroenterology, CHU de Caen Normandie, Caen, France; 21Gastroenterology, Hepatology and Transplantation Division, ASST Papa Giovanni XXIII, Bergamo, Italy; 22Division of Hepatology, Ospedale San Gerardo, Monza, Italy; 23Division of Hepatogastroenterology, Department of Precision Medicine, Università della Campania “Luigi Vanvitelli”, Naples, Italy; 24Division of Internal Medicine 2 and Center for Hemochromatosis, University of Modena and Reggio Emilia, Modena, Italy; 25Institute of Infectious Diseases and Public Health, Università Politecnica delle Marche, Ancona, Italy; 26Division of Internal Medicine, Hepatobiliary and Immunodermic Diseases, IRCCS Azienda Ospedaliero-Universitaria di Bologna, Bologna, Italy; 27Department of Gastroenterology, CH d’Avignon, Avignon, France; 28Department of Gastroenterology, Toulouse University Hospital, Toulouse, France; 29Université de Nantes, INSERM U1413, Department of Infectious Diseases, CHU Hôtel Dieu, Nantes, France; 30Assistance Publique des Hôpitaux de Paris, Hôpital Cochin, Liver department, Paris, France; 31Assistance Publique des Hôpitaux de Paris, Hôpital Bichat Claude Bernard, Service des Maladies Infectieuses et Tropicales, Paris, France; 32CHU Dijon, Service d’Hépato-gastroentérologie et oncologie digestive, Insenl EPICARD LCN-UMR1231, Université de Bourgogne-Franche Comté, Dijon, France; 33Service d’hépatogastroentérologie, Centre Hospitalier Intercommunal, Créteil, France; 34ASST Grande Ospedale Metropolitano Niguarda, Division of Infectious Diseases, Milan, Italy; 35CRC “A. M. and A. Migliavacca” Center for Liver Disease, Department of Pathophysiology and Transplantation, University of Milan, Milan, Italy Email: elisabetta.degasperi@policlinico.mi.it

**Table:** (abstract: LBP-10).
Background and aims: Chronic hepatitis D virus infection is the most debilitating form of viral hepatitis causing severe hepatic damage consequently leading to liver cirrhosis. Bulevirtide (BLV) has been conditionally approved by the EMA for the treatment of chronic hepatitis D virus infection in patients with compensated liver disease. Its safety and efficacy on HDV viral load and ALT levels has been demonstrated for compensated patients in clinical trials and recently published real world cohorts. However, BLV data in the vulnerable collective of patients with decompensated cirrhosis are still lacking. We thus, aimed to report real-world data obtained from patients with decompensated HDV cirrhosis in whom BLV was used off-label.

Method: We collected anonymized and retrospective data from Austrian, Italian and German centers experienced in the use of BLV. Patients with HDV cirrhosis at Child-Pugh stages B and C or clinical signs of decompensated cirrhosis were included. Virologic response was defined by a decline in HDV-RNA levels by ≥2 log while virologic non-response was defined if HDV-RNA decline was <1 log decline.

Results: We included 15 patients (Child-Pugh A n = 1, Child-Pugh B n = 14) with 10 patients showing ascites at BLV initiation. The patient with Child-Pugh A liver cirrhosis had history of large volume paracentesis due to ascites but resolution of ascites under ongoing diuretics at treatment initiation. However, given the uncontrolled CHD the patient was considered as decompensated following the Baveno VII recommendations. At baseline hypoalbuminemia was present in 9 patients (mean 33 ± 4.6 g/dL), hyperbilirubinemia (>34.2 µmol/l) in 6 patients (mean 36.1 ± 24.6 µmol/l) and thrombocytopenia (platelets <150 G/L) in all patients indicating portal hypertension.

Virologic response was achieved after a mean of 23 weeks in 10 (66%) patients while viral non-response did not occur. ALT levels significantly decreased from baseline to 1.5 times (median: 1.3) of baseline at W96. ALT levels at W96 were 58%. Patients with <1 log HDV RNA decline vs baseline declined from 52% at W24 to 48% at W48 and 37% at W96. Twenty-four percent of cases; 1 patient discontinued BLV due to a grade 3 cytopenia (platelets <150 G/L), 100% CPT score A, measurement (LSM) 18.3 (6.4-75.0) kPa (80% with LSM >25kPa), platelets 89 (17-330) G/L (80% with PLT<150 G/L), 100% CPT score A, measurement (LSM) 18.3 (6.4-75.0) kPa (80% with LSM >25kPa), platelets 89 (17-330) G/L (80% with PLT<150 G/L), 100% CPT score A, and Child-Pugh score B to C-Pugh A in 4 cases. Ascites improved in 4 patients. Hepatic improvement was associated with virologic and biochemical response. In one case a worsening of liver function to Child-Pugh C occurred after off-label pegylated interferon was added to BLV treatment (data censored after start of interferon). Another case experienced further decompensation after TIPS insertion and incarceration of a hernia. In both cases decompensation was not attributed to BLV therapy. In 3 cases BLV was terminated at liver transplantation.

Conclusion: The off-label use of BLV in patients with decompensated cirrhosis and impaired liver function results in a decline in HDV-RNA and ALT levels. Improvement of liver function and cirrhosis recompensation may be achieved in selected patients. While some patients developed further decompensation, this was not related to the use of BLV. This case report series supports the antiviral efficacy of BLV also in decompensated cirrhosis. To investigate long term efficacy...
of BLV on clinical end points and its safety profile in this highly vulnerable patient population with decompensated cirrhosis, prospective clinical trials are urgently needed.

**LBP-13**

**Safety, pharmacokinetics and antiviral efficacy of freethiadine, a novel capsid assembly modulator, in healthy volunteers and patients with chronic hepatitis B virus infection**

Yanhua Ding1, Xiaojiao Li2, Jia Xu3, Jixuan Sun1, Yingjun Zhang4, Jing Zhu2, Yujie Chen2, Lin Luo3, Qingyun Ren6, Yunfu Chen6, Junqi Niu7. 1Phase I Clinical Trial Center, The First Hospital of Jilin University, Changchun, China; 2Phase I Clinical Trial Center, The First Hospital of Jilin University, Changchun; 3Phase I Clinical Trial Center, The First Hospital of Jilin University, Changchun, China; 4Sunshine Lake Pharma Co., Ltd., Guangdong, China; 5Sunshine Lake Pharma Co., Ltd., Guangdong, China; 6Sunshine Lake Pharma Co., Ltd., Guangdong, China; 7Department of Hepatology, The First Hospital of Jilin University, Changchun, China

Email: dingyanh@jlu.edu.cn

**Background and aims:** Freethiadine is a novel capsid assembly modulator (CAM) developed by Sunshine Lake Pharma Co., Ltd. Here we report the safety, tolerability, pharmacokinetics (PK), and 28-day antiviral activity of freethiadine in two randomized, double-blinded phase I studies in healthy subjects and patients with chronic HBV infection (CHB).

**Method:** The studies were consisted of two parts. Part 1 was a double-blind, randomized, placebo-controlled single-ascending-dose (SAD, 50-600 mg), multiple-ascending-dose (MAD, 100 mg, 200 mg, or 300 mg, BID) and food effect (200 mg) study. Part 2 was a double-blind, double-dummy, randomized, entecavir controlled, multi-dose escalation study in CHB patients. Patients were randomized 4:1 to freethiadine+ entecavir placebo or entecavir 0.5 mg+ freethiadine placebo across 4 multiple-dose cohorts: freethiadine 100 mg once a day (QD), 200 mg QD, 200 mg twice a day (BID), and 300 mg QD for 28 days.

**Results:** A total of 88 healthy subjects and 40 CHB patients were enrolled in the study. Freethiadine was safe and well tolerated both in healthy subjects and CHB patients. The paresthesia was occurred among both healthy subjects and patients when the freethiadine dose greater than 300 mg. Grade I or II alanine aminotransferase (ALT) elevation was the most common AE (12.5%-50%) among freethiadine treated patients, and the incidence and severity was not related to the dose. Only two grade III ALT elevation occurred at 200 mg QD and 300 mg QD cohorts, respectively. All the ALT elevation was correlated with the decline in the HBV DNA levels, which is “good flare”. Absorption and elimination of HEC160208 and active metabolite HEC142106 occurred rapidly in plasma. In the SAD study, median Tmax of HEC160208 and HEC142106 was 1.75-3.0 h, 2.5-4 h, and t1/2 ranged from 0.71-2.02 h, 1.95-5.84 h, respectively. The exposure of HEC160208 and HEC142106 was proportional to dose and was not significantly affected by food intake. The HEC160208 exposure of 100 mg has exceeded that of the the effective dose in the preclinical mouse model. In the MAD study, steady-state was attained on day 3, and there was no apparent plasma accumulation of HEC160208 and HEC142106 after 10-day dosing. (Racc <1.0). The exposure of both analytes was slightly higher in CHB patients than that in the healthy subjects. After 28 days of treatment, the mean maximum HBV DNA declines from baseline were -2.76, -3.47, -3.56, -2.89, and -2.55 log10 IU/ml for the 100 mg QD, 200 mg QD, 200 mg
Evaluation of 8 non-invasive models in predicting NAFLD severity and progression in a one-year prospective study based on MRI-PDFF

Aruhan Yang1, Lei Zhang1, Hong Chen1, Guoyu Lv1, Xiaoxue Zhu1, Yanhua Ding1.

1First hospital of Jilin University, China

Email: arh20@mails.jlu.edu.cn

Background and aims: Although biopsy remains the gold standard for assessing NAFLD, several non-invasive models can provide useful estimates. The aim of this prospective study was to compare the accuracy of eight non-invasive methods to predict steatosis and disease progression.

Method: A total of 846 samples were collected, among which 236 samples were collected from participants with two examinations (baseline and 1 year). The liver fat content (LFC, measured by MRI-PDFF) decrease/increase by 20% from baseline was classified as the Improve/Progression group, and the others were referred to as the Keep group. Eight models (FAST, HSI, FLI, KANFLD, BAAT, LAP, Liver Fat Score, Liver Fat Equation) were calculated in agreement with previous studies, and their performances in diagnosing NAFLD and predicting progression were compared based on the MRI-PDFF.

Results: The 8 clinical models performed well in predicting different degrees of NAFLD in this cohort (healthy: N = 146, 17.3%; mild NAFLD: N = 400, 47.3%; moderate NAFLD: N = 257, 30.4%; severe NAFLD: N = 43, 5%), especially KNAFLD (the highest AUC of diagnosis was 0.90). Within the whole cohort, the correlation analysis revealed that KNAFLD was most strongly correlated with LFC (r = 0.56, P < 0.01, Figure 1), and other clinical models (FAST, liver fat score, BAAT, HSI, FLI, LAP, liver fat equation) also showed weaker but significantly positive correlations with LFC (correlation coefficients: 0.48, 0.48, 0.45, 0.43, 0.38, 0.35, 0.33, respectively; P < 0.05 for all). When the KNAFLD score was above 2.935, the LFC was significantly higher (4.4% vs. 19.7%, P < 0.001). After 1 year of follow-up, FAST performed best in predicting NAFLD progression (AUC = 0.84), correlation analysis showed that the association between the changes in FAST and LFC was the strongest (r = 0.42, P < 0.01), followed by KNAFLD (r = 0.39, P < 0.01); when the change in FAST from baseline was lower than -0.012, the LFC significantly decreased (from 11.5% to 8.5%, P < 0.05), and when it was higher than -0.012, the LFC increased from 8.6% to 10.9% (P < 0.05).

Conclusion: Most non-invasive techniques are correlated with LFC and have acceptable accuracy in estimating the degree and progression of NAFLD, especially KNAFLD. FAST has the best accuracy in predicting NAFLD progression.

LBP-15
Evidence of durable response to bepirovirsen in B-Clear responders: B-Sure first annual report

Adrian Gadano1, Manuela Arbune2, Masanori Atsukawa3, Shigetoshi Fujiyama4, Natalya Urievna Gankina5, Binu John6, Takuya Komura7, Masayuki Kurosaki8, Young Oh Kweon9, Seng Gee Lim10, Rosie Mngqibisa11, Theerma Piratvisuth12, Olga Sagalova13, Lawrence Serfaty14, Tatyana Stepanova15, Radoslava Tsrancheva16, Qing Xie17, Man-Fung Yuen18, Chelsea Macfarlane19, Stephen Corson20, Jie Dong21, Helene Plein22, Geoff Quinn23, Robert Elston23 24 25, Stuart Kendrick23, Melanie Paf24, Dickens Theodore25, 1Hospital Italiano de Buenos Aires, Buenos Aires, Argentina; 2St.Cuv. Parascheva Infectious Diseases Clinical Hospital, Galati, Romania; 3Nippon Medical School, Tokyo, Japan; 4Kumamoto Shinto General Hospital, Kumamoto, Japan; 5Krasnojarsk Regional Center of AIDS prevention, Krasnojarsk, Russian Federation; 6Miami VA Health System and University of Miami, Miami, United States; 7Kanazawa Medical Center, Ishikawa, Japan; 8Musashino Red Cross Hospital, Tokyo, Japan; 9Kyungpook National University Hospital, Daegu, Korea, Rep. of South; 10National University Health System, Singapore, Singapore; 11Enhancing Care Foundation, Durban, South Africa; 12NKC Institute of Gastroenterology and Hepatology, Songkhla, Thailand; 13South Ural State Medical University, Chelyabinsk, Russian Federation; 14HUS-Hôpital de Hautepierre, Strasbourg, France; 15Modern Medicine Clinic, Moscow, Russian Federation; 16Alexandrovska University Hospital, Sofia, Bulgaria; 17Ruijin Hospital affiliated to Shanghai Jiao Tong University, Shanghai, China; 18Queen Mary Hospital, The University of Hong Kong, Hong Kong, China; 19GSK, Waltham, United States; 20PHASTAR, Glasgow, United Kingdom; 21GSK, Shanghai, China; 22GSK, Brentford, United Kingdom; 23GSK, Stevenage, United Kingdom; 24GSK, Collegeville, United States; 25GSK, Durham, United States

Email: robert.c.elston@gsk.com

Background and aims: Bepirovirsen (BPV) is an investigational novel unconjugated antisense oligonucleotide for treatment of chronic hepatitis B virus (HBV) infection. Data from the Phase 2b B-Clear study (NCT04449029) indicated that a subset of participants (pts) achieved a response at end of BPV treatment, which was sustained for...
24 weeks' follow-up. This occurred in pts on and not on nucleos (t)ide analogue (NA) therapy (On-NA and Not-on-NA), in the absence of newly initiated antiviral therapy. Pts who achieved a partial or complete response at the end of study (EoS) visit were eligible for this long-term durability study-B-Sure (NCT04954859). Here we present preliminary data from the first annual review to examine the durability of response for B-Clear On-NA and Not-on-NA complete responders (hepatitis B surface antigen [HBsAg] <0.05 IU/ml and HBV DNA <lower limit of quantification) who enrolled into B-Sure.

**Method:** Not-on-NA pts will be followed up at Month 3, Month 6, and every 6 months thereafter for up to 36 months after B-Clear EoS. On-NA pts, if eligible, will cease NA 6 months after B-Clear EoS visit and be followed more intensively. Adverse events were recorded, and physical exams and blood tests were performed at each visit to assess safety and response. Durability of response was assessed:

1. On-NA: Time from NA cessation to loss of complete response.
2. Not-on-NA: Time from achieving a B-Clear complete response to loss of response.

**Results:** 13/16 On-NA and 12/14 Not-on-NA complete responders in B-Clear enrolled into B-Sure (Figure). 12 On-NA and 12 Not-on-NA pts remain in the study at the time of reporting. For On-NA pts (n = 13), 12 (92%) were male, with a mean age of 53.2 years; 6/13 (46%) had chronic HBV infection for ≥20 years, 10/13 (77%) were hepatitis B e antigen (HBeAg) negative and 9/13 (69%) had HBsAg ≤1000 IU/ml at B-Clear study baseline. 9/13 (69%) pts ceased NA as per protocol, 3/13 (23%) were not eligible to cease NA and 1/13 (8%) withdrew prior to NA cessation. 7/9 (78%) of those who ceased NA had complete data with ≥3 months of follow-up, and 6/7 (86%) maintained response 3 months post NA cessation. 4/9 (44%) had complete data with ≥6 months of follow-up post NA cessation, of whom 100% (4/4) maintained response. No pts restarted NAs. For Not-on-NA pts (n = 12), 7 (58%) were male with a mean age of 43.8 years; 3/12 (25%) had chronic HBV infection for ≥20 years, all were HBeAg negative and 7/12 (58%) had HBsAg ≤1000 IU/ml at B-Clear study baseline. 9/12 responders (75%) had complete data with ≥3 months of follow-up and 78% (7/9) maintained response 3 months after enrolling into B-Sure. 3/12 (25%) had complete data with ≥9 months of follow-up, of which 100% (3/3) maintained response.

---

**Figure:** Patient flow diagram and treatment response in the first annual review of the B-Sure study.
POSTER PRESENTATIONS

whom 100% (3/3) maintained response 9 months into B-Sure. There were no safety signals that suggested a latent adverse drug effect following use of BPV.

Conclusion: These data provide early evidence on the durability of response observed with BPV.

Funding: GSK (study 206882)

LBP-16

Hepatocellular carcinoma surveillance improves early detection and curative treatment in chronic hepatitis C patients treated with direct acting antivirals

Cassia Regina Guedes Leal,1 Carmem Ferguson Theodoro,1 Thais Guaranã,a Jorge Strogoff-de-Matos,1 Rosângela Teixeira,2 Renata Perez,2 Paulo de Tarso Aparecida Pinto,2 Tatiana Guimaraes,2 Solange Artim1,1 Antonio Pedro University Hospital, Fluminense Federal University, Brazil; 2Minas Gerais Federal University, Brazil; 3Federal University of Rio de Janeiro, Brazil; 4Hospital Federal dos Servidores do Estado, Brazil

Email: cassia.r.g.leal@gmail.com

Background and aims: Hepatocellular carcinoma (HCC) is the third leading cause of cancer mortality worldwide. HCC prognosis remains poor, partly because up to 70% of patients are diagnosed with advanced HCC at initial presentation. As with other cancers, surveillance programs aim to detect tumors at an early stage, facilitate curative-intent treatment, and reduce cancer-related mortality. The aim of this study was to evaluate the incidence of HCC and the impact of surveillance on early diagnosis in patients with chronic hepatitis C virus (HCV) treated with direct antiviral agents (DAAs).

Method: A cohort of 1075 HCV patients ≥ 18 years were treated with DAAs from 2015 to 2019 and followed until 2022. Ultrasonography was performed up to 6 months before DAAs and each 6 months thereafter for patients with advanced fibrosis (F3 and F4 META VIR). HCC diagnosis was established based on the criteria of the European Association for the Study of the Liver and staging according to the Barcelona Clinic Liver Cancer (BCLC) system.

Results: Of the total, 51/1075 (4.7%) developed HCC in the median of 40 (IQR 25–58) months: 26/51 (51%) male, median age 60 (IQR 54–66) years, alpha-fetoprotein (AFP) 12.2 (IQR 6.1–18.8) ng/ml, 47/51 (92.1%) cirrhotic (78.7%; Child-Pugh CP A and 21.3% CP B), 8/51 (15.7%) without sustained virological response (SVR). Cumulative HCC incidence was 6.5%. Overall incidence was 1.46/100 patient-years (PY) (95% CI = 1.09–1.91), being 2.31/100 PY (95% CI = 1.70–3.06), 0.45/100 PY (95% CI = 0.09–1.03) and 0.20/100 PY (95% CI = 0.01–1.01) in META VIR F4, F3 and F2, respectively. According to BCLC, liver tumors were classified as follows: 0 (8/51, 15.6%), A (26/51, 51%), B (11/51, 21.6%), C (5/51, 9.8%) and D (1/51, 2%). Among patients with early HCC diagnosis, 71% received potentially curative treatment.

Conclusion: HCC still occurs after HCV treatment with DAAs, mainly in META VIR F4 patients. According to our findings, screening favored early diagnosis in approximately 70% of patients, facilitating earlier initiation of potentially curative treatments thus improving the prognosis of these patients.

LBP-17

Artificial intelligence to measure fibrosis change on liver biopsy in MAESTRO-NASH a phase 3 52-week serial liver biopsy study in 966 patients with NASH treated with resmetirom or placebo

Stephen Harrison,1 Rebecca Taub,2 Dominik Labriola2, Yayun Ren1, Elaine Cheng1, Deán Tai1,1 Pinnacle Research, United States; 2Madrigal Pharmaceuticals, RanDo, United States; 3Histoindex, Singapore

Email: rebeccataub@yahoo.com

Background and aims: MAESTRO-NASH (NCT03900429) is an ongoing 54-month, Phase 3, registration double blind, placebo-controlled non-cirrhotic NASH clinical trial to study the effect of once daily 80 mg or 100 mg resmetirom as compared with placebo in 966 patients with NASH and liver fibrosis. NASH resolution and fibrosis reduction end points on liver biopsy at 52 weeks were achieved at both resmetirom doses, including at least a one stage reduction in fibrosis without worsening of NASH of 24%, 26% (mITT) at 80 and 100 mg doses compared with placebo (14%). As an exploratory end point, artificial intelligence slide reading technologies were employed to measure the effect on fibrosis on serial liver biopsy using both continuous and quantitative scoring.

Method: Fibrosis was estimated as a continuous and categorical variable using second harmonic generation (SHG) (qFibrosis)/two photon excited fluorescence of 768 paired biopsy samples from MAESTRO-NASH. A separate untrained slide was analyzed for qFibrosis (normalized by tissue area and then corrected for qSteatosis (tissue area-steatosis area)). Relative changes in 184 fibrosis parameters were determined.

Results: The analyses were based on a total of 768 slide pairs including a baseline and Week 52 slide that were received and met criteria for quality (<10% missing pairs; <3% excluded for quality). Based on a continuous qSteatosis score, the % change from baseline in steatosis was 80 mg, –36%; 100 mg, –46%; placebo, –10%, p < 0.0001 for both doses, the continuous change from baseline in corrected qFibrosis score was 80 mg, –22%; 100 mg, –20%; placebo, 3%, p < 0.0001 for both doses. The categorical qFibrosis stage aligned with pathologist scoring (F1, F2, F3) with the exception that qfibrosis estimated a high fraction ~20% as F4 stage fibrosis at baseline (F4 stage scored at baseline by central pathologists were excluded from this study). Based on categorical change in qFibrosis score, there was a significant improvement in fibrosis stage (1-stage or 2-stage improvement) at 80 and 100 mg relative to placebo, and less worsening of fibrosis in the resmetirom treatment groups compared with placebo (Table). The percentage showing improvement in qFibrosis (≥1-stage) was higher than scored by pathologists, and identified 90% of resmetirom responders determined by pathologists. Significant correlations were observed between reduction in qFibrosis and reduction in PDFF, ALT, AST, and ELF.

Categorical change in qFibrosis stage

<table>
<thead>
<tr>
<th>Improvement</th>
<th>p value</th>
<th>Improvement</th>
<th>p value</th>
<th>Worsened</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>80 mg</td>
<td>58%</td>
<td>&lt;0.0001</td>
<td>19%</td>
<td>&lt;0.0001</td>
<td>11%</td>
</tr>
<tr>
<td>100 mg</td>
<td>56%</td>
<td>&lt;0.0001</td>
<td>25%</td>
<td>&lt;0.0001</td>
<td>11%</td>
</tr>
<tr>
<td>PBO</td>
<td>34%</td>
<td>7%</td>
<td>35%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: Measurements of fibrosis change using qFibrosis on either a continuous or categorical scale demonstrated a clear improvement and less worsening in fibrosis in resmetirom treated NASH patients as compared with placebo after 52 weeks of treatment.

LBP-18

ALG-000184, a capsid assembly modulator, dosed with entecavir for up to 28 weeks is well tolerated and resulted in substantial declines in surface antigen levels in untreated Hepatitis B e antigen positive subjects with chronic hepatitis B

Jinlin Hou,1 Yanhua Ding,2 Junqi Niu,2 Xieer Liang,3 Man-Fung Yuen,4 Edward J. Gane,4 Kosh Agarwal,3 Min Wu,3 Kha Le,2 Meenakshi Venkatraman,1 Christopher Westland,2 Maida Maderazo,3 Sushmita Chanda,1 Leonid Beigelman,1 Lawrence Blatt,1 Tse-I Lin,1 Matt McClure7, John Fry9.

1Nanfang Hospital, Southern Medical University, China; 2Jilin University, the First Hospital, China; 3University of Hong Kong, Hong Kong; 4University of Auckland, New Zealand; 5King’s College, United Kingdom; 6Aligos Therapeutics (Shanghai) Co., Ltd, China; 7Aligos Therapeutics, United States; 8Aligos Belgium BV, Belgium; 9Consultant, United States

Email: jlhousmu@163.com

Background and aims: To evaluate the safety, pharmacokinetics (PK), and antiviral activity of
ALG-000184, an oral prodrug of ALG-001075, a novel, pan-genotypic capsid assembly modulator with picomolar potency.

Method: ALG-000184-201 is a multi-part, multi-center, double-blind, randomized, placebo-controlled study (NCT04536337). Single and multiple ALG-000184 daily doses have previously been shown in Parts 1-3 to be well tolerated for dosing durations of 1-28 days and have potent antiviral activity in untreated chronic hepatitis B (CHB) subjects. In Part 4, multiple cohorts are evaluating dosing with ALG-000184 (100 mg x 24 weeks in Cohort 1 and 300 mg x 48 weeks in Cohort 2) in combination with entecavir (ETV) in untreated hepatitis B e antigen positive (HBeAg +) CHB subjects. Previously, available data from Cohorts 1 and 2 have shown that <300 mg ALG-000184 + ETV for ≥28 weeks is well tolerated and lowers hepatitis B DNA and surface antigen (HBsAg) levels. Here we report newly emerging safety, PK, and antiviral activity data from Cohort 2.

Results: Fifteen subjects were enrolled, all of which were Asian, with 7 (47%) female, mean age 31.4 years and body mass index 22.2 kg/m². Baseline alanine aminotransferase (ALT) was elevated in 8 (53%) of subjects and all subjects were genotype B (33%) or C (67%). Mean (log₁₀) baseline HBV DNA, RNA and HBsAg levels were 8.1 IU/ml, 6.7 copies/ml, and 4.4 IU/ml, respectively. 300 mg ALG-000184 + ETV for up to 28 weeks has been well tolerated with no concerning safety findings or trends reported, including no serious or treatment emergent adverse events (TEAEs) leading to discontinuation. Three subjects have experienced Grade ≥3 TEAEs; 1 subject developed Grade 4 neutropenia that was deemed related to an upper respiratory tract infection and 2 subjects experienced aminotransferase elevations (Grade 4 ALT with Grade 2 or 3 aspartate aminotransferase (AST) elevations), both of which were considered by the study ALT Flare Committee to be related to antiviral activity. All of these events resolved or are improving despite continued dosing. The PK profile with longer term dosing is consistent with prior observations with shorter dosing durations. Substantial mean (SEM) DNA (6.4 (0.3) log₁₀ IU/ml) and RNA (4.7 (0.7) log₁₀ copies/ml) declines have been observed for subjects dosed x 28 weeks (N = 5). Additionally, 4 (80%) of these subjects have exhibited continuous HBsAg declines of at least 1.1 log₁₀ IU/ml with a mean (SEM) decline of 1.4 (0.1) log₁₀ IU/ml; 2 of these 4 responders experienced declines of 1.6 and 1.7 log₁₀ IU/ml, respectively.

Conclusion: 300 mg ALG-000184 + ETV was well tolerated and had profound antiviral effects, including lowering HBsAg levels by up to 1.7 log₁₀ IU/ml among subjects dosed for 28 weeks. The observed HBsAg lowering effects indicate oral ALG-000184 may play an important role in combination regimens designed to achieve enhanced functional cure rates.

LBP-19
Assessing progress towards regional hepatitis B control goal-nationwide serosurvey among children, Uzbekistan, 2022
Nino Khetsuriani1, Dilorom Tursunova2, Rano Kasimova3, Said Sharapov2, Brock Stewart1, Renat Latipov4, Liudmila Mosina5, Bakhodir Yusupaliev2, Erkin Musabaev3, Pietro Lampertico1,2, Heiner Wedemeyer3, Maurizia Brunetto4, Pavel Bogomolov5, Tatjana Stepanova6, Sandra Ciesek7, Annemarie Berger3, Dmitry Manulov6, Qi An8, Audrey Lau9, Ben Da9, John F. Flaherty9, Renee-Claude Mercier10, Stefan Zeuzem11, Markus Cornberg12, Maria Butti12, Soo Alam13,4, Foundation IRCCS Ca’ Granda Ospedale Maggiore Policlinico, Division of Gastroenterology and Hepatology, Milan, Italy; 5CRC “A. M. and A. Migliavacca” Center for Liver Disease, University of Milan, Department of Pathophysiology and Transplantation, Milan, Italy; 6Klinik für Gastroenterologie, Hepatologie und Endokrinologie, Medizinische Hochschule Hannover, Hannover, Germany; 7Hepatology Unit, Reference Center of the Tuscany Region for Chronic Liver Disease and Cancer, University Hospital of Pisa and Department of Clinical and Experimental Medicine, Italy; 8State Budgetary Institution of Health Vare of Moscow Region “Moscow Regional Research Clinical Institute After M.E. Vladimirsky”, Moscow, Russian Federation; 9Limited liability company “Clinic of Modern Medicine”, Moscow, Russian Federation; 10Institute for Medical Virology, German Centre for Infection Research, External Partner Site Frankfurt, University Hospital, Goethe University Frankfurt am Main, Frankfurt am Main, Germany; 11Gilead Sciences, Inc., Foster City, United States; 12University Hospital Frankfurt, Department of Medicine, Frankfurt am Main, Germany; 13Hospital Universitario Vall d’Hebron and CIBERERD del Instituto Carlos III, Barcelona, Spain; 14Karolinska University Hospital/Karolinska Institutet, Department of Infectious Diseases, Stockholm, Sweden
Email: nck7@cdc.gov

Background and aims: Uzbekistan, a highly endemic country for hepatitis B virus (HBV), has adopted regional hepatitis B control and global hepatitis B elimination goals. Routine infant vaccination with hepatitis B vaccine (HepB), including a birth dose (HepB-BD), was introduced in the national immunization schedule in 2001. Since 2002, reported immunization coverage in Uzbekistan has been ≥80% for ≥3 doses of HepB (HepB3) and ≥95% for HepB-BD. However, the impact of vaccination and the progress towards achieving the European regional control target of ≤0.5% HBV surface antigen (HBsAg) prevalence in vaccinated age groups had not been assessed. To determine current HBsAg prevalence among children in Uzbekistan, we conducted a serosurvey in 2022.

Method: This nationwide serosurvey included primary school children (ages 6-10 years) and used a stratified, multi-stage cluster design. Participants’ basic demographics and HepB immunization information (from clinic records) were obtained. Blood samples were tested for HBsAg using a WHO-prequalified rapid test (Bioline HBsAg WB, Abbott Diagnostics). Samples with positive and indeterminate results were tested for HBsAg by ELISA (Murex HepB version 3, Diasorine). Weighted proportions and adjusted 95% confidence intervals (CI) for HBsAg prevalence and for receipt of HepB3, HepB-BD, and timely HepB-BD (given within the first 24 hours of birth), were calculated.

Results: Of 4,119 children enrolled in classes selected from the 148 participating schools, blood was collected from 3,753 (91.1%) and immunization data were available for 3,833 (93.3%). Overall, national HBsAg prevalence was 0.20% (adjusted 95% CI, 0.05%-0.38%). Among children with available immunization data, 3,745 (97.7% [97.2%-98.1%]) received HepB3 and 3,635 [94.9% (94.1%-95.5%)] received HepB-BD. Timely HepB-BD was given to 3,349 [93.7% [92.9%-94.5%]] of 3,592 children with available HepB-BD vaccination age data.

Conclusion: Uzbekistan has most likely achieved the European region hepatitis B control target based on ≥90% HepB-BD and HepB3 vaccine coverage and <0.5% HBsAg seroprevalence among children. To further decrease HBsAg seroprevalence in Uzbekistan to a ≤0.1% level consistent with the elimination of mother-to-child transmission of HBV, additional interventions should be considered, including improving antenatal screening for HBsAg and providing hepatitis B immunoglobulin to infants born to HBsAg-positive mothers and anti-HBV antiviral treatment to eligible HBsAg-positive pregnant women.

LBP-20
Continued treatment of early non-responder or partial virologic responders with bulevirtide monotherapy in patients with chronic hepatitis D through week 96 leads to improvement in virologic and biochemical responses
Pietro Lampertico1,2, Heiner Wedemeyer3, Maurizia Brunetto4, Pavel Bogomolov5, Tatjana Stepanova6, Sandra Ciesek7, Annemarie Berger3, Dmitry Manulov6, Qi An8, Audrey Lau9, Ben Da9, John F. Flaherty9, Renee-Claude Mercier10, Stefan Zeuzem11, Markus Cornberg12, Maria Butti12, Soo Alam13,4, Foundation IRCCS Ca’ Granda Ospedale Maggiore Policlinico, Division of Gastroenterology and Hepatology, Milan, Italy; 5CRC “A. M. and A. Migliavacca” Center for Liver Disease, University of Milan, Department of Pathophysiology and Transplantation, Milan, Italy; 6Klinik für Gastroenterologie, Hepatologie und Endokrinologie, Medizinische Hochschule Hannover, Hannover, Germany; 7Hepatology Unit, Reference Center of the Tuscany Region for Chronic Liver Disease and Cancer, University Hospital of Pisa and Department of Clinical and Experimental Medicine, Italy; 8State Budgetary Institution of Health Vare of Moscow Region “Moscow Regional Research Clinical Institute After M.E. Vladimirsky”, Moscow, Russian Federation; 9Limited liability company “Clinic of Modern Medicine”, Moscow, Russian Federation; 10Institute for Medical Virology, German Centre for Infection Research, External Partner Site Frankfurt, University Hospital, Goethe University Frankfurt am Main, Frankfurt am Main, Germany; 11Karolinska University Hospital/Karolinska Institutet, Department of Infectious Diseases, Stockholm, Sweden
Email: pietro.lampertico@unimi.it

Background and aims: Bulevirtide (BLV), a novel entry inhibitor of hepatitis delta virus (HDV), is conditionally approved in the EU for treatment of chronic hepatitis D (CHD) based on surrogate end point results. In clinical studies, virologic responders (VR) to HDV therapy is...
defined as achieving undetectability or a ≥2-log_{10} IU/mL decline in HDV RNA from baseline (BL). However, the optimal BLV treatment duration is unknown, and it is also unclear if patients who are early virologic non-responders (NR) will benefit from continued therapy. This analysis aimed to evaluate the efficacy of continued BLV monotherapy in those who were not VR after 24 weeks (W) of treatment.

**Method:** Data from the ongoing phase 3 study (MYR301; NCT03852719) was analyzed. MYR301 is an open-label, randomized study evaluating three cohorts: BLV 2mg (Arm B) and BLV 10mg (Arm C) for 144W, and a delayed treatment arm (Arm A). Only results from participants on treatment at 96W from Arm B + C were included in this analysis. NR and partial-responders (PR) were defined as HDV RNA declines of <1-log_{10} IU/mL and ≥1 but <2-log_{10} IU/mL, respectively. Rates of participants achieving biochemical response (alanine transaminase [ALT] within normal limits [WNL]), were compared between NR, PR, and VR.

**Results:** Participants with CHD (N = 94) were included (47 BLV 2mg; 47 BLV 10mg). BL characteristics included: 62% male, 85% white, 48% with cirrhosis, 61% taking concomitant nucleos (t)ide analogues and 55% with prior interferon exposure. Mean (SD) HDV RNA was 5.0 (1.3) log_{10} IU/mL and median (Q1, Q3) ALT was 102 (65, 141) U/mL. At W24, 58 (62%) participants were VR of which 30 had ALT WNL, 22 were PR of which 12 had ALT WNL, and 14 were NR of which 2 had ALT WNL. Of 14 NR participants at W24, 6 became VR (3-BLV2 mg/3-BLV10 mg); 15 with ALT WNL) and 3 remained PR (3-BLV 10mg); 2 with ALT WNL. Of 14 NR participants at W24, 6 became VR (3-BLV2 mg/3-BLV10 mg); by W96, and 3 became PR (3-BLV2 mg), with 5 remaining NR. Mean (SD) HDV RNA decline from baseline at W96: VR [−3.6 (1.1) log_{10} IU/mL, PR [−1.5 (0.3) log_{10} IU/mL, and NR [−0.2 (0.5) log_{10} IU/mL]. Median (Q1, Q3) ALT decline from baseline at W96: VR [−48 (−75, −12) U/mL, PR [−42 (−102, 9) U/mL, and NR [−83 (−102, −33) U/mL]. At W96, ALT had declined by >50% from BL in 5 of the 6 NR (1 achieved ALT WNL).

**Conclusion:** Most participants who were PR (18 of 24; 75%) and a considerable portion who were NR (6 of 14; 43%) to BLV at 24W achieved VR by W96; with ALT improvements occurring in all groups including those who remained a NR. These results provide evidence for continuing BLV therapy despite early (W24) suboptimal virologic responses in patients with CHD.

**Table 1: Shift Table for Non- and Partial Responders at Week 24 Through Week 48 and 96**

<table>
<thead>
<tr>
<th></th>
<th>BLV 2mg</th>
<th>BLV 10mg</th>
<th>BLV 2mg + 10mg</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Week 24 HDV RNA</td>
<td>Week 24 HDV RNA</td>
<td>Week 24 HDV RNA</td>
</tr>
<tr>
<td>NR n = 10</td>
<td>PR n = 12</td>
<td>VR n = 25</td>
<td>NR n = 4</td>
</tr>
<tr>
<td>Nonresponder</td>
<td>8 (80)</td>
<td>1 (8.3)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Partial Responder</td>
<td>1 (10)</td>
<td>0 (0)</td>
<td>2 (8)</td>
</tr>
<tr>
<td>Responder</td>
<td>1 (10)</td>
<td>11 (91.7)</td>
<td>23 (92)</td>
</tr>
<tr>
<td>W96 HDV RNA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonresponder</td>
<td>4 (40)</td>
<td>1 (8.3)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Partial Responder</td>
<td>3 (30)</td>
<td>0 (0)</td>
<td>2 (8)</td>
</tr>
<tr>
<td>Responder</td>
<td>3 (30)</td>
<td>11 (91.7)</td>
<td>23 (92)</td>
</tr>
</tbody>
</table>

**Figure:** (abstract: LBP-20).
Results: Of the 473 individuals invited to participate in R1, 344 (72.7%) completed the survey. The 344 R1 respondents were invited to participate in R2, with 288 (83.7%) completing the survey. The panel originated from 94 countries and are predominantly employed in the academic sector (66.6%), and work in the field of clinical research (79.4%). In R1, the study presented 31 initial priorities to the panel. In revisions ahead of R2 three priorities were removed, with key components of these being merged with others, leaving 28 for the panel to review in R2. Across rounds, consensus increased in all domains, with the mean percentage of ‘agree’ responses rising from 78.3 in R1 to 81.1 in R2. In R2, the mean level of combined agreement (‘agree’ + ‘somewhat agree’) across all priorities was 97.7% and five received unanimous combined agreement (Figure 1); the remaining 23 priorities exhibited >90% combined agreement. All but one of the priorities exhibited at least a super-majority of agreement (>66.7% ‘agree’). Thirteen priorities had <80% ‘agree’, with reliance on ‘somewhat agree’ to achieve >90% combined agreement.

Conclusion: Adopting the multidisciplinary consensus research priorities agenda can deliver a step-change in understanding fatty liver disease, from the individual and societal harms to its prevention, identification, treatment, and care. The outcomes of this study should catalyse the global liver health community’s efforts to advance and accelerate responses to this widespread and fast-growing public health threat.

LBP-22
Twelve-week treatment with BOS-580, a novel, long-acting Fc-FGF-21 fusion protein, leads to a reduction in liver steatosis, liver injury, and fibrosis in patients with phenotypic NASH: a randomized, blinded, placebo-controlled phase 2A trial

Rohit Loomba1, Kris Kowdley, Jose Rodriguez2, Nomita Kim3, Alma Alvarez2, Linda Morrow4, Philip Yin5, Lakshmi Amaravadi6, Brenda Jeng7, Alicia Acosta8, Swapan Chowdhury9, Craig Basson10, Etienne Dumont13, Eric Svensson14, Tatjana Odrljin15
1 UC San Diego, Medicine, La Jolla, United States; 2Liver Institute Northwest, N/A, Seattle, United States; 3Southwest General Health Care Center, Medical Director/Principal Investigator, Fort Meyers, United States; 5Boston Pharmaceuticals, Research, Austin, United States; 6Century Research, LLC, Clinical, Miami, United States; 7ProSciento, Inc., Medical Affairs, San Diego, United States; 8Pemi River Health Solutions, LLC, N/A, Somerville, United States; 9DepotWise Therapeutics, Preclinical Development and Translational Medicine, Natick, United States; 10Boston Pharmaceuticals, Clinical Operations, Cambridge, United States; 11Boston Pharmaceuticals, Research and Development, Biometrics, Cambridge, United States; 12Boston Pharmaceuticals, Research, and Development, Biometrics, Cambridge, United States; 13Boston Pharmaceuticals, Scientific, Cambridge, United States; 14Boston Pharmaceuticals, Clinical Development, Cambridge, United States
Email: roloomba@health.ucsd.edu

Background and aims: BOS-580 is a genetically engineered fusion of IgG1 Fc and fibroblast growth factor 21 (FGF-21) with specificity for FGF receptors 1c/2c/3c allowing for prolonged, balanced pharmacological effects. BOS-580 has a 21-day half-life that enables biweekly and monthly dosing. A growing body of evidence demonstrates that FGF-21 analogues can increase NASH resolution and improve fibrosis in patients with NASH. The aim of this study was to examine pharmacokinetics, safety and efficacy of multiple doses and dose regimens of BOS-580 in patients with phenotypic NASH.

Method: Inclusion criteria for this patient- and investigator-blinded, randomized, placebo-controlled Phase 2A trial were a BMI of 30-40 kg/m2 and a liver stiffness measurement (VCTE-LSM) of 7.0 to 9.0 kPa, and serum aspartate transaminase (AST) >20 IU/L. Subjects were randomized into 5 cohorts treated for 12 weeks: BOS-580 75 mg Q4W, 75 mg Q2W, 150 mg Q4W, 150 mg Q2W, and placebo. The primary end point was safety/tolerability and pharmacokinetics; exploratory efficacy end points were also evaluated.
Background and aims: In March 2023, the United States CDC updated its screening guidelines for hepatitis B virus (HBV) from risk-factor-based to universal one-time screening for adults. The WHO recommends screening where prevalence is ≥2%. In NYC, HBV prevalence is 2.9%, and ~46% of New Yorkers with HBV are undiagnosed. To address this public health issue and in anticipation of the CDC’s new guidelines, in October 2022 we implemented universal one-time HBV screening for adults in our large, multi-center hospital system serving metro-NYC. We describe the process of implementing modifications to the electronic medical record (EMR). We also summarize initial changes in screening rates and outcomes from patient navigation for patients identified as HBsAg+.

Method: We met with leadership from population health, ambulatory, EMR IT, and laboratory teams to secure buy-in and to build the EMR modification and provider education materials. The screening consists of three lab orders: HBsAg, anti-HBs, and anti-HBc, in line with updated CDC guidance. In response to PCP concerns, we made several adjustments, including limiting the alert to adults 18-79 rather than 18+, turning off patient-facing alerts, and creating a new panel that orders all three labs in one step. To complement the EMR alert, we conducted outreach to PCPs in three of our five pilot clinics via presentations, feedback reports, broadcast and personalized emails, and a one-page tip sheet. We also implemented patient outreach and navigation via phone, patient portal, and PCP engagement for patients who tested HBsAg+, with the goal of connecting them to liver care.

Results: Since implementation of the EMR alert, the average HBV screening rate has increased from 4% at baseline in September 2022 to 23% in March 2023 across our pilot clinics that received our EMR modification and provider education materials. The screening consists of three lab orders: HBsAg, anti-HBs, and anti-HBc, in line with updated CDC guidance. In response to PCP concerns, we made several adjustments, including limiting the alert to adults 18-79 rather than 18+, turning off patient-facing alerts, and creating a new panel that orders all three labs in one step. To complement the EMR alert, we conducted outreach to PCPs in three of our five pilot clinics via presentations, feedback reports, broadcast and personalized emails, and a one-page tip sheet. We also implemented patient outreach and navigation via phone, patient portal, and PCP engagement for patients who tested HBsAg+, with the goal of connecting them to liver care.

LBP-23

Improving hepatitis B screening and linkage to care rates via the electronic medical record, provider engagement, and patient navigation in a large, urban health system

Anna Mageras1, Eric Woods1, Brooke Wyatt1, Rebecca Roediger1, Francina Collado1, Tasnim Bhuiyan1, Caroline Romano1, Douglas T Dieterich1. Icahn School of Medicine at Mount Sinai, United States
Email: anna.mageras@mssm.edu

Background and aims: In March 2023, the United States CDC updated its screening guidelines for hepatitis B virus (HBV) from risk-factor-based to universal one-time screening for adults. The WHO recommends screening where prevalence is ≥2%. In NYC, HBV prevalence is 2.9%, and ~46% of New Yorkers with HBV are undiagnosed. To address this public health issue and in anticipation of the CDC’s new guidelines, in October 2022 we implemented
Background and aims: HH-003 is a human monoclonal antibody that targets the preS1 domain of the large envelope protein of HBV and HDV. It prevents the binding of preS1 with sodium taurocholate co-transporting polypeptide (NTCP), the cellular receptor for HBV and HDV, and effectively blocks viral infection and re-infection of hepatocytes. This open-label, phase 2 study (NCT05674448) aimed to evaluate the safety and efficacy of HH-003 in patients with chronic HBV and HDV co-infection.

Method: The study included nine participants (aged 18-70 years old) who were serum anti-HDV IgG positive and HDV RNA positive at screening and had a history of HBV for at least 6 months at screening. All participants received intravenous infusion of 20 mg/kg HH-003 once every two weeks for 24 weeks, with a 24-week follow-up. Virological response (a serum HDV RNA level below the limit of detection or a ≥2 log10 IU/ml decline from baseline) and biochemical response (normalization of ALT, normal ALT was defined as ≤33 U/L for women and ≤41 U/L for men) to HH-003 treatment were assessed at week 24 and week 48. Serum HDV RNA level was measured using RoboGene HDV RNA Quantification kit 2.0.

Results: The median (min, max) HDV RNA and ALT levels at baseline were 3.48 (1.58, 5.40) log10 IU/ml and 36.0 (21.0, 86.0) U/L, respectively. After HH-003 treatment, the median (min, max) changes of HDV RNA level from baseline at week 24 and week 48 were -2.18 (-3.88, 0.35) log10 IU/ml and -1.98 (-3.64, 0.72) log10 IU/ml, respectively. At week 24, 77.8% (7/9) of the participants achieved virological response; 5 (56.3%) achieved ALT normalization, and the other 4 participants remained to have normal ALT levels (100%, 4/4); and 3/5 (60%) participants achieved ALT normalization and combined response, respectively. One subject (11.1%) experienced treatment-related adverse events (AEs) of abdominal discomfort (Grade 1) and asthenia (Grade 2). No grade 3 or higher AEs or serious AEs occurred, and no participants discontinued treatment due to AEs.

Conclusion: HH-003 treatment at a dose of 20 mg/kg demonstrated significant decrease of HDV RNA level and ALT normalization, with a good safety profile in participants co-infected with HBV and HDV. HH-003 might provide a new treatment option for patients with HBV and HDV co-infection, and a large-scale study will be conducted to further demonstrate such a promising anti-viral effect of HH-003 in patients with HBV and HDV co-infection.

LBP-25
Safety and efficacy of anti-pre-S1 domain monoclonal antibody (HH-003) treatment in patients with co-infection of chronic hepatitis B virus (HBV) and hepatitis D virus (HDV): a single center, open-label, phase 2 trial
Xinrui Wang1, Xiumei Chi1, Yingyu Zhang1, Yumei Gu2, Long Xiao2, Yonghe Qi2, Liangfeng Zou2, Jiaying Wen2, Yin Zhang3, Pan Chen2, Cong Lei2, Bin Ye2, Jianhua Sui3, Wenhui Li3, Junqi Niu1, *First Hospital of Jilin University, China; 2Huahui Health Ltd., China; 3National Institute of Biological Sciences, China
Email: junqiniu@jlu.edu.cn

Figure: Efficacy outcomes from the study. (A) Serum HDV RNA level reduction during the HH-003 treatment period. Line plot with median and interquartile range (IQR) showing the log10 change from baseline of the serum HDV RNA level. (B) Line plot with median and IQR showing the dynamics of ALT levels in 5 participants with abnormal baseline ALT levels. (C) The proportions of patients achieved virologic response, ALT normalization and combined response at week 24 and week 48.

Conclusion: HH-003 treatment at a dose of 20 mg/kg demonstrated significant decrease of HDV RNA level and ALT normalization, with a good safety profile in participants co-infected with HBV and HDV. HH-003 might provide a new treatment option for patients with HBV and HDV co-infection, and a large-scale study will be conducted to further demonstrate such a promising anti-viral effect of HH-003 in patients with HBV and HDV co-infection.
aimed to investigate the efficacy and safety of concurrent therapy of NIV and EBRT in pts with aHCC with VI.

**Method:** In this phase 2, single-arm, multicenter, investigator-initiated trial, pts with Child-Pugh class A HCC with VI were treated with intravenous NIV (3 mg/kg every 2 weeks) and EBRT concurrently followed by maintenance NIV until progression or unacceptable toxicity. The primary end point was progression-free survival (PFS) and safety; secondary end points included overall survival (OS), time to progression (TTP), objective response rate (ORR), and disease control rate (DCR). (NCT04611165)

**Results:** Between January 2020 and June 2021, 50 pts were enrolled to progression (TTP), objective response rate (ORR), and disease toxicity. The primary end point was progression-free survival (PFS) with intravenous NIV (3 mg/kg every 2 weeks) and EBRT concurrently initiated trial, pts with Child-Pugh class A HCC with VI were treated with NIV and EBRT in pts with aHCC with VI. Concurrent therapy of NIV and EBRT demonstrates a meaningful PFS and promising clinical outcomes in pts with aHCC with VI. The safety profile was overall acceptable. Figure:

**Conclusion:** Concurrent therapy of NIV and EBRT demonstrates a meaningful PFS and promising clinical outcomes in pts with aHCC with VI. The safety profile was overall acceptable.

**LBP-26**

Evaluation of non-invasive tests to identify precirrhotic fibrosis due to NASH in patients screened for the phase 3 REGENERATE and REVERSE studies of obeticholic acid

Rohit Loomba¹, Kris Kowdley², Quentin Anstee³, Mazen Noureddin⁴, Zobair Younossi⁵, Naim Alkhour²,⁶, Jerome Boursier⁶, Stephen Harrison⁵, Thomas Capozza¹⁰, Jing Li¹⁰, Arianna Battisti⁴, Marie-Laure Plissonnier¹,²,³, Marintha Heil⁵, Christopher Gasink¹⁰, Mary Rinella¹¹, University of California, San Diego, La Jolla, United States; ¹Liver Institute Northwest and Elson S. Floyd College of Medicine, Washington State University, Seattle, United States; ²Translational and Clinical Research Institute, Faculty of Medical Sciences, Newcastle University, Framlington Place, Newcastle upon Tyne, United Kingdom; ³Division of Digestive and Liver Diseases, Cedars-Sinai Medical Center, Los Angeles, United States; ⁴Beatty Liver and Obesity Research Program, Center for Liver Diseases, Inova Medicine, Falls Church, United States; ⁵The Texas Liver Institute, University of Texas Health San Antonio, San Antonio, United States; ⁶Arizona Liver Health, Chandler, United States; ⁷Angers University Hospital, Angers University, Angers, France; ⁸Pinnacle Clinical Research Center, San Antonio, United States; ⁹Intercept Pharmaceuticals, Inc., Morristown, United States; ¹⁰University of Chicago, Pritzker School of Medicine, Chicago, United States

Email: roloomba@health.ucsd.edu

**Background and aims:** Liver biopsy is the historic basis to identify non-alcoholic steatohepatitis (NASH) fibrosis (F) stage but is limited by complications as well as pathologist read and sampling variability. However, non-invasive tests (NITs) are now widely used in clinical practice and society guidelines to identify and risk-stratify NASH F stage. Potential NASH therapies create a pressing need for NIT-based approaches to specifically identify appropriate patients (pts) with F2/3 (precirrhotic) fibrosis.

**Method:** Patients (pts) screened for the phase 3 trials of obeticholic acid (n = 6060) were examined based on values for FibroScan (FS), Enhanced Liver Fibrosis (ELF), Fibrosis-4 (Fib-4), direct bilirubin (DB), albumin (ALB), and platelet count (PLT) vs both original single-pathologist and consensus panel pathology reads to identify pts likely to have F2/F3 disease, while excluding F0, F1, and F4. The distribution of each NIT across the spectrum of histologic F stages was used to determine ideal cutoffs, which were then assessed for sensitivity (SENS), specificity (SPEC), and related parameters using NITS alone and in combination.

**Results:** Among all screened pts, F stage n was F0:658, F1:1160, F2:1088, F3:1619, and F4:1535 (REGENERATE only, n = F0:657, F1:1158, F2:1084, F3:1599, and F4:273). The lower bounds of Fib-4 (1.3), ELF (9.6), and FS (9.6) eliminated most F0/1 pts, while the upper bounds (Fib-4, 2.67; ELF, 11; FS, 18) discriminated between F3 and F4. Results were generally similar in single and consensus pathology reads (Table). Although single NITs had insufficient SPEC, use of 2 sequential tests, ie, Fib-4 (1.3–2.67) followed by either ELF (9.6–11) or FS (9.6–18) with additional exclusion of PLT <150 x10⁹/L, DB >0.5 mg/dL, and ALB <3.8 g/dL led to a SPEC of 91% for identification of F2/F3 pts (SENS:31, NPV:35, PPV:89, AUCROC:75; for F3: SPEC:85, SENS:38, NPV:66, PPV:65, AUCROC:74).

**Conclusion:** A combined NIT approach using Fib-4 followed by either ELF or FS identified F2/F3 pts with high SPEC and PPV. The addition of PLT, DB, and ALB upper bounds further increased SPEC, ensuring precise identification of pts who would be appropriate for therapies or studies in this population. While low SENS is a limitation, this approach reliably identified precirrhotic fibrosis without liver biopsy in almost 40% of F3 pts. This approach should be validated in an independent cohort of similar pts.

**LBP-27**

Evaluation of the hepatitis B virus liver reservoir with fine needle aspirates

Barbara Testoni¹,²,³, Armando Andres Roca Suarez¹,²,³, Arianna Battisti⁴, Marie-Laure Plissonnier¹,²,³, Marinha Heil¹, Thierry Fontanges³, François Villaret⁴, Yasmina Chouik⁵, Massimo Lervero¹,³,⁶, Uphar Gill⁵, Patrick Kennedy⁶, Fabien Zoulim¹,²,³,⁶, INSERM U1052, CNRS UMR-5286, Cancer Research Center of Lyon (CRL), France; ²University of Lyon, Université Claude-Bernard (UCBL), Lyon, France; ³Hepatology Institute of Lyon, France; ⁴Barts Liver Centre, Immunobiology, Blizzard Institute, Barts and The London School of Medicine and Dentistry, Queen Mary University of London, London, United Kingdom; ⁵Roche Molecular Diagnostics, Pleasanton CA, United States; ⁶Department of Hepatology, Croix Rousse hospital, Hospices Civils de Lyon, France; ⁷Department of Internal Medicine-DMISM and the IIT Center for Life Nanoscience (CLNS), Sapienza University, Rome, Italy

Email: fabien.zoulim@inserm.fr
Background and aims: Finite duration of treatment associated with Hepatitis B surface antigen (HBsAg) loss is the current goal for improved therapeutic approaches against chronic hepatitis B virus (HBV) infection, as this indicates elimination or durable inactivation of intrahepatic covalently-closed circular (ccc)DNA. To assist drug development, it will be essential to define early predictive markers of HBsAg loss by assessing their value in reflecting intrahepatic cccDNA levels and transcriptional activity. In this context, fine needle aspirates (FNA) have recently emerged as a less invasive alternative to core liver biopsy (CLB), having already shown to be useful for the characterization of intrahepatic immune responses. The aim of this study was to optimize and validate the use of FNA vs CLB to evaluate the intrahepatic viral reservoir.

Method: Paired FNA/CLB samples were obtained from patients with hepatitis B e antigen (HBeAg)+ chronic hepatitis (n = 4), HBeAg- chronic hepatitis (n = 4) and HBeAg- chronic infection (n = 1). One HBeAg+ patient was undergoing tenofovir treatment. HBV 3.5-kb RNA and cccDNA were quantified by droplet digital (dd)PCR.

Results: cccDNA was quantifiable in all but one FNA/CLB pair, showing the highest levels in untreated HBeAg+ subjects, with exception of the tenofovir-treated patient. Similarly, 3.5-kb RNA and cccDNA were quantified by droplet digital (dd)PCR.

Conclusion: These results demonstrate the possibility to quantify cccDNA and assess its transcriptional activity in chronic hepatitis B patients by combining FNA and ddPCR. Moreover, this supports the use of FNA in clinical trials to evaluate the intrahepatic viral reservoir during the development of new antivirals and immunomodulatory agents.

LBP-28
Phase 2a study of CM-101, a CCL24 neutralizing antibody, in patients with non-alcoholic steatohepatitis: a proof-of-concept study
Rifaat Saafdi1, John Lawler2, Revital Aricha2, Ilan Vaknin2, Scott Friedman3, Adi Mor2.
1Hadassah Hebrew University Hospital, Israel; 2Chemomab Therapeutics, Ltd, Israel; 3Icahn School of Medicine, United States
Email: saafdi@hadassah.org.il

Background and aims: CCL24 (eotaxin-2) is a chemokine that promotes cell trafficking and regulates inflammatory and fibrotic processes through the CCR3 receptor. CCL24 plays a central role in the development of hepatic fibrosis and liver injury (Segal-Salto M, 2020). Patients with non-alcoholic steatohepatitis (NASH) and advanced non-alcoholic fatty liver diseases (NAFLD) were noted to have elevated levels of CCL24 and CCR3 in liver and blood samples. CM-101 is a humanized IgG1 neutralizing monoclonal antibody to CCL24, which significantly reduced migration and activation of immune cells and fibroblasts, including hepatic stellate cells. CM-101 has been shown to reduce liver damage in three different experimental animal models of liver fibrosis and NASH (Segal-Salto M, 2020). The purpose of study is to evaluate the therapeutic potential of CM-101 in patients with NASH with fibrosis stages 1c, 2 and 3.

Method: This was a single country, multicenter, randomized, double-blind, placebo-controlled, phase 2a study. Patients with liver biopsy confirming NASH within 18 months of randomization or screening were randomized (2:1) to receive either CM-101 5mg/kg or placebo subcutaneously (SQ), every 2 weeks for 14 weeks (8 total administrations) and all patients had a follow-up visit 6 weeks after the end of treatment.
treatment (total study duration 20 weeks). The primary end point was safety and tolerability at 16 weeks. Secondary and exploratory end points included changes from baseline in various fibrotic and inflammatory serum biomarkers and liver stiffness as assessed by Fibroscan. PK and target engagement profile of CM-101, and the development of anti-drug antibodies (ADAs) were also assessed.

Results: 23 patients (14 CM-101; 9 Placebo) were randomized. The demographic and baseline characteristics were comparable between the groups, except more patients in the CM-101 group had a higher fibrosis stage (36% Stage F3 vs. 0% Stage 3), enhanced liver fibrosis (ELF) score (9.8 vs. 8.7, p = 0.001), and liver stiffness (11.3 kPa vs. 8.1 kPa, p = 0.037) at baseline than patients in placebo group, respectively.

CM-101 5mg/kg SQ every 2 weeks for 14 weeks was safe and well tolerated. Most adverse events (AEs) were mild with one unrelated serious adverse event. There were no significant injection site reactions, and no ADAs were detected at 20 weeks. CM-101 showed a favorable PK and target engagement profile that was consistent with other phase 1 studies. Compared to placebo-treated patients, a higher proportion of CM-101-treated patients showed improvement in liver fibrosis-related biomarkers (ProC-3, ProC-4, ProC-18, TIMP-1, ELF) (Fig 1A). At 20 weeks, 8 (60%) of CM-101-treated patients had improvements in at least 3 fibrotic biomarkers compared to 0 of the placebo-treated patients (Fig 1B). Among CM-101-treated patients, those with higher CCL24 levels at baseline showed greater reductions in fibrosis-related biomarkers than patients with lower CCL24 levels.

Conclusion: CM-101 5mg/kg administered SQ every 2 weeks for a relatively short duration of 14 weeks was safe and well tolerated and provided evidence supporting CCL24 as a potential therapeutic target in NASH. Neutralizing the pro-inflammatory and pro-fibrotic effects of CCL24 with CM-101 at higher doses and for prolonged duration should be further evaluated in a statistically powered, biopsy-based, randomized, placebo-controlled study.

LBP-29
Predictors of long-term mortality after HCV eradication among PLWH
Alessia Siribelli, Sara Diotallevi, Laura Galli, Giulia Morsica, Riccardo Lolatto, Costanza Bertoni, Emanuela Messina, Simona Bosssolascio, Benedetta Trentacapilli, Caterina Uberti-Foppa, Antonella Castagna, Hamid Hasson, San Raffaele Scientific Institute, Milan, Italy; Vita-Salute San Raffaele University, Italy
Email: siribelli.alessia@hsr.it

Background and aims: This study aimed to assess the long-term incidence and risk factors of death in HIV-HCV coinfected people treated with direct acting antivirals (DAAs).

Method: Retrospective study in HIV-HCV coinfected people, anti-retroviral-treatment experienced, followed at San Raffaele Hospital, who achieved sustained virological response (SVR) after DAAs. Biochemical and virological data were collected at baseline (BL), defined as end of DAA treatment; follow-up (FU) accrued since BL until death, lost-to FU or last visit. ALBI grade, which reflects the hepatic functional reserve, was calculated with the formula: (log10(bilirubin[µmol/L]× 0.66)+ (albumin[g/L]− 0.0852).

Results: Overall, 663 people analyzed; BL characteristics are reported in Table 1. During a median follow-up of 4.41 years (IQR = 3.5-5.5), 49 people died: 35% deaths were liver-related, 51% malignancies of which 16% liver cancers. The overall 3-, 5- and 7-year cumulative probabilities of death were 4.9% (95%CI = 3.2%-6.7%), 8.0% (95%CI = 5.5%-10.4%), 11.4% (95%CI = 7.8%-14.9%), respectively. Cumulative probabilities of death were higher among older individuals (Figure1), in people with vs without cirrhosis (Figure2), with AFP ≥3.4 vs <3.4 ng/ml (Figure3), with ALBI grade ≥2 vs 1 (Figure4), with HCC (log-rank p = 0.002). At multivariate analysis, death was more likely in older people [aHR (5-year older) = 1.46, 95%CI 1.16-1.83, p = 0.0009] and in people with diabetes [aHR = 2.98, 95%CI 1.55-5.71, p = 0.001], ALBI grade ≥2 [aHR = 2.13, 95%CI 1.17-3.90, p = 0.014] and AFP ≥3.4 ng/ml [aHR = 1.96, 95%CI 1.01 - 3.84, p = 0.049]; the effect of HCC on the risk of death was marginally significant [aHR = 2.69, 95%CI 0.90-8.05, p = 0.076].
HIV-HCV coinfected people who achieved SVR after DAAs showed a higher risk of death in presence of cirrhosis, HCC, diabetes, ALBI grade $\geq 2$ and AFP $\geq 3.4$ ng/L, the latter as possible laboratory predictors of mortality. We observed a high number of liver and non-liver malignancies among died people suggesting that surveillance of non-liver events should be extended to all individuals, regardless of liver disease stage.

Figure: [Graph showing the risk of death over time]

Conclusion: HIV-HCV coinfected people who achieved SVR after DAAs showed a higher risk of death in presence of cirrhosis, HCC, diabetes, ALBI grade $\geq 2$ and AFP $\geq 3.4$ ng/L, the latter as possible laboratory predictors of mortality. We observed a high number of liver and non-liver malignancies among died people suggesting that surveillance of non-liver events should be extended to all individuals, regardless of liver disease stage.

LBP-30-YI
A new risk model outperforms FIB-4 when predicting incident cirrhosis in the general population: a cohort study of 504,000 persons
Rickard Strandberg1, Mats Talbäck2, Niklas Hammar2, Hannes Hagström3, 1Karolinska Institutet, Department of Medicine, Huddinge, Sweden; 2Karolinska Institutet, Institute of Environmental Medicine, Solna, Sweden; 3Karolinska University Hospital, Department of Upper GI, Huddinge, Sweden
Email: rickard.strandberg@ki.se

Background and aims: Non-alcoholic fatty liver disease (NAFLD) has a high prevalence in the general population, and the incidence of NAFLD-associated cirrhosis is increasing. The Fibrosis-4 score (FIB-4) is a diagnostic model used in patients with NAFLD to estimate the present degree of fibrosis, but the FIB-4 score is inadequate for predicting future events. The aim of this study was to develop a risk score allowing physicians to identify individuals at a high risk of developing cirrhosis. Correct identification would allow for early intervention and preventive measures.

Method: We used a large Swedish population-based cohort, free of known liver diseases other than possibly NAFLD, with available laboratory data, including biomarkers associated with liver disease, and national registry data. Using flexible parametric survival models, a 10-year risk model of cirrhosis or associated complications was created, employing non-liver death as a competing event. The new comprehensive risk score includes age, sex, body mass index (BMI), aspartate aminotransferase (AST), alanine aminotransferase (ALT), gamma-glutamyl transferase (GGT), cholesterol, platelet count, albumin, bilirubin, glucose, and triglycerides. The performance was assessed in terms of calibration (calibration curves), discrimination (time-dependent area-under-curve (AUC)), and utility (decision curve analysis). The model was compared to the FIB-4 score.

Results: We used data of 504,309 individuals that were followed over an average follow-up time of 25 years. During follow-up, 7604 liver-related outcomes were observed. The cumulative risk of liver cirrhosis at ten years was 0.22%. The new risk score achieved a 10-year AUC of 81% compared to the FIB-4 AUC of 73% (Figure). In total, 4525 individuals had a FIB-4 above the established high-risk cut-off (2.67). Among these, the 10-year positive predictive value (PPV) for incident cirrhosis was 4.6%. Among an equal 4525 individuals with the highest new score (corresponding to >1.62% predicted risk), the 10-year PPV was 7.2%. According to the decision curve analysis, the new score has a positive net benefit for risk thresholds up to 18%, and a higher net benefit than FIB-4 for all thresholds.

Conclusion: The new risk score, the Cirrhosis Outcome Risk Estimator (CORE), based on a flexible modeling approach, and using biomarkers easily accessible in primary care, outperforms FIB-4 when predicting...
liver-related outcomes in the general population. External validation is needed before use in primary care.

**LBP-33-YI**

**Investigating the potential of the primary cilium as an immunomodulatory organelle in intrahepatic cholangiocarcinoma**

Sara Teles1, Scott Waddell1, Kostas Gournopanos1, Kyle Davies1, Philippe Gautier1, Pleasantine Mill1, Edward Jarman1, Luke Boulter1.

1Institute of Genetics and Cancer, University of Edinburgh, MRC Human Genetics Unit, United Kingdom

Email: sarapteles@gmail.com

**Background and aims:** Primary cilia (PC) are important organelles that protrude from biliary epithelial cells to sense changes in bile. Although changes in PC have been observed in Intrahepatic Cholangiocarcinoma (iCCA), why these cancers supress their cilia and how the lack of a functioning cilium benefits iCCA progression remains unexplored. Here, we investigate how PC loss shapes the immune microenvironment of iCCA to favour tumour progression.

**Method:** Using a combination of human iCCA tissue and two transgenic mouse models in which iCCA originates from either ciliated or unciliated cholangiocytes, we used bulk RNA sequencing to analyse the cell-intrinsic transcriptional changes resulting from PC-loss. By deriving organoid cultures from the same ciliated/unciliated cells, we have then functionally investigated how PC status in biliary cells affects the tumour immune microenvironment and how this influences iCCA progression.

**Results:** Human iCCA lack PC by immunohistochemical analysis; therefore, we developed an in vivo mouse model of iCCA in which PC are either lost or remain intact. In this model, iCCA does not develop when PC are present in biliary cells. However, when PC-loss is induced in vivo (through deletion of the essential cilia gene Wdr35), iCCA rapidly develops. Importantly, unciliated cells do not show increased rates of proliferation. Rather, bulk RNA sequencing showed that PC-loss induced the expression of progenitor transcription factors and immunoregulatory genes. Interestingly, in mice with unciliated iCCA we found lower levels of liver neutrophil infiltration. Using in vitro organoid cultures of ciliated and unciliated iCCAs and transwell assays, we found that PC-loss on cancer cells influences neutrophil recruitment and migration, indicating that loss of PC in iCCA has the potential to modulate local tumour immunity and avoid neutrophil-induced clearance.

**Conclusion:** PC-loss coordinates an inflammatory cell state that affects the recruitment of immune cells to the liver. By directly modulating the chemotaxis and infiltration of neutrophils, PC-loss promotes an immunosuppressive tumour microenvironment, thereby favouring iCCA progression.

**LBP-34**

**Modelling intrahepatic bile duct morphogenesis in vitro using synthetic hydrogels**

Ludovic Vallier1, Iona Thelwall2, Kevin Chalut3, Carola Maria Morell2, Lucia Cabriales4.

1Berlin Institute of Health, Berlin, Germany; 2Wellcome-MRC Cambridge Stem Cell Institute, United Kingdom; 3Altos Labs, Great Abington, United Kingdom; 4Lightcast Discovery Ltd, United Kingdom

Email: igt20@cam.ac.uk

**Background and aims:** Cholangiopathies account for a third of adult liver transplantations, access to which is limited by a shortage of healthy donor organs. A promising alternative is the use of human induced pluripotent stem cell (hiPSC)-derived cholangiocytes in a therapeutic context. However, lack of knowledge regarding cholangiocyte development limits the generation of fully functional cells. To address this issue, we developed a culture system consisting of tuneable synthetic hydrogels capable of testing the influence of mechanical stimuli on cholangiocyte development, with the aim of generating fully functional cholangiocyte organoids.

**Method:** Novel 2D polyacrylamide hydrogels developed in the Chalut Lab (Labouesse et al. 2021) were optimised for the in vitro culture of hiPSC-derived hepatoblast-like-cells using established protocols (Hannan et al. 2013, Sampaziotis et al. 2017). Optimised parameters consist of seeding cells at a density of 500,000 cells/cm² onto collagen I-coated soft hydrogels. Once seeding was optimised, the hepatoblast-like-cells were differentiated into cholangiocyte-like cells and marker expression was verified. The 2D hydrogel was then used as the base of a novel sandwich culture consisting of two distinct hydrogels, both with a defined extracellular matrix. Production of the sandwich culture involves the differentiation of immature cholangiocyte-like cells on polyacrylamide and the subsequent application of a proprietary synthetic gel top layer. This provides the encapsulation required for 3D structure formation and enables cholangiocyte morphogenesis into tubular bile duct structures.

**Results:** We have developed a promising alternative to Matrigel in the form of a novel synthetic hydrogel which enables the production of luminal bile ducts in vitro from hiPSCs. Cholangiocytes cultured in this system express biliary markers (KRT7/SOX9) to the same or a greater level than that observed in iPSC-derived intrahepatic bile duct (IHBD) organoids. We found that collagen I-coated hydrogels provide...
an excellent substrate for cholangiocyte differentiation, with increased collagen correlated with enhanced bilary (KRT7/SOX9) and reduced hepatic (ALB/AFP) marker expression. Indicating a potential mechanism by which collagen I directs hepatoblast fate choice and subsequent differentiation. This is supported by in vivo results showing that foetal IHBDs are surrounded by a localised region of collagen I. We are currently using the hydrogel system as a model to study the role of extracellular matrix composition in the induction of mechanically activated pathways linked to cholangio- 
cytodifferentiation (TGF-beta, Activin/Nodal and YAP-TAZ) with the end goal of elucidating a mechanism for extracellular matrix-driven 
hepatoblast zonation.

Conclusion: Overall, these results show that our synthetic hydrogel 
platform can be used to model bile duct development in vitro. Its tunable properties make the hydrogel a novel tool for the investiga-
tion of mechanical stimuli on cholangiocyte differentiation and enable the incorporation of good-manufacturing-process compliant 
reagents for cell therapy applications.

LBP-35

Long-term maintenance of response and improved liver health with maralixibat in patients with progressive familial 
intrahepatic cholestasis (PFIC): data from the MARCH-ON study

Alexander Miethke1, Adib Moukarzel2, Gilda Porta3, 
Joshue Covarrubias Esquer4, Piotr Czubkowski5, Felipe Ordonez6, 
Manila Candusso7, Amal A. Aquil8, Robert H. Squires9, Etienne Sokal10, 
Daniel D’Angostino11, Ulrich Baumann11, Lorenzo D’Antiga12, 
Najrag Kasi14, Nolwenne Laborde15, Cigdem Arkan16, Chuan-Hao Lin17, 
Susan Gilmour18, Naveen Mittal19, Fang Kuan Chio20, 
Simon P. Horslen21, Wolf-Dietrich Huber21, Tiago Nunes22, 
Anamaria Lascu22, Lara Longpre22, Douglas Mogul22, Raul Aguilar22, 
Nadia Ovchinsky28, Pamela Vig22, Vera Hupertz23, Regino Gonzalez-Peralta24, 
Emma Leong25, Jane Hartley26, Noemie Laverdure27, 
Nadja Ovchinsky28, Richard Thompson29,1

Cincinnati Children’s Hospital Medical Center, Cincinnati, Ohio, United States; 
Hôpital Dieu de France Saint Joseph University Hospital, Beirut, Lebanon; 
Hospital Sirio Libanes, Sao Paulo, Brazil; Nois De Mexico SA De CV, Jalisco, Mexico; 
The Children’s Memorial Health Institute, Gastroenterology, Hepatology, 
Nutritional Disorders and Pediatrics, Warsaw, Poland; 
Cardioinfantil Foundation-Lacardio, Bogota, Colombia; 
Ospedale Pediatrico Bambino Gesù IRCCs, Lazio, Italy; 
University of Texas Southwestern Medical Center, Dallas, Texas, United States; 
UPMC Children’s Hospital of Pittsburgh, Pediatrics, Pittsburgh, Pennsylvania, United States; 
UCLouvain, Cliniques Universitaires St Luc, Pediatric Hepatology, Brussels, Belgium; 
Hospital Italiano De Buenos Aires, Buenos Aires, Argentina; 
Hamnever Medical School, Pediatric Gastroenterology and Hepatology, Hannover, Germany; 
Hospital Papa Giovanni XXIII, Paediatric Hepatology, Gastroenterology and 
Transplantation, Bergamo, Italy; 
Medical University of South Carolina, Charleston, South Carolina, United States; 
Hôpital Des Enfants-CHU Toulouse, Toulouse, France; 
Koc University School of Medicine, Istanbul, Turkey; 
Children’s Hospital Los Angeles, Los Angeles, California, United States; 
University of Alberta, Pediatrics, Alberta, Canada; 
University of Texas Health Science Center at San Antonio, San Antonio, Texas, United States; 
Women’s and Children’s Hospital, Singapore; 
Medical University of Vienna, Vienna, Austria; 
Mimran Pharmaceuticals, Inc., Foster City, California, United States; 
Cleveland Clinic Children’s, Cleveland, Ohio, United States; 
AdventHealth for Children and AdventHealth Transplant Institute, Pediatric Gastroenterology, Hepatology, and Liver Transplant, Orlando, Florida, United States; 
Medstar Georgetown Transplant Institute, Medstar Georgetown University Hospital, Washington DC, United States; 
Birmingham Women and Children’s Hospital, Birmingham, United Kingdom; 
Hospital Femme Mere Enfant, Hospices Civils De Lyon, Pediatric Hepato Gastroenterology and Nutrition Unit, Lyon, France; 
New York University Grossman School of Medicine, New York, New York, United States; 
Institute of Liver Studies, King’s College London, London, United Kingdom 

Email: richard.j.thompson@kcl.ac.uk

Background and aims: Progressive familial intrahepatic cholestasis (PFIC) is a group of genetic disorders resulting in disrupted bile composition, cholestasis, and pruritus. Maralixibat (MRX) is a minimally absorbed ileal bile acid transporter (IBAT) inhibitor which prevents enterohepatic bile acid recirculation. In the 26-week placebo-controlled MARCH Phase 3 study, MRX at 570 µg/kg BID demonstrated significant improvements in pruritus, serum bile acid (sBA), bilirubin and growth in patients across the broadest range of PFIC types studied to date. MARCH-ON is an open-label long-term extension study for patients who completed the MARCH study. Here, we report on long-term maintenance of effect from MARCH-ON.

Method: Long-term maintenance of response was assessed for patients who were originally randomized to receive MRX in MARCH and continued with treatment in MARCH-ON (MRX-MRX group; n = 33). MRX response was assessed for patients who received PBO in the MARCH study and switched to open-label MRX in MARCH-ON (PBO-MRX group; n = 24). Assessments included: pruritus measured by 0-4 scale of ItchRO(Objs), sBA, bilirubin, and growth z-scores, as well as incidence of treatment-emergent adverse events (TEAEs). Baseline (BL) was defined as the start of MRX for each group.

Results: For the MRX-MRX group, the median (min, max) time on MRX was 394 days (108, 836). In total, 20 of 33 patients reached week 52 at time of analysis. Significant improvements observed in the first 26 weeks of the MARCH study were sustained from BL through week 52 in MARCH-ON for pruritus severity (-2.13, p < 0.0001), sBA (-200 µmol/L, p = 0.0004), bilirubin (-2.64 mg/dL, p = 0.0084), height z-score (+0.54, p < 0.0001), weight z-score (+0.44, p = 0.0010). In the PBO-MRX group, the median time on MRX was 256 days (29, 569). In total, 15 of 26 patients reached week 26 at time of analysis. Newly gained statistically significant reductions in pruritus and sBA levels were observed in the key efficacy end points from BL through Week 26 for pruritus (-1.05, p = 0.0017) and sBA (-141 µmol/L, p = 0.0003), in line with observations from the initial MARCH MRX group. Overall, there were no new safety signals identified. The most frequent TEAEs were GI-related with early onset of diarrhoea (44%) in line with the mechanism of IBAT inhibition, mostly mild and transient. In the MRX-MRX sub-group, fewer patients experienced diarrhoea (n = 2) in MARCH-ON supporting these effects are early and transient in nature.

Conclusion: Significant and sustained responses in pruritus, sBA, bilirubin as well as growth are observed with 52 weeks of MRX treatment across the broadest range of genetic PFIC types studied to date. These data suggest overall improved liver health with MRX treatment which can be maintained over time.

LBP-36

Oral vancomycin induces remission in PSC-IBD, which is associated with a reduction in bile salt hydrolase and colonic amine oxidase activity

Nabil Quraishi1; James Ferguson1, RossMcInnes2, 
Jonathan Cheesbrough1, Naveen Sharma1, Rachel Cooney1, 
PeterRimmer1, Willem van Schaik2, Tariq Iqbal3, Palak Trivedi4, 
Queen Elizabeth Hospital Birmingham, Gastroenterology, Birmingham, United Kingdom; 
University of Birmingham, Institute of Microbiology and Infection, Birmingham, United Kingdom; 
University of Birmingham, NIHR Birmingham BRC Centre for Liver and Gastrointestinal Research, Birmingham, United Kingdom 

Email: nabilquraishig@gmail.com

Background and aims: Primary sclerosing cholangitis (PSC) is the classical hepato-biliary manifestation of inflammatory bowel disease (IBD). The strong association between gut and liver disease has fostered several pathogenic hypotheses, in which enteric dysbiosis is proposed to contribute. We conducted a phase 2A clinical trial of oral vancomycin (OV), a gut-restricted antibiotic, in patients (pts) with

POSTER PRESENTATIONS
PSC and active colitis. The overarching goal was to identify key mechanistic pathways associated with induction of treatment response.

Method: Study drug was administered at a dose of 125mg QID for 4 weeks (wk) followed by a 4wk washout (total study duration 8 wks). Lower gastrointestinal endoscopies were performed at 0 and 4 wks. Clinical assessment was performed and peripheral blood and stool laboratory tests obtained at 0, 4 and 8 wks. The primary outcome measure was to quantify the magnitude of composite treatment response at 4w, defined as a reduction in faecal calprotectin (fcal), which was assessed by 

\[ \text{Delta fcal} = \text{fcal}_0 - \text{fcal}_4 \]

The study was registered on clinicaltrials.gov (NCT05376228).

Results: In entirety, 15 patients were recruited to the study, all of whom completed the 4wk treatment course (11 men, 7 previously treated with at least one biological agent). At 4wks, all participants attained response with regards IBD activity (Fig. 1A+B), along with significant reductions in serum ALP (Fig 1C). No significant changes in bilirubin were observed. Paradoxically, a reduction in gut microbial diversity associated with improvement in IBD activity (\( \Delta fcal \)) correlated with downregulation of 134 genes and upregulation of 298 genes following treatment with OV (Fig 1D). Reduction in IBD activity strongly correlated with downregulation of the enzymatic activity of several pathways, including copper containing amine oxidases and inferred microbial bile salt hydrolase (Fig 1E-F). No adverse safety events were observed during treatment. However, microbiological analyses captured the emergence of vancomycin resistant Enterococci in 6 pts as early as 1 wk into treatment. During washout, relapse in IBD activity and an increase in serum ALP was observed in 4 pts upon stopping OV therapy.

Conclusion: Oral vancomycin is associated with a reduction in colitis activity, serum ALT and ALP values in PSC-IBD. However, emergence of antimicrobial expression warrants further evaluation. Targeting specific bile acid and amine oxidase metabolic pathways may offer novel avenues for future therapeutic intervention in PSC-IBD.

LBP-37

Intestinal bacterial vesicles cause fibrosis progression and serum albumin levels reduction in cirrhosis

Atsunori Tsuchiya1, Kazuki Natsui1, Yui Natsui1, Nobutaka Takeda1, Shuji Terai1. 1Niigata University, Japan
Email: atsunori@med.niigata-u.ac.jp

Background and aims: Liver fibrosis progression causes portal hypertension and the formation of an edematous intestinal tract with impaired gut barrier function, resulting in bacteria and bacterial components invasion of the host. Lipopolysaccharides and pathogen-associated molecular patterns are well-known bacterial components. This study investigated the role of outer membrane vesicles (OMVs) of Escherichia coli, the representative pathogenic gut-derived bacteria in patients with cirrhosis, to assess cirrhosis pathogenesis.

Method: We analyzed the roles of OMVs in humans using human serum and ascites samples and the role of OMVs from Escherichia coli in mice using mouse liver-derived cells and a mouse cirrhosis model. The effects of OMVs in immune cells of the cirrhotic mouse liver were also investigated by single-cell RNA-sequencing.

Results: In vitro, OMVs activated inflammatory responses to macrophages and neutrophils especially, with upregulation of C-type lectin domain family 4 member E (Clec4e) and reduction in the albumin production from hepatocytes, but with a relatively little direct effect on hepatic stellate cells. In a mouse cirrhosis model, administration of OMVs led to increased liver inflammation, especially inducing the activation of macrophages, worsening fibrosis, and decreasing serum albumin levels. Albumin administration weakened these inflammatory changes. Human sample analysis showed increased antibodies against bacterial components such as ompA and CirA with a progressing Child-Pugh grade. OMVs were detected in ascites samples of patients with decompensated cirrhosis. The Clec4e reported in this study was not present in Clec4f-positive Kupffer cells but was abundant in Cx3cr1-positive, extrahepatic-derived macrophages that are Mrc1-negative and Cdh6-positive by single-cell RNA-sequencing.

Conclusion: OMVs induce inflammation, fibrosis, and suppression of albumin production, affecting the pathogenesis of cirrhosis. Appropriate albumin administration could reduce these inflammatory changes. This study could pave the way for the future prevention and treatment of cirrhosis.
LBP-38
Preliminary safety and antiviral activity of AB-729 combination treatment with pegylated interferon alfa-2a in virally suppressed, HBeAg-negative subjects with chronic HBV infection
Man-Fung Yuen1, Jeong Heo2, Ronald G Nahass3, Grace Lai-Hung Wong4, Tatiana Burda5, Kalyan Ram Bhamidimarri6, Tsung-Hui Hu7, Tuan Nguyen8, Young-Suk Lim9, Chi-Yi Chen10, Stuart C Gordon11, Jacinta Holmes12, Wan-Long Chuang13, Anita Kohli14, Naim Alkhouri15, Kevin Gray16, Emily P. Thi17, Elina Medvedeva16, Timothy Eley16, Karen Sims18. 1The University of Hong Kong, Gastroenterology and Hepatology, Hong Kong; 2Pusan National University Hospital, Gastroenterology and Hepatology, Korea, Rep. of South; 3ID Care, Hillsborough, United States; 4The Chinese University of Hong Kong, Medical Data Analytics Centre and Institute of Digestive Disease, Hong Kong; 5Arensa Exploratory Medicine, Chisinau, Moldova; 6University of Miami, Digestive Health and Liver Diseases, Miami, United States; 7Chang Gang Memorial Hospital, Internal Medicine, Taiwan; 8Research and Education Inc., San Diego, United States; 9Asan Medical Center, Gastroenterology, Seoul, Korea, Rep. of South; 10Chia-Yi Christian Hospital, Gastroenterology, Taiwan; 11Henry Ford Hospital, Gastroenterology, Detroit, United States; 12St. Vincent’s Hospital, Melbourne, Australia; 13Kooshsing Medical University Hospital, Internal Medicine, Kaohsiung, Taiwan; 14Arizona Liver Health, United States; 15Arizona Liver Health, Chandler, United States; 16Arbutus Biopharma, Clinical Development, Warminster, United States; 17Arbutus Biopharma, Discovery, Warminster, United States; 18Arbutus Biopharma, Clinical Development, Warminster, United States
Email: ksims@arbutusbio.com

Background and aims: AB-729 is an N-Acetylgalactosamine (GalNAc)-conjugated single trigger RNA interference therapeutic that targets all HBV RNA transcripts, resulting in suppression of viral replication and all viral antigens. AB-729-201 is an ongoing Phase 2a study assessing 24 weeks of AB-729 followed by 12 or 24 weeks of pegylated interferon alfa-2a (IFN) with or without additional AB-729 doses in virally suppressed, HBeAg-negative CHB subjects. We report interim data through 12 weeks of IFN treatment for the first 12 subjects.

Method: Forty-three CHB subjects, virally suppressed on stable nucleos (t)ide analog (NA) therapy, were all enrolled to receive AB-729 60 mg every 8 weeks for 24 weeks (4 doses) during the lead-in phase. After Week 24, the subjects were randomized to 1 of 4 sub-groups: A1 (24 weeks IFN + AB-729+NA), A2 (24 weeks IFN + NA), B1 (12 weeks IFN + AB-729 + NA) or B2 (12 weeks IFN + NA). After completing IFN ± AB-729 treatment, subjects continued NA therapy only for an additional 24 weeks and were then evaluated for NA discontinuation based on protocol criteria (ALT <2 x upper limit of normal, undetectable HBV DNA, confirmed HBsAg <100 IU/ml). Safety and antiviral assessments were obtained every 2-4 weeks. HBsAg quantification was assessed via Roche Cobas Elecsys HBsAg II quant II assay (lower limit of quantitation [LLOQ] = 0.05 IU/ml).

Results: The median subject age was 46 years, 72% were male, and 79% were Asian. To date, 32 of 43 subjects have been randomized to the 4 IFN sub-groups after completing the 24-week AB-729 lead-in period. The mean (standard error [SE]) baseline HBsAg level for all 43 subjects was 2.98 (0.07) log10 IU/ml and the median (range) was 2.92 (2.7-3.4) log10 IU/ml. The mean (SE) HBsAg decline observed at Week 24 was -1.65 log10 (0.10, n = 34). All subjects had HBsAg declines of approximately 1 log10 or more from baseline, and 28 of the 32 (88%) randomized subjects reached HBsAg <100 IU/ml. After 6 weeks of IFN treatment, mean HBsAg declines from baseline ranged from -1.53 to -2.49 log10 across the 4 sub-groups (3-5 subjects/group), and after 12 weeks of IFN, mean HBsAg declines ranged from -0.74 to -2.20 log10 (2-4 subjects/group). Three subjects had intermittent HBsAg <LLOQ, 2 during the IFN treatment period and 1 at the end of the AB-729 lead-in period. Three subjects have completed the NA follow-up period, and 1 subject met the criteria to stop NA therapy. AB-729 treatment has been well-tolerated with no serious adverse events (AEs) or AEs leading to AB-729 discontinuation. AEs during IFN treatment have been typical, with 4 subjects requiring IFN dose reduction or interruption due to neutropenia and 1 due to Grade 3 ALT elevation.

Conclusion: AB-729 treatment in virally suppressed CHB subjects was well tolerated and led to mean HBsAg declines of >1.6 log10 after 24 weeks of treatment, comparable to other AB-729 studies. HBsAg levels <100 IU/ml were noted in 88% of the subjects. This interim data analysis suggests addition of IFN was well tolerated, and AB-729 + IFN appears to result in continued HBsAg declines in most subjects with 2 subjects reaching HBsAg <LLOQ during IFN treatment, but more data is needed to assess the overall impact on HBsAg responses.
Acute liver failure and drug induced liver injury

WEDNESDAY 21 TO SATURDAY 24 JUNE

TOP-087
Epigenetic modifications implicated in idiosyncratic drug-induced liver injury
Marina Villanueva1, Romina De los Santos Fernández1, Ismael Alvarez-Alvarez1, Hao Niu1, Camilla Stephens1,2, A González-Jiménez1, Gonzalo Matilla1, María Isabel Lucena1,2, Inmaculada Medina-Caliz1, Raul J. Andrade1,2.

1Servicios de Aparato Digestivo y Farmacología Clínica, Hospital Universitario Virgen de la Victoria, Instituto de Investigación Biomédica de Málaga y Plataforma en Nanomedicina-IBIMA Plataforma BIONAND, Universidad de Málaga, Malaga, Spain; 2Centro de Investigación Biomédica en Red, Enfermedades Hepáticas y Digestivas (CIBERehd), Madrid, Spain
Email: lucena@uma.es

Background and aims: Drug-induced liver injury (DILI) is a complex disorder involving pharmacological, genetic, and environmental factors. Among these, genetic factors have been the most studied. Different Human Leucocyte Antigen (HLA) alleles and liver metabolism genes polymorphisms have been associated with an increased risk of DILI. However, the role of epigenetic modifications in DILI has been minimally investigated. Our study aimed to analyse the genome methylation status during an idiosyncratic DILI episode in a cohort of well-defined DILI cases from the Spanish DILI Registry.

Method: DNA from 32 well-characterized DILI cases enrolled in the Spanish DILI Registry and 32 healthy controls were extracted from peripheral blood samples by using the DNeasy Blood and Tissue Kit (Qiagen). For the study of genome-wide methylation analysis, high-quality genomic DNA samples (500 ng) were subjected to bisulfite treatment using the EZ-96 DNA Methylation kit (Zymo Research, Irvine, CA) following the manufacturer’s instructions. Subsequently, DNA methylation was analyzed by microarray assays using Infinium Methylation EPIC BeadChip Kit (Illumina, San Diego, CA). Then, whole-genome amplification and hybridization were performed using BeadChip, followed by single-base extension and analysis using the HiScan SQ module (Illumina) to assess the cytosine methylation states. The annotation of CpG islands (CpGIs) used the following categorization: (1) shore, for each of the 2-kb sequences flanking a CpGIs; (2) shelf, for each of the 2-kb sequences next to a shore; and (3) open sea, for DNA not included in any of the previous sequences or in CpGIs. DNA methylation for each CpG site was represented by beta values ranging from 0 to 1, corresponding to fully unmethylated and fully methylated. Finally, an analysis of differentially methylated regions between groups was performed.

Results: Control and DILI groups showed a similar density distribution of beta values. A total of 43861 CpG islands were identified (FDR ≤0.05) from which 213 manifested significative differential methylation (delta beta ≥0.1 and FDR ≤0.05) between groups with an overall tendency towards hypomethylation within the DILI cohort. Finally, candidate genes with the most significative differentially methylated CpGIs regions between groups were identified, resulting in 14 hypomethylated genes (ZNF350-AS1, LOC349408, P2RY13, GPR109B, SUMO1B1, LOC285626, FAM200B, LOC284276, TEX28, STS, KLRK1, LOC101928100, TLR8, CSTA) and one hypermethylated gene (FAM163B) in DILI group compared to the control group.

Conclusion: This exploratory analysis shows a general tendency towards hypomethylation in the DILI cohort compared to the control group. Further, deeper analysis must be conducted to unveil the relationship between DNA methylation and DILI phenotypes, severity, and outcome. Funding: PI19/00883, PEMF-2020-0127, PI21/01248, PI21/01248, PI-0310-2018, ISCIII CIBERehd, POSTDOC_21_00780, CD20/00083, CD21/00198.

Figure: (abstract: TOP-087).
Distinct cytokine profiles in checkpoint inhibitor-induced liver injury, idiosyncratic drug-induced liver injury and autoimmune hepatitis: a potential mechanistic biomarker panel

Edmond Atallah1,2, Stuart Astbury1,2, Jane I. Grove1,2, Ankit Rao3, Hester Franks3,4, Poulam Patel1,4, Guruprasad Aithal1,2, 1Nottingham University Hospitals NHS Trust and the University of Nottingham, National Institute for Health Research (NIHR) Nottingham Biomedical Research Centre, Nottingham, United Kingdom; 2University of Nottingham, Nottingham Digestive Diseases Centre, Translational Medical Sciences, School of Medicine, Nottingham, United Kingdom; 3Nottingham University Hospitals NHS Trust, Oncology, Nottingham, United Kingdom; 4University of Nottingham, Centre for Cancer Sciences, Translational Medical Sciences, Biodiscovery Institute, Nottingham, United Kingdom

Email: edmond.atallah@nottingham.ac.uk

Background and aims: Immune mechanisms underlie the development of acute liver injury in checkpoint inhibitor-induced liver injury (ChILI) which shares some clinical and histological features with idiosyncratic drug-induced liver injury (DILI) and acute autoimmune hepatitis (AIH). Currently, there are no biomarkers to differentiate between these three aetiologies in individuals presenting with acute liver injury. We aimed to characterise circulating cytokine profiles of well-phenotyped acute cases of ChILI, DILI and de-novo AIH and develop a classification model that distinguishes between the groups.

Method: Consecutive patients with acute liver injury were prospectively enrolled. All met the criteria defined by the DILI International Expert Working Group at the time of sampling. They were evaluated through formal causality assessment and then adjudicated by an independent panel as ChILI (n = 19), DILI (n = 18) or AIH (n = 7) based on International AIH Group criteria. Plasma cytokine profiling was performed using a 20-plex inflammatory panel (Luminex). Kruskal-Wallis test was used to compare cytokine levels between groups and corrected for multiple testing. Linear Discriminant Analysis (LDA) was performed for classification, dimension reduction, and data visualization.

Results: All cytokines except for GM-CSF were quantifiable and included in the analysis. There was a significant difference in the plasma levels of anti-inflammatory cytokine IL-10 (p < 0.0001) and pro-inflammatory cytokines CXCL10 (p = 0.006), IL-1 beta (p = 0.01), and CCL3 (p = 0.02) between the groups. Cytokines showed different linear discriminant coefficients separating the groups. Two dimensional LDA model, using 19 cytokines, classified patients into three types of liver injury with high diagnostic accuracy. IL-17A was the key cytokine associated with ChILI indicating a possible role of Th17 cells. IL-1 beta and CXCL10 which recruit T cells and amplify the inflammatory response in checkpoint-induced colitis, were important markers differentiating ChILI from DILI and AIH. CXCL8, a potent chemoattractant to neutrophils, distinguished AIH in combination with IFN gamma and IL-17A. IL-12p70 and TNF-alpha were the most important cytokines identifying DILI from other types of liver injury.

Conclusion: Distinct cytokine profiles in ChILI, DILI and AIH point to key immunopathogenic pathways underlying each type of acute liver injury. The profile in ChILI highlights the contribution of pro-inflammatory subsets of CD4 T cells producing IL-17A (characterizing Th17 subtype), similar to other immune-related organ toxicities. In AIH, CXCL8 release by monocytes and macrophages is distinctive, previously shown to correlate with serum IgG and macrophage accumulation in liver fibrosis. In DILI, IL12p70 stimulates the production of TNF-alpha (which previously showed prognostic value in acute DILI), emphasising the role of Th1 in response to antigenic stimulation.

Using cytokine profiles for LDA classification modelling revealed a high diagnostic accuracy in separating these aetiologies. If validated in a larger number of patients, an algorithm using cytokine profiles may assist in the diagnosis of these conditions.
immunosorbent assay (ELISA). These were correlated to markers of illness severity and 21 day survival (LT was grouped with death). Validation of key markers CD155, CD163, HLA-DR, MerTK, programmed cell death protein 1 (PD1), PD-L1, and CD206 was performed on peripheral blood monocytes using flow cytometry and analysed using an R pipeline (cytofkit) to generate unsupervised and unbiased clustering.

**Results:** Two hundred and twenty-four patients (79 (36%) male) with a median (range) age of 42 (17–81) and 34 HC were studied from USAFLG. Eighty-seven ALF cases (39%) had drug induced liver injury (DILI), 46 (20%) indeterminate ALF, 60 (27%) with APAP-ALF, 15 (7%) autoimmune and 16 (7%) for other aetiologies as vascular or hypoxic hepatitis. All marker serum concentrations were significantly higher in ALF compared to controls (p <0.0001). sMR/CD206 concentration was higher in patients with bacteraemia (p =0.002) and infection (p =0.006). In MELD-adjusted multivariate modelling sMR/CD206 and sCD163 after day 3 retained statistical significance for survival prediction. There were increases in surface expression ofCD206 (p <0.001) and PD-L1 (p <0.05) on CD14+ monocytes from patients with ALF compared with controls. CD206% were higher in patients with sepsis compared to those without and correlated with SOFA score (p =0.018).

**Conclusion:** Soluble markers of macrophage activation are upregulated in patients with ALF that died compared to those who survived. sMR/CD206 serum concentrations were higher in patients with infections and those who died. In a validation cohort CD206 and PD-L1 (p <0.05) on CD14+ monocytes from patients with ALF compared with controls. CD206% were higher in patients with sepsis compared to those without and correlated with SOFA score (p =0.018).

**Figure:** Surface expression on CD14+ monocytes in acute liver failure (ALF) and healthy controls (HC) measured by Flow Cytometry and analysed via Cytokit demonstrating 13 clusters with a clear division between healthy and ALF patient.

**Conclusion:** Soluble markers of macrophage activation are upregulated in patients with ALF that died compared to those who survived. sMR/CD206 serum concentrations were higher in patients with infections and those who died. In a validation cohort CD206 and PD-L1 (p <0.05) on CD14+ monocytes from patients with ALF compared with controls. CD206% were higher in patients with sepsis compared to those without and correlated with SOFA score (p =0.018).

**Table:** Diagnostic performance of independently associated factors alone, in series, and in parallel.

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
<th>PPV (%)</th>
<th>NPV (%)</th>
<th>AUC</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANA ≥1:1000</td>
<td>59</td>
<td>82</td>
<td>42</td>
<td>90</td>
<td>0.702</td>
<td>0.574–0.830</td>
</tr>
<tr>
<td>Globulin ≥31.5 g/L</td>
<td>88</td>
<td>63</td>
<td>35</td>
<td>96</td>
<td>0.757</td>
<td>0.661–0.853</td>
</tr>
<tr>
<td>ANA ≥1:1000 and Globulin ≥31.5 g/L</td>
<td>47</td>
<td>87</td>
<td>44</td>
<td>88</td>
<td>0.670</td>
<td>0.541–0.798</td>
</tr>
<tr>
<td>ANA ≥1:1000 or Globulin ≥31.5 g/L</td>
<td>100</td>
<td>58</td>
<td>35</td>
<td>100</td>
<td>0.790</td>
<td>0.734–0.845</td>
</tr>
</tbody>
</table>

**Statistical tests:** Receiving-operating characteristic curve analysis.

Abbreviations: PPV: positive predictive value; NPV: negative predictive value; AUC: area under the curve; ANA, antinuclear antibody; CI: confidence interval.

**Conclusion:** For ANA-positive DILI patients who present with an ANA titer ≥1:1000 or globulin ≥31.5 g/L, liver biopsy is indicated to determine the presence of histological features of AIH, and patients who then present with the histological features of AIH should be followed to detect the development of AIH.

**THU-394**

**Outbreak of unexplained acute hepatitis in children: the role of viral infections**

Yael Gozlan1, Lital Goldberg1, Orith Waisbourd-Zinman2, Yael Mozar-Glazberg1, Ronen Arnon 3, Lior Hecht Sagie 4, Yael Gozlan1, Lital Goldberg 1, Orith Waisbourd-Zinman 2, Michal Mandelboim1, Merav Weil1, Sara Dovrat4, Orna Mor1, Eyal Shteyer5, Israeli Ministry of Health, Centerial Virology Laboratory, Israel; 2Schneider Children’s Medical Center, Gastroenterology, Nutrition and Liver Diseases, Israel; 3Rambam Medical Center, Israel; 4Israeli Ministry of Health, Israel; 5Shaare Zedek Medical Center, The Juliet Keidan Institute of Pediatric Gastroenterology Institute, Jerusalem, Israel

**Email:** eyals@szmc.org.il

**Background and aims:** An increase in the number of cases of acute hepatitis of unknown etiology (AHUA) in children has been observed since October 2021. In view of the SARS-Cov-2 pandemic, adenovirus and adeno-associated virus 2 (AAV2) infections have been suggested as possible triggers in numerous cases. However, the causal relationship between AHUA and any potential etiology is still unclear. Our aim was to characterize the cohort of children with AHUA in Israel.

**Method:** Subsequent to the WHO/CDC announcement on the AHUA a national registry was established by the Israeli Ministry of Health. Retrospective and prospective demographic, clinical data and laboratory results on the children compatible with the CDC criteria for AHUA were collected. In addition, when available, blood and stool were sent to the central virology laboratory (CVL).

**Results:** A total of 42 children were included in the registry, of them 21 females, median age of 39 months. Past SARS-Cov-2 exposure (infection or vaccination) was observed in 25 children. Median lab values were AST 1164 (IU/L), ALT 1082 (IU/L), total bilirubin 5 (mg/dL), INR 1.12. Samples from 23 children were further assessed by the CVL.

**Background and aims:** Although useful for distinguishing drug-induced liver injury (DILI) from autoimmune hepatitis (AIH), liver biopsy is an invasive examination, and the high prevalence of antinuclear antibody (ANA) positivity in cases of DILI may lead to excessive use of biopsy. Hence, we aimed to develop a non-invasive screening tool based on histological features for detection of AIH in ANA-positive DILI patients and analyzed their clinical outcomes.

**Method:** This retrospective study included patients who presented with suspected DILI, were ANA-positive, and underwent liver biopsy between January 2017 and December 2020. Two pathologists determined histological features of AIH. The follow-up period was 1 year after DILI onset.

**Results:** The final analysis included 93 ANA-positive DILI patients, of which 17 had AIH-like histology and 76 did not. Factors independently associated with AIH-like histology included globulin level (odds ratio [OR] = 1.136, 95% confidence interval [CI]: 1:03–1:27; p = 0.017) and ANA titer ≥1:1000 (OR = 6.363, 95% CI: 1.30–47.44; p = 0.035). The optimal cut-off value for globulin indicating AIH-like histology was 31.5 g/L. This globulin level in combination with ANA titer ≥1:1000 provided a sensitivity of 100% and specificity of 57.9% for indicating histological features of AIH in ANA-positive DILI patients.

During the 1-year follow-up, more patients developed AIH in the group with AIH-like histology than in the group without (31.2% vs 0, p <0.001).

**Table:** Diagnostic performance of independently associated factors alone, in series, and in parallel.

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
<th>PPV (%)</th>
<th>NPV (%)</th>
<th>AUC</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANA ≥1:1000</td>
<td>59</td>
<td>82</td>
<td>42</td>
<td>90</td>
<td>0.702</td>
<td>0.574–0.830</td>
</tr>
<tr>
<td>Globulin ≥31.5 g/L</td>
<td>88</td>
<td>63</td>
<td>35</td>
<td>96</td>
<td>0.757</td>
<td>0.661–0.853</td>
</tr>
<tr>
<td>ANA ≥1:1000 and Globulin ≥31.5 g/L</td>
<td>47</td>
<td>87</td>
<td>44</td>
<td>88</td>
<td>0.670</td>
<td>0.541–0.798</td>
</tr>
<tr>
<td>ANA ≥1:1000 or Globulin ≥31.5 g/L</td>
<td>100</td>
<td>58</td>
<td>35</td>
<td>100</td>
<td>0.790</td>
<td>0.734–0.845</td>
</tr>
</tbody>
</table>

Statistical tests: Receiving-operating characteristic curve analysis.

Abbreviations: PPV: positive predictive value; NPV: negative predictive value; AUC: area under the curve; ANA, antinuclear antibody; CI: confidence interval.

**Conclusion:** For ANA-positive DILI patients who present with an ANA titer ≥1:1000 or globulin ≥31.5 g/L, liver biopsy is indicated to determine the presence of histological features of AIH, and patients who then present with the histological features of AIH should be followed to detect the development of AIH.
of which 10 showed variable autoimmune features consisting of plasma cells and variable degree of interface hepatitis and two appeared as non-specific hepatitis. Six were treated with steroids. Two underwent liver transplantation.

Conclusion: In view of the SARS-Cov-2 pandemic, it may be that combination of reactivation or active infection with specific viruses is a trigger for this AHUA outbreak. In our cohort HHV6 is the most abundant cause.

THU-396
Determinants of steroid responsiveness in patients with severe acute hepatitis of indeterminate, autoimmune hepatitis and drug induced aetiologies
Mahdi Saeidinejad1, Andrew Hall2, Disha Jindal3, Shashank Ramakrishnan4, Su Lin4, Alberto Quaglia5, Fausto Andreola1, Rajiv Jalan1.
1University College London, Liver failure Group, Institute for Liver and Digestive Health, Division of Medicine, London, United Kingdom; 2Royal Free London NHS Foundation Trust, Department of Cellular Pathology and Sheila Sherlock Liver Centre, United Kingdom; 3Royal Free London NHS Foundation Trust, Hepatology, United Kingdom; 4the First Affiliated Hospital, Fujian Medical University, Department of Hepatology, Hepatology Research Institute, Fuzhou, China; 5Royal Free Hospital and UCL Cancer Institute, Department of Cellular Pathology, London, United Kingdom
Email: mohammad.saeidinejad@nhs.net

Background and aims: Acute hepatitis (AH) due to autoimmune hepatitis (AIH), drug induced liver injury (DILI) and indeterminate acute hepatitis (IAH) have similar histological features. The role of corticosteroids (CS) in these situations is unclear. The aims of this real-world study were to determine the role of CS in patients with AH due to AIH, DILI and IAH. Furthermore, we aimed to identify prognostic factors and their value in predicting response to CS therapy.

Method: Patients admitted with AH due to AIH, DILI and IAH to Royal Free Hospital, between January 2010 to August 2022, who form part of an ongoing hospital database, the CARNATION cohort. Diagnosis was based on history, routine screening tests and liver biopsy. Response to CS was defined as survival at 90-days without the need for emergency liver transplantation (ELT). Univariate and Multivariate analyses were then performed to identify factors predictive of steroid responsiveness (SR).

Results: 129 patients with AH (76 IAH, 29 AIH, 24 DILI) were included of whom 76 had received CS (38 with IAH, 28 with AIH, 10 with DILI). CS was used more frequently in patients with AIH (96.6%) vs. 51.3% and 45.8% in IAH and DILI respectively. Transplant-free survival amongst patients who received CS was not different compared to those who did (62.8% vs 51.0%; p = 0.18). 29.5% underwent ELT in the CS group compared to 43.1% in the latter (p = 0.11). The baseline MELD-Na (22.9 vs 24.0; p = 0.46) and the infection rates were similar between those that received steroids and those that did not (9.0% vs 7.8%; p = 0.70). SR was 67.9% in those with AIH, 60% in DILI, and 60.5% in IAH (p = 0.57). When comparing those with severe AH (n = 62) [total serum bilirubin of more than 5 times the upper limit of normal, and INR of more than 1.2], the overall SR was found to be lower at 54.8% but still not significantly different across the 3 etiologies (50.6% AIH, 60% DILI, 65% IAH; p = 0.27). All patients with non-severe AH were that were treated with CS were steroid responsive. In the multivariate analyses only the MELD-Na score was found to be independent predictive of SR.

<table>
<thead>
<tr>
<th>Patient number</th>
<th>AAV2</th>
<th>Adeno</th>
<th>SARS-Cov-2</th>
<th>HHV6</th>
<th>Any Virus</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total positive 4/18 (22%) 4/21 (19%) 16/22 (73%) 13/22 (59%) 21/23 (91%)

Figure 1: (abstract THU-394): Virological results in samples from 23 AUHA patients. Adeno, AAV2 and HHV6 were tested by RT-PCR in whole blood samples (adeno also in stool samples). Anti HHV6 IgG antibodies were measured by immunofluorescence in sera samples. All cases positive for HHV6 in whole blood, with high IgG titer (>1:600) or positive IgM were recorded as having HHV6 infection or reactivation. SARS-Cov-2 exposure status (infected or vaccinated) was retrieved from the Ministry of Health records.
TABLE 1: Clinical and histological characteristics of DILI patients with different liver injury severity.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Grades 1–2 (n = 157)</th>
<th>Grades 3–4 (n = 144)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at diagnosis, years</td>
<td>47 (35–55)</td>
<td>46 (35–54)</td>
<td>0.874</td>
</tr>
<tr>
<td>Females, n (%)</td>
<td>111 (70.7)</td>
<td>91 (63.2)</td>
<td>0.166</td>
</tr>
<tr>
<td>Implicated agents</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Herbal and dietary supplements</td>
<td>70 (44.6)</td>
<td>79 (54.9)</td>
<td>0.161</td>
</tr>
<tr>
<td>Western medicine</td>
<td>57 (36.3)</td>
<td>29 (27.1)</td>
<td></td>
</tr>
<tr>
<td>ASB</td>
<td>30 (19.1)</td>
<td>26 (18.1)</td>
<td></td>
</tr>
<tr>
<td>ALT at onset (μU/L)</td>
<td>5170 (252.8–892.0)</td>
<td>6850 (3700–11201)</td>
<td>0.003</td>
</tr>
<tr>
<td>AST at onset (μU/L)</td>
<td>251.5 (116.6–514.0)</td>
<td>497.4 (238.5–796.3)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>ALP at onset (μU/L)</td>
<td>135.3 (79.7–175.5)</td>
<td>171.4 (132.9–239.8)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>TBIL at onset (μmol/L)</td>
<td>23.8 (15.5–41.8)</td>
<td>184.0 (122.5–276.4)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Cr (μmol/L)</td>
<td>570.0 (510–710.0)</td>
<td>58.0 (510–680)</td>
<td>0.985</td>
</tr>
<tr>
<td>INR</td>
<td>0.97 (0.89–1.06)</td>
<td>1.02 (0.93–1.19)</td>
<td>0.006</td>
</tr>
<tr>
<td>PLT (×10^9/L)</td>
<td>192.0 (153–240.3)</td>
<td>195.8 (160–239.2)</td>
<td>0.447</td>
</tr>
<tr>
<td>Clinical pattern of liver injury</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n (%)</td>
<td>302 (19.1)</td>
<td>26 (18.1)</td>
<td></td>
</tr>
<tr>
<td>Hepatocellular</td>
<td>115 (73.2)</td>
<td>95 (66.0)</td>
<td></td>
</tr>
<tr>
<td>Cholestatic</td>
<td>15 (9.6)</td>
<td>16 (11.1)</td>
<td></td>
</tr>
<tr>
<td>Mixed</td>
<td>27 (17.2)</td>
<td>33 (22.9)</td>
<td></td>
</tr>
<tr>
<td>Granulomas, n (%)</td>
<td>41 (5.7)</td>
<td>2 (1.4)</td>
<td>0.045</td>
</tr>
<tr>
<td>Ductular reaction, n (%)</td>
<td>27 (17.2)</td>
<td>47 (32.6)</td>
<td>0.002</td>
</tr>
<tr>
<td>Cholangiolar</td>
<td>17 (10.8)</td>
<td>55 (38.2)</td>
<td></td>
</tr>
<tr>
<td>cholestasis, n (%)</td>
<td>17 (10.8)</td>
<td>55 (38.2)</td>
<td></td>
</tr>
<tr>
<td>IFS ≥1 points, n (%)</td>
<td>18 (11.5)</td>
<td>34 (23.6)</td>
<td>0.005</td>
</tr>
<tr>
<td>HAI ≥10 points, n (%)</td>
<td>21 (14.6)</td>
<td>43 (29.9)</td>
<td>0.001</td>
</tr>
</tbody>
</table>

All data are presented as n (%) or median (interquartile range).
DILI: drug-induced liver injury; ALT: alanine aminotransferase; AST: aspartate aminotransferase; ALP: alkaline phosphatase; TBIL: total bilirubin; ALB: albumin; Cr: creatinine; INR: international normalized ratio; PLT: platelet count; IFS: Ishak fibrosis score; HAI: histology activity index.

Conclusion: In this biopsy-based cohort of DILI, severer liver injury was related to higher degrees of fibrosis stage, cholestasis, and ductular reaction, whereas granulomas was associated with milder injury.

THU-398

Clinical characteristics of chronic drug-induced liver injury in mainland China: a multicenter retrospective cross-sectional study

Hong Zhao1, Chengwei Chen2, Yimin Mao3, Wen Xie1

1Center of Liver Diseases, Beijing Ditan Hospital, Capital Medical University, Beijing, China; 2Liver Disease Center of Naval 905 Hospital, Shanghai, China; 3Division of Gastroenterology and Hepatology, Shanghai Institute of Digestive Disease, Renji Hospital, School of Medicine, Shanghai Jiao Tong University, Shanghai, China

Email: xiewen6218@163.com

Background and aims: To investigate the prevalence, clinical characteristics, and risk factors of chronic drug-induced liver injury (DILI) in mainland China.

Method: A multicenter, open, retrospective, non-interventional, epidemiological survey collected the baseline information, medical history, data of laboratory examinations and imaging, examinations and outcomes of the DILI patients from 308 medical centers in mainland China from 2012 to 2014.

Results: A total of 25,927 patients were enrolled in the study, including 22,556 cases with acute DILI and 3,371 cases with chronic DILI. The average age of patients with chronic DILI was higher than that of the acute DILI group (p < 0.0001). The proportion of male cases in the acute DILI group was significantly higher as compared to the chronic DILI group (p < 0.0001), while the chronic DILI had underlying liver diseases, significantly higher than the chronic DILI group (p < 0.0001). ALT, AST, AKP, TBIL, and INR levels in the chronic DILI group were higher than the acute DILI group (p < 0.0001). The percentage of patients with fatigue, jaundice, itch, and gastrointestinal symptoms in the chronic DILI group was higher than that in the acute DILI group (p < 0.0001). A large subset of chronic DILI group used Chinese herbal medicine or dietary supplements as compared to...
the acute DILI group (p < 0.0001). In the chronic DILI group, the percentage of cholestatic liver injury was higher as compared to the acute DILI group (p < 0.0001). Multivariate logistic regression analysis showed that the independent risk factors of chronic DILI included gender (male, p < 0.0001) and history of underlying liver diseases (p < 0.0001).

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Acute DILI (N = 22556)</th>
<th>Chronic DILI (N = 3371)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y), mean ± SD</td>
<td>45.19 ± 17.12</td>
<td>48.00 ± 16.65</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Male (%)</td>
<td>11397 (51.51%)</td>
<td>1533 (46.27%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>History of liver disease</td>
<td>4832 (21.42%)</td>
<td>1229 (36.46%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Cause of liver injury</td>
<td></td>
<td></td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Herbal medicines</td>
<td>5968 (26.46%)</td>
<td>1227 (36.40%)</td>
<td></td>
</tr>
<tr>
<td>Western medications</td>
<td>15072 (66.82%)</td>
<td>131 (34.32%)</td>
<td></td>
</tr>
<tr>
<td>Herbal, Western products</td>
<td>1515 (6.72%)</td>
<td>313 (9.29%)</td>
<td></td>
</tr>
<tr>
<td>Number of drugs for liver injury</td>
<td>13491 (59.81%)</td>
<td>2154 (63.90%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>1 drug</td>
<td>13491 (59.81%)</td>
<td>2154 (63.90%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>2 drugs</td>
<td>4106 (18.20%)</td>
<td>618 (18.33%)</td>
<td></td>
</tr>
<tr>
<td>≥3 drugs</td>
<td>4959 (21.99%)</td>
<td>599 (17.77%)</td>
<td></td>
</tr>
<tr>
<td>Days from drug use to symptom appearance, median</td>
<td>33.00</td>
<td>51.00</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Jaundice</td>
<td>3895 (17.27%)</td>
<td>936 (27.77%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Itching</td>
<td>729 (3.23%)</td>
<td>168 (4.98%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Digestive symptoms (including inappetence, abdominal distension, nausea, vomiting)</td>
<td>8800 (39.01%)</td>
<td>1669 (49.51%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Fever</td>
<td>1112 (4.93%)</td>
<td>163 (4.84%)</td>
<td>0.8127</td>
</tr>
<tr>
<td>Rash</td>
<td>463 (2.05%)</td>
<td>58 (1.72%)</td>
<td>0.2000</td>
</tr>
<tr>
<td>Feeble</td>
<td>8453 (37.48%)</td>
<td>1642 (48.71%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Hemorrhagic tendency</td>
<td>28 (0.12%)</td>
<td>16 (0.47%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Others (liver pain, arthralgia, hepatitis, hepatosplenomegaly)</td>
<td>4566 (20.24%)</td>
<td>1010 (50.13%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>No symptoms and signs</td>
<td>8472 (37.56%)</td>
<td>730 (21.66%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Pattern of DILI</td>
<td></td>
<td></td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Hepatocellular</td>
<td>10626 (51.21%)</td>
<td>1672 (52.60%)</td>
<td></td>
</tr>
<tr>
<td>Cholestatic</td>
<td>4091 (19.72%)</td>
<td>769 (24.19%)</td>
<td></td>
</tr>
<tr>
<td>Mixed</td>
<td>6033 (29.07%)</td>
<td>738 (23.21%)</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: Compared to acute DILI patients with chronic DILI were older, with a high percentage of female patients. Moreover, liver function-associated indicators and clinical symptoms were severe. Among these, female gender and history of underlying liver diseases were independent risk factors of chronic DILI.

THU-399 Impact of plasma exchange and evolution of intensive care management in patients with acute liver failure in a liver transplant center over the past decade

David Taposanta1, Octavi Bassegoda1, Miriam Valdivieso1, Fatima Aziz1, Juliana Zapatero1, Natalia Jimenez-Esquível1, Foix Valles1, Helena Hernández Eovle1, Joan Cid1, Enric Reverter1, Miquel Lozano1, Javier Fernandez1, 1Hospital Clinic de Barcelona, Barcelona, Spain Email: bassegoda@clinic.cat

Background and aims: Acute liver failure (ALF) is a rare clinical syndrome characterized by an acute alteration in liver blood test, coagulopathy, and encephalopathy in patients without chronic liver disease. The most common causes are acetaminophen-induced liver injury (AILI) and drug-induced liver injury (DILI). ALF may progress to multiple organ dysfunction and need for an emergent liver transplantation (LT). Plasma exchange (PE) improves transplant-free survival in patients with ALF, mainly in non-candidates to LT. PE was implemented in the standard care of those patients in the recent decade. Our goals were to determine the current management and outcomes of patients with ALF treated with PE in a real-life scenario.

Method: Retrospective cohort study of ALF patients admitted to the Liver Intensive Care Unit of Hospital Clinic of Barcelona during the period 2012–2022. We included all patients with a diagnosis of ALF defined as an acute alteration of liver blood tests, coagulopathy (INR >1.5) and hepatic encephalopathy of any grade without previous chronic liver disease. Listing for emergent LT was applied according to local criteria. PE was initiated at the discretion of the clinical team, mainly when a contraindication for emergent LT was present, or the expected time-to-transplant was above 24 h as a bridge to LT.

Results: A total of 46 patients with ALF were included. The most common etiology was autoimmune hepatitis (26%), followed by DILI (20%) and acetaminophen-induced liver injury (15%). Most patients required organ support with mechanical ventilation (70%), vasoactive drugs (60%) and renal replacement therapy (36%). Neurological monitoring was performed with ultrasonography in 41% of the patients and with intracranial sensor in 28%. Most patients were listed for LT (70%) and 63% were transplanted. Overall, mortality was 30%. Of the total cohort, 35% received PE. Those patients requiring PE were more severely ill as assessed by SOFA score and only 31% were transplanted. Mortality of patients receiving PE was 43% compared to patients who did not receive PE (23%). In the subgroup of non-transplanted patients, mortality in patients who received PE was 54% vs. 45% in those who did not. PE was well tolerated with no serious adverse events.

Conclusion: Mortality of ALF in patients who are not candidates for LT remains high despite the use of PE. Autoimmune hepatitis has replaced AILI and DILI as the main causes of ALF in our environment in the last decade. Neurological monitoring is performed mainly using ultrasonography. More studies addressing the use of PE in ALF patients who are not candidates to emergent LT are needed.

THU-400 Clinical and histological features of porto-sinusoidal vascular disorder in drug-induced liver injury population: a retrospective study in biopsy-based cohort

Mengqi Li1, Ting Zhang1, Xingang Zhou2, Hong Zhao1, Gang Wan3, Wen Xie1,2,1Center of Liver Diseases, Beijing Ditan Hospital, Capital Medical University, Beijing, China; 2Department of Pathology, Beijing Ditan Hospital, Capital Medical University, Beijing, China; 3Department of Biostatistics, Beijing Ditan Hospital, Capital Medical University, Beijing, China Email: xiewen6218@163.com

Background and aims: Porto-sinusoidal vascular disorder (PSVD) has been introduced as a new entity to describe a group of vascular liver diseases with or without portal hypertension (PH). Drug exposure is related to PSVD. However, the relationship between PSVD and drug-induced liver injury (DILI) is still unclear. This study aimed to describe the clinical and histological features of PSVD in DILI population.

Method: Patients diagnosed with DILI, underwent a liver biopsy at baseline and excluding those with pre-existing liver disease were screened for PSVD criteria in this retrospective study. Diagnosis of PSVD requires liver biopsy and the presence of (i) at least one specific feature for PH or one specific histological sign for PSVD or (ii) at least one unspecific feature for PH together with at least one unspecific histological sign for PSVD.

Results: Thirty-six patients with specific or unspecific clinical PH signs were enrolled in this study. Finally, 29 patients diagnosed with PSVD and 4 patients diagnosed with sinusoidal obstruction syndrome. Specific clinical PH signs and specific histological signs were found in 5 (17%) and 9 (31%) of 29 PSVD patients, respectively. Specific clinical PH signs including: (i) gastric, esophageal or ectopic

POSTER PRESENTATIONS
varicose (n = 4); (ii) portal hypertensive bleeding (n = 1); (iii) porto-systemic collaterals at imaging (n = 1). Specific histological signs of PSVD including: (i) obliterator portal venopathy (n = 4); (ii) nodular regenerative hyperplasia (n = 5); (iii) incomplete septal fibrosis (n = 1). Patients with PSVD were mostly female (72%), with a median age of 47 years. Over half patients exposed to Chinese medicines or herbal and dietary supplements, 8 (28%) and 6 (21%) patients exposed to medicine or both of them, respectively. Five (17.2%) patients with persistent abnormalities in liver tests over 12 months.

Conclusion: It seems that PSVD is not rare in DILI patients. Therefore, clinicians and pathologists should pay more attention to PSVD patients in DILI population.

Reference

THU-401
Stanozolol-induced liver injury: a peculiar biochemical profile in a series of thirteen cases
Vinicius Nunes1, Isadora Almeida1, Maria Carolina Campos1, Bárbara Freire2, Marcelo Silva2, Raimundo Parana Filho3, Fernando Bessone3, Nélia Hernandez4, Eduardo Cancado5, Maria Schinoni1, 2Hospital Universitario Professor Edgard Santos, Brazil; 2Hospital Sao Roque, Argentina; 3Hospital Provincial del Centenario- Rosário, and Uruguay (HC-UdelAR). We declare financial support from the Maria Emilia foundation.

Results: Nine reports of Stanozolol Induced Liver Injury were observed in Brazil, 02 in Argentina and 02 in Uruguay. All patients were males between 21 and 37 years old, and all of them reported use of AAS with the objective of muscular hypertrophy. About the symptoms latency period, the average was 63.2 days, and the average resolution time was 141 days. All patients presented with jaundice, pruritus and fatigue. The enzymatic pattern observed was a total bilirubin (TB) mean of 30.23 mg/dL, with 92.3% of patients presenting values higher than 9 mg/dL, a small increase of aminotransferases, which the aspartate transferase (AST) presented a mean value of 62.75 mg/dL, and the alanine transaminase (ALT), of 117.5 mg/dL. The alkaline phosphatase (ALP) was characterize by an increase in all cases with an average of 311.9 U/L, and the gama-glutamyl-transferase (GGT) was very close to normal, presenting an average of 387.22 U/L.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Age</th>
<th>Sex</th>
<th>Latency period of time</th>
<th>Duration</th>
<th>TB</th>
<th>AST</th>
<th>ALT</th>
<th>ALP</th>
<th>GGT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>21</td>
<td>M</td>
<td>40</td>
<td>180</td>
<td>15.2</td>
<td>52</td>
<td>72</td>
<td>258</td>
<td>17</td>
</tr>
<tr>
<td>2</td>
<td>31</td>
<td>M</td>
<td>45</td>
<td>60</td>
<td>15</td>
<td>59</td>
<td>147</td>
<td>146</td>
<td>36</td>
</tr>
<tr>
<td>3</td>
<td>26</td>
<td>M</td>
<td>180</td>
<td>100</td>
<td>9.7</td>
<td>60</td>
<td>103</td>
<td>217</td>
<td>53</td>
</tr>
<tr>
<td>4</td>
<td>29</td>
<td>M</td>
<td>15</td>
<td>180</td>
<td>15.7</td>
<td>53</td>
<td>61</td>
<td>100</td>
<td>75</td>
</tr>
<tr>
<td>5</td>
<td>29</td>
<td>M</td>
<td>30</td>
<td>120</td>
<td>45</td>
<td>38</td>
<td>50</td>
<td>139</td>
<td>71</td>
</tr>
<tr>
<td>6</td>
<td>25</td>
<td>M</td>
<td>-</td>
<td>90</td>
<td>31</td>
<td>47</td>
<td>49</td>
<td>250</td>
<td>45</td>
</tr>
<tr>
<td>7</td>
<td>22</td>
<td>M</td>
<td>-</td>
<td>-</td>
<td>21</td>
<td>48</td>
<td>-</td>
<td>241</td>
<td>80</td>
</tr>
<tr>
<td>8</td>
<td>29</td>
<td>M</td>
<td>45</td>
<td>-</td>
<td>36</td>
<td>-</td>
<td>46</td>
<td>319</td>
<td>13</td>
</tr>
<tr>
<td>9</td>
<td>37</td>
<td>M</td>
<td>45</td>
<td>180</td>
<td>44.3</td>
<td>105</td>
<td>98</td>
<td>281</td>
<td>89</td>
</tr>
<tr>
<td>10</td>
<td>31</td>
<td>M</td>
<td>50</td>
<td>-</td>
<td>32</td>
<td>-</td>
<td>98</td>
<td>775</td>
<td>42</td>
</tr>
<tr>
<td>11</td>
<td>37</td>
<td>M</td>
<td>80</td>
<td>-</td>
<td>5.1</td>
<td>-</td>
<td>355</td>
<td>253</td>
<td>51</td>
</tr>
<tr>
<td>12</td>
<td>36</td>
<td>M</td>
<td>99</td>
<td>-</td>
<td>38</td>
<td>-</td>
<td>104</td>
<td>689</td>
<td>52</td>
</tr>
<tr>
<td>13</td>
<td>26</td>
<td>M</td>
<td>62</td>
<td>218</td>
<td>49</td>
<td>-</td>
<td>228</td>
<td>387</td>
<td>22</td>
</tr>
</tbody>
</table>

Conclusion: Liver injury induced by stanozolol was found in a population of young men, who have aesthetic purpose. These patients have high levels of total bilirubin, modest aminotransferases elevations. We suppose that genetic mutations such as seen in familial intrahepatic cholestasis may be present. Further studies are needed to confirm this hypothesis.

THU-402
Systematic review: patients with pre-existing chronic liver disease are more vulnerable to the severe sequelae of drug induced liver injury
Georgia Zeng1,2, Guy Elistick3, Martin Weltman1,2, 2Nepean Hospital, Gastroenterology and Hepatology, Australia; 2The University of Sydney, Nepean Clinical School, Australia; The University of Newcastle, NHMRC Centre of Research Excellence in Digestive Health, Australia Email: georgiazeng@icloud.com

Background and aims: Drug-induced liver injury (DILI) is a leading cause of death from acute liver failure (ALF) as well as medication withdrawal from the market. The diagnosis and management of DILI in the context of preexisting chronic liver disease (CLD) remains a controversial and difficult area to navigate, given that the natural...
history of certain hepatological conditions involves a spontaneous fluctuation of LFTs. Our systematic review sought to assess the current literature in regard to the diagnosis and prognosis of DILI in CLD patients, and evaluate whether patients with CLD are at higher risk of worse DILI outcomes.

**Method:** Studies with a minimum of 50 patients adhering to a systematic collection of all DILI cases available to the registry were identified from electronic databases PubMed and EMBASE through to 26 October 2022. Only studies inclusive of patients with pre-existing CLD were included. Data extraction from each study included DILI definition, causality assessment, severity assessment, types of pre-existing CLD included, predominant DILI agents implicated, and incidence of the following outcomes delineated by patients with and without pre-existing CLD where available: ALF, liver-related mortality, liver transplant and chronic DILI.

**Results:** Overall, 10 studies comprising 36,579 unique patients were included. 6,596 of these patients had CLD, and the most common aetiologies were viral hepatitis, non-alcoholic fatty liver disease and alcoholic liver disease. No studies adopted specialised algorithms proposed to define DILI in CLD patients, based on multiples of their baseline ALT or Bilirubin values rather than the ULN. Only 2 studies compared the spread of DILI agents between patients with and without CLD, of which the multicentre Spanish DILI registry found a significantly higher prevalence of antitubercular drugs in patients without CLD, of which the multicentre Spanish DILI registry found a significantly higher prevalence of antitubercular drugs in patients with CLD (21% of cases) vs without CLD (7.6% of cases). 6 of 9 studies compared rates of ALF, liver decompensation and/or severity of DILI between DILI patients with and without CLD, 3 of which returned significant results. For example, in a large-scale retrospective Chinese study comprising 25,927 DILI cases, patients with pre-existing CLD consisted of 64% of fatal cases, 29% of cases with jaundice, and only 21% of cases without jaundice. 3 of 4 studies concluded that DILI patients with CLD were not at higher risk of suffering from DILI chronicity.

**Conclusion:** Our systematic review demonstrates that a majority of DILI registries support higher rates of mortality in patients with CLD, with adjusted HRs as high as 2.64 (95% CI 1.78–3.93, p < 0.001) in a multicentre Taiwanese study, and 2.72 (95% CI 2.33–3.19, p < 0.001) in a national population-based Thailand study. 6 studies compared rates of ALF, liver decompensation and/or severity of DILI between DILI patients with and without CLD, 3 of which returned significant results. For example, in a large-scale retrospective Chinese study comprising 25,927 DILI cases, patients with pre-existing CLD consisted of 64% of fatal cases, 29% of cases with jaundice, and only 21% of cases without jaundice. 3 of 4 studies concluded that DILI patients with CLD were not at higher risk of suffering from DILI chronicity.

**THU-403**

**Autoimmune hepatitis (AIH) or drug-induced liver injury (DILI)-a diagnostic challenge**

Yaakov Maoz1,2, Ali Abdallah1,3, Leore Cohen Mendel4, Ehud Melzer1,2, Stephen Malnick2,3, Yaakov Maor1,2, Ali Abdallah1,3, Leore Cohen Mendel4, Ehud Melzer1,2, Stephen Malnick2,3.

**Background and aims:** AIH and DILI share clinical, biochemical, serological and histopathological characteristics. DILI cause by several medications may simulate AIH, while certain drugs can induce bona-fide AIH. Therefore, the diagnosis of AIH vs. DILI is often challenging.

**Method:** Patients evaluated for hepatitis with clinical, biochemical, serological, and liver biopsy with a presumptive diagnosis of AIH or DILI were included in a retrospective attempt to make a definitive diagnosis. All biopsies were reviewed for features compatible with either diagnosis or both. Conventional scores of AIH (simplified criteria) and DILI (RUCAM) were calculated.

**Results:** 20 patients were enrolled: 75% female; mean age 59 years (age >50 years in 75%). 50% were affected with the metabolic syndrome and 45% with autoimmune disorders. A potential hepatotoxic drug was identified in 90%, mainly statins. Pattern of injury was hepatic in 90%. Bilirubin >10 mg/dL occurred in 25%, IgG >1.5xULN was present in 65% and ANA/ASMA >1:80 in 40%. Histopathology considered typical of AIH in 70%; compatible with or atypical in 15% each. AIH simplified score was: probable (≥2 points) in 15% and definite (≥7 points) in 40%. Histopathology determined suspected of DILI in 55%, consider DILI in 25% and low probability in 20%. RUCAM scored possible (3–5 points) in 60% and probable (6–8 points) in 40%. 75% were treated with corticosteroids ± azathioprine, with 70% response rate.

**Conclusion:** Distinction between DILI and AIH is still problematic, reflected by significant overlap in immune serology and histopathologic features in HLA and DILI. The majority of patients received corticosteroid treatment for severe or protracted hepatitis. DILI may be the initiating event of a flare of AIH or still unrelated to liver injury in such instances.

**THU-404**

**Gender differences in liver transplantation (LT) for acute liver failure (ALF) in a multicentre ALF-LT Spanish cohort**

Isabel Conde1,2,3, Sara Martínez1, Andrea Bosca1,2, Maria Senosián4, Rosa María Martín Mateos5, Carolina Almohalla Alvarez6,7, Maria Luisa Gonzalez Dieguez8, Sara Lorente Perez9, Alejandra Otero9, Maria Rodriguez10, Jose Ignacio Herrero11,12, Isabel Campos-Varela13, Ainhoa Fernandez14, Marina Berenguer1,2,3,15, Victoria Aguilera Sancho1,2,3,15, Hospital Universitario y Politécnico La Fe, Valencia, Spain; 1Instituto de Investigación Sanitaria La Fe, Valencia, Spain; 2CIBERehd, Instituto de Salud Carlos III, Madrid, Spain; 3Hospital Universitario de Cruces, Bilbao, Spain; 4Hospital Universitario Ramón y Cajal, Madrid, Spain; 5Hospital Universitario Río Hortega, Valladolid, Spain; 6Hospital Universitario Central de Asturias, Oviedo, Spain; 7Hospital Clínico Universitario Lozano Blesa, Zaragoza, Spain; 8Complejo Hospitalario Universitario A Coruña, A Coruña, Spain; 9Hospital General Universitario de Alicante, Alicante, Spain; 10Clínica Universidad de Navarra, Pamplona, Spain; 11Instituto de Investigación Sanitaria de Navarra, Pamplona, Spain; 12Hospital Universitari Vall d’Hebron, Barcelona, Spain; 13Hospital General Universitario Gregorio Marañón, Madrid, Spain; 14Universitat de València, Department of Medicine, Valencia, Spain

**Background and aims:** ALF is a critical illness with high mortality, improved by LT. There may be potential differences in

**POSTER PRESENTATIONS**

**Figure:** Improving the Diagnosis and Prognosis of CLD Patients with DILI: A 3 Step Plan

**Conclusion:** Our systematic review concludes that the majority of DILI registries support higher rates of mortality in patients with CLD, with a stronger correlation between cirrhotic patients and poor outcomes. Future DILI registries should aim to fully characterize CLD patient cohorts regarding their demographics, clinical characteristics and spread of DILI agents. Our findings suggest that CLD patients who suffer DILI would stand to benefit from increased surveillance and a clear diagnostic strategy.
clinical presentation and outcome between men and women which we aimed to assess in this Spanish multicenter ALF-LT cohort.

**Method:** Baseline features, biochemical data, comorbidities, acute complications, early and late outcomes of an ALF-LT retrospective cohort from 11 hospitals (2001–2020) were collected. The inclusion criteria were patients with acute liver failure and LT performed between 2001 and 2020. Results: We included 217 adults ALF-LT (62% women) with an increasing proportion of women over time (57% in 2001, 69% in 2011–2015, 67% in 2016–2020) but similar age (median: men 41, women 41.5 years). Past history of alcohol, tobacco and drug use was higher in men (p < 0.05). Autoimmune and cryptogenic aetiologies were more frequent in women (31% vs 19% and 31 vs 20%) while HBV was more common in men (29% vs 10%) (p < 0.007). Kings College criteria in women were more frequent in men (14% vs 5% and 52% vs 29%, respectively). Renal function, ALT, platelets and MELD before LT were present more frequently in men (14% vs 5% and 52% vs 29%, respectively). Later complications: arterial hypertension-AHT (36% vs 27%), dyslipidaemia (25% vs 11%), chronic kidney disease (24% vs 17%) and biliary complications (32% vs 21%) were all more frequent in men but without reaching statistical significance. AHT, pre-LT AKI and infection were independently associated with poor survival (HR 2.6, p = 0.031; HR 3.7, p = 0.004 and HR 2.5, p = 0.03, respectively) without reaching statistical significance. AHT, pre-LT AKI and infection were independently associated with poor survival (HR 2.6, p = 0.031; HR 3.7, p = 0.004 and HR 2.5, p = 0.03, respectively). Gender differences. Causes of death, survival and re-LT were similar in both groups.

**Conclusion:** Aetiology and history of toxic abuses were different between gender. At time of LT men were in worse clinical condition resulting in a higher rate of early post-LT complications, with the exception of rejection, yet long-term outcome was similar.

### ALF-LT aetiology: gender differences

![ALF-LT aetiology: gender differences](image)

**Figure:**

**Conclusion:** Aetiology and history of toxic abuses were different between gender. At time of LT men were in worse clinical condition resulting in a higher rate of early post-LT complications, with the exception of rejection, yet long-term outcome was similar.

### THU-405

**CDK 4/6 inhibitors induced liver injury: 7 cases from REFHEPS registry**

Lucy Meunier¹, Bénédicte Delire², Eleonora De Martin³, Yves Horsmans², Dominique Larrey¹, ¹CHU Montpellier, Hepatology, Montpellier, France; ²Cliniques Universitaires Saint-Luc, Gastroenterology, Belgium; ³Hôpital Paul Brousse, Centre hepatobiliaire, France

**Background and aims:** Cyclin-dependent kinase inhibitors (CDKIs) are the cornerstone of systemic therapy for patients with hormone-positive (HR+) HER2-negative metastatic breast cancer (MBC). As reported by large randomized clinical trials, grade 3 elevation of alanine and aspartate aminotransferases occurred in up to 11% and 6% of patients receiving ribociclib or abemaciclib. The mechanism of liver toxicity remains unclear.

**Method:** Seven cases have been retrospectively collected through the French-speaking hepatotoxicity network (REFHEPS).

**Results:** Of the 87 cases collected by REFHEPS between November 2021 and January 2023, 7 involved CDKIs: ribociclib (n = 5) and abemaciclib (n = 2). All were women, median age 63 yr-old (49–77), treated for metastatic breast cancer. All patients also had concomitant hormonal treatment: letrozole, fulvestran or anastrozole. The median time to onset of hepatitis after introduction of CDKIs was 46 (24–274) days. All liver events exhibited a hepatocellular profile with a CTCAE severity grade 3 (n = 4) or 4 (n = 3). Median peak of liver tests were: AST: 335 IU/L (262–1201); ALT : 698 IU/L (402–2523); ALP : 131 IU/L (87–423). Exhaustive work-up was performed in all patients including viral serologies, liver antibodies and imaging. Only 2 patients had positive anti-nuclear antibodies and one had a slightly elevated immunoglobulin G level (1.1N). Liver biopsy, performed in 3 patients, showed no fibrosis but centrolobular hepatitis in favor of DILI. RUCAM score was between 3 and 9. For most patients, improvement was spontaneous after CDKI withdrawal, median xx 57.6 days (min:19; max:112). Three patients received steroids (0.5–1 mg/kg) introduced due to a lack of spontaneous resolution followed by complete resolution. No recurrence of hepatitis after stopping steroids or resuming anti-tumor treatment.

**Conclusion:** CDKIs are frequently used to treat metastatic breast cancer. A few DILI cases have been reported in the literature. The mechanism of toxicity is unknown. However, the interest of corticoids to treat such DILI cases has been outlined but its place remains unknown. Here we reported 7 DILI cases from the REFHEPS registry outlining the interest ant potential limitations of steroid treatment. More data are clearly needed.

---

### Patients' characteristics

<table>
<thead>
<tr>
<th>Case</th>
<th>Sex, age (years)</th>
<th>CDK 4/6</th>
<th>Concomitant medications</th>
<th>Delay treatment-DILI (days)</th>
<th>RUCAM score</th>
<th>Grade DILI</th>
<th>Delay improvement (between stop drugs and grade 1) (days)</th>
<th>Steroids</th>
<th>Duration of steroids (days)</th>
<th>Delay DILI-steroids (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F, 49</td>
<td>Abemaciclib</td>
<td>Anastrozole</td>
<td>274</td>
<td>7</td>
<td>2</td>
<td>42</td>
<td>No</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>2</td>
<td>F, 77</td>
<td>Ribociclib</td>
<td>Fulvestran</td>
<td>24</td>
<td>9</td>
<td>1</td>
<td>34</td>
<td>No</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>3</td>
<td>F, 63</td>
<td>Ribociclib</td>
<td>Letrozole</td>
<td>77</td>
<td>8</td>
<td>1</td>
<td>112</td>
<td>Yes</td>
<td>15</td>
<td>88</td>
</tr>
<tr>
<td>4</td>
<td>F, 65</td>
<td>Ribociclib</td>
<td>Anastrozole</td>
<td>46</td>
<td>9</td>
<td>1</td>
<td>93</td>
<td>Yes</td>
<td>24</td>
<td>59</td>
</tr>
<tr>
<td>5</td>
<td>F, 61</td>
<td>Abemaciclib</td>
<td>Letrozole</td>
<td>46</td>
<td>8</td>
<td>1</td>
<td>19</td>
<td>No</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>6</td>
<td>F, 63</td>
<td>Ribociclib</td>
<td>Letrozole</td>
<td>27</td>
<td>8</td>
<td>1</td>
<td>NA</td>
<td>No</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>7</td>
<td>F, 71</td>
<td>Ribociclib</td>
<td>Letrozole/ pembrolizumab</td>
<td>52</td>
<td>3</td>
<td>3</td>
<td>46</td>
<td>Yes</td>
<td>76</td>
<td>1</td>
</tr>
</tbody>
</table>

---

*(abstract: THU-405): Patients' characteristics,*
Exponential increase of paracetamol liver injury over the last decade in a Spanish referral center

Background and aims: Paracetamol is one of the most used analgesics worldwide. Despite the fact that paracetamol overdose accounts for most cases of acute liver failure in some countries, this was uncommon in Spain. Since we had the perception that more patients were admitted to our unit due to paracetamol overdose, we analyzed its incidence and characterized the clinical phenotype of patients admitted to our Liver Unit during the last decade.

Method: We retrospectively reviewed all admissions due to paracetamol-associated liver toxicity from January 2010 to August 2022. Demographic data, laboratory test, use of concomitant drugs and psychiatric comorbidities were registered. In addition, the severity of liver injury and the need for support therapy were analyzed.

Results: One hundred and five patients with a median age of 31 (22–34) years were included; 65% were women. From 2010 to 2015 the incidence remained stable with around 5 cases/year, whereas starting in 2016 the incidence increased progressively, reaching 20 cases in 2022. In most patients the overdose was taken with autolytic intention (93%) and was the first attempt (69%). Regarding psychiatric comorbidities, 29% had past medical history of depression, anxiety (25%), or borderline personality disorder (16%). The intake of other medications or drugs during the episode was common (55%); anti-inflammatories (37%), illicit drugs such as cocaine (22%) or benzodiazepines (22%). Regarding the severity of liver injury, 87% required ICU admission due to PT<40%, hepatic encephalopathy or metabolic acidosis. At admission, the median values of ALT and total bilirubin were 1177 (204–4509) IU/L and 1, 55 (0.89–2.5) mg/dl, respectively. Hepatotoxicity resolved with specific treatment (N-Acetylcysteine) in 87% patients; 4% required plasma exchange or renal replacement therapy. One patient (1%) required liver transplantation and six patients died (6%). Variables associated with acute liver failure were overdose with autolytic intent (84% vs 43%) and presence of psychiatric comorbidity (87% vs 69%) (p <0.05).

Conclusion: The incidence of hepatitis caused by paracetamol has increased significantly in recent years in Spain. The profile of patients are young women with symptoms of anxiety and/or depression, who attempt suicide. Although most cases resolve with specific treatment, ICU admission is frequent.

Liver transplantation in acute liver failure in Slovenia

Background and aims: Acute liver failure (ALF) is characterised by sudden onset of hepatic encephalopathy with concomitant coagulopathy, jaundice and multiorgan failure in a patient without previously known liver disease. Most prevalent causes of ALF in developed countries are paracetamol toxicity, drug induced liver injury (DILI), hepatitis B virus infection and autoimmunity. Viral hepatitis A, E and especially B are the main causes of ALF in Eastern countries. Patients with acute liver failure are transplanted urgently if criteria for urgent liver transplantation are met.

Method: 388 patients, of which two thirds’ men and one third women, underwent liver transplantation in UMC Ljubljana, Slovenia, between 20.6.1995 and 31.12.2021. The average age at transplantation was 51 years. 31 (8,0%) patients, of which 9 men and 22 women, were transplanted urgently, due to acute liver failure. Their average age at transplantation was 39 years. 6 patients (1 man and 5 women) underwent emergency liver transplantation due to fulminant autoimmune hepatitis (19,4%), which is the most common indication for urgent liver transplantation in Slovenia. 4 patients (2 men and 2 women) each were urgently transplanted for drug-induced liver disease (12,9%) and Budd Chiari syndrome (12,9%) and 4 women for acute Wilsons disease (12,9%). 3 female patients (9,7%) were urgently transplanted due to fulminant hepatitis B. 1 man was urgently transplanted due to liver trauma and 1 female patient each due to mushroom poisoning and liver failure during pregnancy. We were unable to determine the cause of acute liver failure in 3 men and 4 women (22,6%). 41 (10,6%) of all patients and 3 (9,7%) of patients with acute liver failure were re-transplanted.

Results: 1 and 5-year survival of our liver transplanted patients is 84,1% and 76,1% respectively. 1 and 5-year survival of urgently transplanted patients with acute liver failure is 68,0%. 10 out of 31 urgently transplanted patients died, all of them in the first year after transplantation: 3 each because of infection and graft failure and 1 each because of gastric carcinoma and complication of liver transplant procedure. In 2 patients the cause of death is unknown.

Conclusion: Acute liver failure is a rare disease with poor prognosis and high mortality. For critically ill patients, urgent liver transplantation is currently the only effective method of treatment. Urgently transplanted patients are on average younger than electively transplanted patients. Unlike electively transplanted patients, women predominate among them. 1-year survival of urgently transplanted patients is worse than in electively transplanted, that reflects the severity and complexity of acute liver failure. Long-term survival is better due to younger age at transplantation and fewer comorbidities.
Liver failure (LF) is characterized by a loss of hepatocellular function and is associated with a high mortality. Large-scale data on recent developments and hospital mortality of LF in Germany are missing. A systematic analysis could help to optimize mortality of LF in Germany.

Background and aims: To investigate the frequency of development and nature of cytostatic-induced hepatotoxic reactions in patients with acute myeloid leukemia (AML) with overweight and obesity during remission induction chemotherapy (CT).

Method: We examined 25 patients with newly diagnosed acute leukemia (AL), of which 56% (14/25) were men, 44% (11/25) were women. Depending on the body mass index (BMI), patients were divided into groups: I (n = 10)-patients with AML and BMI of 18.5–24.9 kg/m²; II (n = 15)-patients with AML and BMI ≥25.0 kg/m². The biochemical blood analysis was evaluated twice: before and on the 56th day of CT, which included alanine-, aspartate-aminotransferases, gamma-glutamyltranspeptidase (GGT), alkaline phosphatase (ALP), total protein and total bilirubin.

Results: In patients with AML and normal BMI, CT induction increased the risk of GGT (RR = 3.00; 95% CI = 1.14–7.91; p < 0.05) and ALP activity impairment (RR = 2.67; 95% CI = 0.98–7.22; p > 0.05). The presence of overweight and obesity in patients with AML of group II led to significant risk of increase the GGT (RR < 3.00; 95% CI = 1.46–6.14; p < 0.05) and ALP activity (RR = 4.00; 95% CI = 1.41–11.35; p > 0.05) during CT. GGT and ALP activity in the blood of group II patients after CT exceeded the baseline data in 2.4 times (p < 0.0001) and 1.6 times (p = 0.0007), respectively. After two courses of remission induction CT, the biochemical liver tests violations were recorded in 100% (15/15) of group II patients with overweight and obesity, of which cholestatic syndrome was detected in 20% (3/15) of patients and mixed syndrome—in 80% (12/15) of patients.

Conclusion: The remission induction CT of AML is accompanied by the risk of cytostatic-induced liver injury. In patients with AML, regardless of BMI, induction CT was associated with a risk of increased GGT and ALP activity. However, in patients with normal BMI, GGT and ALP activity increase was associated with hyperbilirubinemia, and in overweight and obese patients—with hypoproteinemia development. Moreover, the increased ALP activity after CT compared with the baseline data was observed in AML patients with high BMI. The presence of overweight, obesity and primary disorders of biochemical liver tests due to the oncohematological disease influence are the risk factors for hepatotoxic reactions development during CT.

Figure:

Conclusion: Although incidence rates and hospital mortality of LF in Germany have constantly decreased, hospital mortality has remained at a very high level. We identified a number of variables associated with increased mortality that could help to improve framework conditions for the treatment of LF in the future.
Method: Serum proteomic patterns were compared in 200 and 119 (discovery/validation cohort) adult patients with ALF, ~50% of them acetaminophen (APAP)-related, as well as in 30 healthy controls without liver disease. The former were randomly selected from admission samples (~<48 h) of the US ALF study group database. Non-survivors were defined as patients who passed away or required liver transplantation within 21 days. Ingenuity pathway analysis (Qiagen) was used to obtain mechanistic insights.

Results: In the discovery cohort, 187 proteins were detected in ≥70% of subjects and most differed between ALF cases and controls. The key altered pathways were IL-6 signalling, acute phase response and prothrombin activation. 158 proteins differed between 95 APAP and 105 non-APAP cases. Three proteins reproducibly discriminated between the groups (AUROC >0.9 in both cohorts) and were superior to other available markers.

In the discovery cohort, 46 proteins significantly differed between 21-day survivors and non-survivors. The most significantly enriched pathways were activated immune and acute-phase response which coincided with a better outcome. In particular, higher alpha1-antitrypsin (SERPINA1) and leucine-rich alpha-2 glycoprotein 1 (LRG1) levels were associated with better prognosis in the overall group (see figure, panel A). In both cohorts, they constituted the best discriminators (AUROC >0.7) and were comparable to MELD score (see figure, panel B).

Conclusion: Unbiased proteomics may help identify a panel of new diagnostic and prognostic biomarkers with biological plausibility in ALF.

FRI-394
An in silico designed receptor antagonizing peptide targeting C-C motif chemokine receptor 8 attenuates monocyte/macrophage recruitment in vitro and in vivo

Eline Geervliet1,2, Ralf Weiskirchen2, Ruchi Bansal1.1University of Twente, Medical cell biophysics, Enschede, Netherlands; 2RWTH Aachen, Institute of Molecular Pathobiology, Experimental Gene Therapy and Clinical Chemistry, Aachen, Germany
Email: egeervliet@gmail.com

Background and aims: Acute liver injury is the most common cause of acute liver failure in the western world. Infiltrating monocytes/macrophages play a crucial role of liver inflammation, one of the hallmarks of acute liver injury. The macrophage compartment of the liver upon acute liver injury is augmented by the infiltrating monocytes driven by C-C motif chemokine receptor/C-C motif chemokine ligand (CCR/CCL) axis. Besides CCL2-CCR2, CCL1–CCR8 is involved in mediating monocyte recruitment which subsequently shapes the inflammatory microenvironment during liver injury. Several small molecular receptor-antagonists have been developed for CCR8 however failed in clinical translation possibly due to poor pharmacokinetic profile, serum stability, and lack of efficacy. Here, using in silico modelling approach, we have designed an antagonizing peptide for CCR8 (AP8) to inhibit liver inflammation and ameliorate acute liver injury.

Method: Efficacy of AP8 on CCL1-driven chemotaxis was examined in vitro in mouse RAW264.7 macrophages and human THP-1 monocytes using transwell assays, and in vivo in an acute carbon tetrachloride (CCL4)-induced acute liver injury mouse model. To assess intrahepatic monocyte infiltration in vivo, liver tissues were mechanically dissociated using Tissue Grinder, and the monocyte-derived macrophage (MoMF) population, characterized by CD11b and F4/80 expression levels, was analyzed using flow cytometry. Furthermore, effects of AP8 on disease progression (inflammation and fibrosis) were assessed using immunohistochemistry and mRNA analysis The effects of AP8 were compared with R243, a selective CCR8 antagonist, in vitro and in vivo.

Results: AP8 showed favorable inhibition of CCL1-driven macrophage and monocyte chemotaxis in both murine RAW264.7 macrophages and human THP1 monocytes while R243 only showed reduced infiltration of mouse macrophages and not human monocytes. In vivo in CCL4-induced acute liver injury mouse model, flow cytometric analysis revealed a decrease in monocytes-derived macrophages (CD11b+/F4/80+) following AP8 treatment, but not R243 treatment. Immunohistochemical analysis evidenced decreased inflammation (F4/80 expression), fibrosis (collagen-I and alpha-smooth muscle actin expression), and increased liver regeneration (Ki-67 and HNF4alpha expression) in the AP8 treated mouse livers. Our data shows effective amelioration of inflammation and fibrosis using a CCR8-antagonizing peptide.

Conclusion: Our CCR8-antagonizing peptide inhibited migration of macrophages/monocytes in vitro and in vivo and ameliorated inflammation and fibrosis in vivo in an acute liver injury mouse model.

FRI-395
E2F2 deficiency protects from acetaminophen-induced hepatotoxicity while E2F1 is required to prevent the devastating effects

Xabier Buque1, Francisco Gonzalez-Romero1, Maider Apodaka-Biguri2, Maria Crespo2, Mariana Mesquita3,4, Igor Aurrekoetxea1,5, Beatriz Gómez Santos1, Igotxo Delgado1, Ana Nieva-Zuluaga1, Mikel Ruiz de Gauna1, Idioa Fernández-Puertas1, Paul Gomez-Jauregui1, Nerea Muñoz-Llanes1, Natalia Sainz-Ramírez1, Ainhoa Iglesias5, Francisco Javier Cubero6,7,8, Guadalupe Sabio2, Ana Zubiaga2, Patricia Aspichueta1,5,7. 1Department of Physiology University of the Basque Country UPV/EHU, Faculty of Medicine and Nursing, 48940 Leioa, Spain; 2Centro Nacional de Investigaciones Cardiovasculares Carlos III, 28029 Madrid, Spain; 3Institute of Biology, Department of Plant Biology, PPG BMM, University of Campinas (UNICAMP), 13083-970 Campinas, São Paulo, Brazil; 4Department of Immunology, Ophthalmology and ENT, Complutense University School of Medicine, 28040 Madrid, Spain; 5Biocruces Bizkaia Health Research Institute, Cruces University Hospital, 48903 Barakaldo, Spain; 6Department of Genetic, Physical Anthropology and Animal Physiology, Faculty of Science and Technology, University of Basque Country UPV/EHU, 48940 Leioa, Spain; 7National Institute for the Study of Liver and Gastrointestinal Diseases (CIBEREHD, Carlos III Health Institute), 28029 Madrid, Spain; 8Instituto de Investigación Sanitaria Gregorio Marañón (ISGEM), 28009 Madrid, Spain
Email: patricia.aspichueta@ehu.eus

Background and aims: Acetaminophen (APAP) is one of the most commonly used pain relievers and antipyretics. APAP overdose, the leading cause of drug-induced hepatotoxicity in Western countries, entails a complex, time- and dose-dependent signaling network involving liver metabolism, immune response and liver regeneration. Available therapies are very limited; thus, new therapeutic targets need to be discovered. E2F1 and E2F2 proteins are cell cycle regulators involved in liver regeneration and mitochondrial metabolism. Additionally, they participate in the activation and maturation of T cells and macrophages. Therefore, the aims were: 1) to investigate if E2F1 and/or E2F2 are involved in APAP-induced liver injury and if so 2) to identify the mechanism.

Method: Efficacy of AP8 on CCL1-driven chemotaxis was examined in vitro in mouse RAW264.7 macrophages and human THP-1 monocytes using transwell assays, and in vivo in an acute carbon tetrachloride (CCL4)-induced acute liver injury mouse model. To assess intrahepatic monocyte infiltration in vivo, liver tissues were mechanically dissociated using Tissue Grinder, and the monocyte-derived macrophage (MoMF) population, characterized by CD11b and F4/80 expression levels, was analyzed using flow cytometry. Furthermore, effects of AP8 on disease progression (inflammation and fibrosis) were assessed using immunohistochemistry and mRNA analysis The effects of AP8 were compared with R243, a selective CCR8 antagonist, in vitro and in vivo.

Results: AP8 showed favorable inhibition of CCL1-driven macrophage and monocyte chemotaxis in both murine RAW264.7 macrophages and human THP1 monocytes while R243 only showed reduced
liver necrosis by 48 h post-APAP. The anatomopathological evaluation post-APAP showed increased inflammatory component linked to necrotic areas in E2f1−/− mice, with neutrophils as the main recruited cells, while in E2f2−/− mice it was lower than that found in WT mice. The higher immune infiltrate in E2f1−/− mice was reinforced with the immunofluorescence determination of CD45+, CD11b+, and F4/80+ cells in the whole liver, inflammation markers that also demonstrated the resistance conferred by E2f2 deficiency. BM transplant showed that the protection of E2f2−/− mice or vulnerability of E2f1−/− mice were associated with the effect of its lack in liver rather than to changes in myeloid cell activity. Liver content of neutral lipids indicated a worse metabolic adaptation of E2f1−/− mice to APAP overdose, which together with changes in mitochondrial complexes contributed to their susceptibility. Ultimately, APAP-treated DKO demonstrated similar phenotype to that of E2f2−/− mice despite being deficient in both factors simultaneously showing the potent protective predominant role of E2F2 deficiency over the negative E2F1 deficient effect.

Conclusion: E2f1 deficiency increases vulnerability to APAP-induced liver injury by altering liver metabolic adaptation. However, the inhibition of E2F2 arise as a potential therapeutic approach.

FRI-396
Mesenchymal stem cell-derived small extracellular vesicles ameliorate liver injury via attenuating macrophage extracellular traps
Zhihui Li1, Zhang Jing1, Meng Shibo1, Bingliang Lin1. 1Third Affiliated Hospital of Sun Yat-sen University, The department of infectious disease, Guangzhou, China
Email: lamikin@126.com

Background and aims: Acute liver failure (ALF) is characterized by massive hepatocyte necrosis and by systemic inflammation. The formation of macrophage extracellular traps (METs) has been associated with immune-mediated diseases. Small extracellular vesicles (sEVs) may act as mediators in the inhibition of inflammation by mesenchymal stem cells (MSCs). In this study, we aimed to investigate the mechanism of bone marrow MSC-derived sEVs (BMSC-sEVs) in treating mice with ALF.

Method: Small EVs and sEV-free BMSC concentrated medium were injected into mice with LPS/D-GalN-induced ALF to assess survival, changes in serology, liver pathology, and the yield of METs in different phases. The results were further verified in vitro in hydrogen peroxide injured L-02 and THLE-2 cells which were co-cultured with METs-induced macrophages THP-1. And Cl-amidine, an inhibitor of METs was used to evaluate the role and mechanism of BMSC-sEVs in METs-mediated liver injury.

Results: Treatment of BMSC-sEVs led to higher 24 h mouse survival rates and significant reductions in METs formation and liver injury compared to treatment with sEV-free concentrated medium. METs increased when macrophages were subjected to hypoxia/reoxygenation, and when METs were co-cultured with hepatocytes, apoptosis increased (Fig) and proliferation decreased, which were reversed by the inhibition of METs. Additionally, the Hippo/YAP pathway was activated in the METs-treated group. 

Conclusion: Our results reveal that BMSC-sEVs play in suppressing METs formation and highlight the therapeutic potential of METs inhibition in reducing liver injury.
FRI-397
SRT-015, best-in-class apoptosis signal-regulating kinase 1 inhibitor, demonstrates preclinical efficacy in acute models of liver injury
Kathleen Elias1, S. David Brown1, Daniel Burge1, Neil D. McDonnell1, Artur Pionoński1, 1Seal Rock Therapeutics, United States
Email: kelias@sealrocktx.com

Background and aims: SRT-015, a best-in-class apoptosis signal-regulating kinase 1 (ASK1) inhibitor, has demonstrated preclinical efficacy in a chronic therapeutic DIO-NASH mouse model with biopsy verified steatosis and fibrosis. In vitro studies have demonstrated dose-dependent direct anti-apoptotic, anti-inflammatory and anti-fibrotic effects with SRT-015 treatment. Clinical safety was demonstrated and human pharmacokinetic profile was established in Phase 1 trials with SRT-015. Here we evaluate the efficacy of SRT-015 in two acute preclinical models of liver injury for alcoholic hepatitis (AH) and acetaminophen (APAP) overdose.

Method: C57BL/6 male mice were used for both models. In the acute AH model, pyrazole induces high cyp2E1 levels emulating the effect of alcohol and LPS administration the gut bacterial toxins. Cyp2E1 was induced by two consecutive days of pyrazole administration (150 mg/kg, i.p.). On day 3 LPS (4 mg/kg i.p.), vehicle or SRT-015 (1, 3, 10 mg/kg, BID p.o.) was administered (n = 6–9/group). Plasma ALT was measured 24 hr. post LPS treatment.

Results: In the AH model, serum ALT level was increased significantly (p < 0.05; 6-fold) in pyrazole plus LPS group compared to vehicle control at 24 hr. SRT-015 dose-dependently decreased ALT (marker of liver injury) elevated by pyrazole plus LPS treatment in the AH model. SRT-015 treatment at 1, 3 and 10 mg/kg decreased ALT levels 63%, 71% and 80% respectively compared to pyrazole plus LPS alone. APAP treatment significantly increased ALT over 30-fold and SRT-015 treatment dose-dependently decreased ALT with 1, 3, and 10 mg/kg treatments restoring ALT to control levels. Western blots demonstrated activation of phospho-JNK, phospho-ASK1 and phospho-p38 after APAP administration and all phospho-MAPKs were inhibited with SRT-015 treatment in a dose-dependent manner.

Conclusion: SRT-015 treatment significantly, and dose-dependently, decreased the liver injury marker ALT in two models of acute hepatotoxicity. These data support the advancement of SRT-015 to chronic AH models and suggest that SRT-015 is a promising therapeutic for both APAP overdose and AH.

FRI-398
Microbiome and metabolome analysis outlines circulatory predictors of poor outcomes in ALF
Jaswinder Maras1, Sushmita Pandey1, Neha Sharma1, Nupur Sharma1, Gaurav Tripathi1, Babu Mathew1, Manisha Yadav1, Vasundhra Bindal1, Sadam H Bhat1, Rakhi Maiwall2. 1Institute of Liver and Biliary Sciences, Molecular and cellular medicine, New Delhi, India; 2Institute of Liver and Biliary Sciences, Department of Hepatology, New Delhi, India
Email: jassi2param@gmail.com

Background and aims: Acute liver failure (ALF) is severe hepatic dysfunction associated with early mortality. Exact mechanisms associated to severity and early mortality in ALF are obscure, but are thought to be driven by microbial and metabolic factors.

Method: Baseline plasma samples of 40 ALF patients and 5 healthy controls were subjected for albumin depletion followed by metabolome and meta-proteome (microbiome) analysis (labelled as training cohort). The results were validated on test cohort; plasma and paired one drop blood; in a 160 ALF patients using machine learning (ML).

Results: Metabolomic profile of ALF-Non-Survival was distinct and showed significantly alteration in bile acid, sphingolipid, tryptophan metabolism, tyrosine metabolism and others already linked to inflammation, cell death, nutrient absorption, and response to stresses (p < 0.05). ALF-Non-Survival plasma showed significant increase in the bacterial diversity as shown by the Alpha and Beta
diversity indices (p < 0.05). ALF-Non-Survival were majorly linked to the phylum Proteobacteria, Firmicutes, Actinobacteria and others (p < 0.05) which documented significant increase in the bacterial functionality linked to energy, amino acids, xenobiotic metabolism and, as others compared to other groups (p < 0.05). Interestingly the increase in the bacterial taxa and functionality correlated with the metabolites Chenodeoxycholic acid, 4-(2-Aminophenyl)-2,4-dioxo-butan-2-one and L-Tyrosine and others in ALF-NS (R² < 0.7). Multimetrics signature-based probability of detection (POD) for non-survival in ALF was greater than 80% and correlated with clinical parameters (R² > 0.85). POD metabolites (AUC = 0.98) directly associated with early mortality (p < 0.05). Specific increase in L-Tyrosine, 4-(2-Aminophenyl)-2, 4-dioxo-butan-2-one (linked to cell death and inflammation), Carnosine (linked to negate oxidative stress effect), Chenodeoxycholic acid (linked to bile acid synthesis), and alanyl-tyrosine (linked to removal of tyrosine) validated in different cohort five machine learning algorithms showed >98% accuracy/sensitivity/ specificity for early mortality prediction.

Conclusion: Our findings demonstrated that changes in the plasma microbiome correlates to metabolome in ALF patients. Baseline increase in plasma metabolite signature could be offered as universal utility to serve as biomarker for ALF patients predisposed to early mortality.

FRI-399
Neddylation inhibition recovers drug-induced liver injury through the stabilization of Tamm41
Claudia Gil-Pitarch1, Marina Serrano-Macías1, Jorge Simón Espinosa1, Rubén Rodríguez Agudo1, Sofía Lachiondo-Ortega2, Maria Mercado-Gómez1, Irene González-Recio1, Narao Goikoetxea1, Teresa Cardoso Delgado1, Luis Alfonso Martínez-Cruz1, Rubén Nogueiras2, Paula Iruzubieta3, Javier Crespo3, Steven Masson4,5, Misti McCain2, Helen Louise Reeves4,5, María Luz Martínez-Chantar1, 1A CIC bioGUNE, Liver disease lab, DERIO, Spain; 2Department of Physiology, School of Medicine-Instituto de Investigaciones Sanitarias, University of Santiago de Compostela, Spain; 3Gastroenterology and Hepatology Department, Marqués de Valdecilla University Hospital, Clinical and Translational Digestive Research Group, IDIVAL, Spain; 4The Liver Unit, Newcastle-upon-Tyne Hospitals NHS Foundation Trust, Newcastle upon Tyne NE7 7TD, United Kingdom; 5Newcastle University Translational and Clinical Research Institute, The Medical School, Newcastle University, Newcastle upon Tyne, NE2 4HH, United Kingdom
Email: mlmartinez@cicibiogune.es

Background and aims: In Western countries, acute liver failure is a serious disorder, being the majority cases caused by drug-induced liver injury (DILI), commonly associated to acetaminophen (APAP) overdose. DILI does not have an effective late stage treatment. Neddylation is an ubiquitin-like post-translational modification, usually associated to protein stabilization. It is upregulated in several liver diseases. The accumulation of Cullin-Ring E3 ligase (CRL) substrates induce cell-cycle arrest, senescence and apoptosis, thus, its proteolytic degradation is needed and occurs with posttranslational neddylation of CRL implicated by Neddy8-activating enzyme (Nae). MLN4924 is an anticancer small molecule, which is currently in phase I trials. MLN4924 inhibits Nae, therefore, blocks cullin neddylation allowing CRL substrates accumulation and triggering cell-cycle arrest, senescence and apoptosis in cancer cells. Studying neddylation role in DILI offers an attracting approach to improve DILI treatment. Tamm41 catalyzes the formation of CDP-diacylglycerol (CDP-DAG) which is central in phospholipid biosynthesis pathways in cells. Those are branched into several pathways, one of which chiefs to the synthesis of Cardiolipin (CL). CL is an essential lipid for the activity of key mitochondrial enzymes that are involved in the cellular energy metabolism. Tamm41 has been identified when inhibiting neddylation, thus, it is accurate to elucidate the relation Tamm41 might have with the neddylation pathway, and, as a consequence, with a possible treatment for DILI.

Method: Neddy8 was measured immunohistochemically and in serum by ELISA assay in clinical DILI samples. The effects of APAP overdose and its treatment with the neddylation inhibitor MLN4924 were evaluated in isolated mouse hepatocytes and pre-clinical three months mice models C57BL/6 and two BirA transgenic mice models, BioNEDD8, and BioUB. Serum and liver samples were cryopreserved, and part of the liver tissue was embedded in paraffin for histological procedures. Neddylation was inhibited to study its implication in cell death, mitochondrial dynamics and respiration, redox balance, endoplasmic reticulum stress, proteome homeostasis and metabolic pathways. Tamm41 was silenced to study its effect and relation along with neddylation pathway.

Results: Neddylation was induced in DILI. Its inhibition reduced cell death and inflammation and promoted regeneration mitochondrial activity. The proteomic analysis of BioNEDD8, and BioUB transgenic mice liver reflected the stabilization of Tamm41. Tamm41 silencing resulted in the abolition of the positive effects caused by neddylation inhibition.

Conclusion: Neddylation was upregulated in DILI causing cell damage. Inhibiting neddylation in DILI, returning it at the normal basal activity, restored the correct functioning of the cell by the stabilization of Tamm41.
Albumin, A1AT, PCK1, HNF4A and hFVI at values comparable to primary hepatocytes. Flow cytometry showed expression near homogenous expression of Albumin (90%), A1AT (99.8%) and ASGR1 (85%). Finally, FoP is a 2-step process taking 20 days compared to 30 days for directed differentiation while allowing the production of 10 hepatocytes from 1 hiPSC.

Figure 1: Hepatocytes derived in 3D suspension culture.

**Conclusion:** Forward Programming in 3D can be used to produce hepatocytes more rapidly and robustly than directed differentiation. In addition, FoP-Heps share key characteristics with their primary counterpart. Finally, this approach is compatible with GMP and large-scale production necessary for future cell-based therapies in the context of liver diseases.

**FRI-401**

**Stress-driven suppression of the hippo pathway accelerates liver injury**

Na Young Lee1, Ari Kwon1, Jae-Hyun Yu1, Myeung Gi Choi1, Ja Hyun Koo1

1Seoul National University, Korea, Rep. of South

Email: jhkoo@snu.ac.kr

**Background and aims:** The Hippo pathway signals actively represses Yes-associated protein (YAP) and its homolog transcriptional coactivator with PDZ-binding motif (TAZ) to suppress overgrowth of organs and maintain homeostasis. Upon activation, YAP/TAZ translocate into the nucleus and bind to TEAD transcription factors to promote transcriptional programs for proliferation or mitochondrial quality control.

**Method:** YAP/TAZ activity was analyzed in hepatocytes from patients with cirrhosis using single-cell transcriptomic data. The impact on Hippo pathway regulation following hepatocyte stress was analyzed using RNA sequencing. Phos-tag immunoblotting, immunocytochemistry, and qRT-PCR were used to assess YAP activity. CRISPR-mediated knockout or knock-in cells were used for mechanistic studies. Mice with hepatocyte-specific disruption of Yap and Taz were used to examine their role in hepatocyte death upon damage.

**Results:** Here, we report that liver damage activates YAP/TAZ in hepatocytes that in turn contributes to promoting hepatitis. Hepatocyte stress suppressed phosphorylation of YAP, increased nuclear translocation and target gene expression of YAP/TAZ. In
addition, global changes in the transcriptome by cellular stress was significantly reversed by YAP/TAZ knockout. Mechanistically, the regulation was occurred through both Hippo-dependent and Hippo-independent pathway, largely requiring a phosphatase activity. Furthermore, hepatic deletion of YAP/TAZ in vivo suppressed liver injury and steatohepatitis progression.

**Conclusion:** These reveal a pathological role of YAP/TAZ in promoting steatohepatitis progression, which provides an insight into therapeutic intervention of the disease.

**FRI-402**

Dysregulated lipolysis increases intrahepatic concentrations of non-esterified fatty acids in chemotherapy-associated steatohepatitis

Martina Derler1, Eva Waich2, Elisabeth Ableitner2, Julia Sturm2, Martina Derler1, Eva Waich2, Elisabeth Ableitner2, Julia Sturm2, Martina Derler1, Eva Waich2, Elisabeth Ableitner2, Julia Sturm2

**Background and aims:** Up to 50% of colorectal carcinoma patients receiving the chemotherapeutic drug irinotecan develop chemotherapy-associated steatohepatitis (CASH). Typical CASH symptoms include intrahepatic accumulation of lipids and hepatic inflammation. CASH impairs liver regeneration after surgical resection of hepatic metastasis and thereby drastically increases mortality. The biochemical mechanisms leading to CASH are still unknown, and treatment options are lacking. This project aims to investigate the effect of irinotecan on hepatocyte lipid metabolism.

**Method:** The murine hepatocyte cell line AML-12 was treated with increasing doses of irinotecan (10–60 μM), and extra- and intracellular concentrations of non-esterified fatty acids (NEFA) were quantified. Additionally, the expression of enzymes involved in fatty acid oxidation, de novo lipogenesis, and lipolysis was analyzed on mRNA- and protein levels by quantitative PCR and western blotting, respectively. The content of adenosine triphosphate was determined by flow cytometry. For mechanistic experiments, AML-12 cells were treated with irinotecan in the presence and absence of 200 μM oleic acid, the lipase inhibitor Atglistatin (40 μM), and under serum-free conditions.

**Results:** Irinotecan treatment of AML-12 cells led to a significant accumulation of intracellular non-esterified fatty acids, whereas triglyceride and cholesterol levels remained unchanged. Protein expression of adipocyte triglyceride lipase (ATGL), which catalyzes the rate-limiting step of intracellular lipolysis, increased with rising doses of irinotecan by 7-fold. However, key proteins of de novo lipogenesis were reduced in irinotecan-treated AML-12 cells. Intracellular levels of adenosine triphosphate and mRNA of enzymes catalyzing fatty acid oxidation were significantly decreased upon irinotecan treatment. This was associated with elevated levels of oxidative stress and increased expression of the oxidative stress marker haemoxigenase-1. Despite increased oxidative stress and NEFA levels, mRNA levels of the peroxisomal biogenesis factor 2 (Pex2) were significantly decreased.

**Conclusion:** Irinotecan leads to a dysregulation of ATGL-mediated lipolysis, which results in a massive intracellular accumulation of NEFA. These metabolic changes might contribute to hepatocyte lipotoxicity and foster the pathogenesis of CASH.

**FRI-403**

Control compounds used to validate in vitro models of idiosyncratic drug-induced liver injury: a systematic review

Antonio Segovia-Zafría1,2, Marina Villanueva1, Ana Serras1, Gonzalo Matilla1, Ana Rodrigo-García1, Daniel E. Di Zeo-Sánchez1, Hao Ni1, Ismael Alvarez-Alvarez2, Sergei Godec4, Irina Milisav4, José Fernandez-Checa6,7, Maria Isabel Lucena1,2, Francisco Javier Cubero2,8,9, Joana Miranda3, Leonard J Nelson10, Raul J. Andrade1,2, Servicios de Aparato Digestivo y Farmacología Clínica, Hospital Universitario Virgen de la Victoria, Instituto de Investigación Biomédica de Málaga y Plataforma en Nanomedicina-IBIMA Plataforma BIONAND, Universidad de Málaga, Málaga, Spain, Spain; Biomedical Research Network Center for Hepatic and Digestive Diseases (CIBEREhd), Carlos III Health Institute, Madrid, Spain, Spain; Research Institute for Medicines (IMed.U.Lisboa), Faculty of Pharmacy, Universidade de Lisboa, Lisbon, Portugal; Clinical Department of Anaesthesiology and Intensive Therapy, University Medical Center, Ljubljana, Slovenia; University of Ljubljana, Faculty of Health Sciences, University of Ljubljana, Ljubljana, Slovenia; Cell Death and Proliferation, Instituto de Investigaciones Biomédicas de Barcelona, CSIC, Barcelona, Spain; Liver Unit, Hospital Clinic I Provincial, IDIBAPS, Barcelona, Spain; University of Southern California Research Center for Liver Diseases, Keck School of Medicine, USC, Los Angeles, CA, USA, United States; Department of Immunology, Ophthalmology and ENT, Complutense University School of Medicine, Madrid, Spain; Instituto de Investigación Sanitaria Gregorio Marañón (ISCM), Madrid, Spain; Instituto for Bioengineering. The University of Edinburg (UK), United Kingdom

**Email:** andrade@uma.es

**Background and aims:** Idiosyncratic Drug-Induced Liver Injury (DILI) encompasses the unpredictable damage that drugs, herbs, and dietary supplements may cause to the liver. When studying the prediction of DILI at preclinical stages, the choice of a validated system is decisive. The present study seeks to provide a list of both DILI positive and negative control compounds. This list arises from a systematic analysis of the existing literature, supported by clinical evidence collected in both national and international DILI registries and endorsed by a committee of experts from the ProEuroDILI Network (COST Action 17112).

**Method:** This systematic review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines. Eligible literature published to June 1st, 2022 was identified through a search in PubMed, Embase, Web of Science, and Scopus. Only peer-reviewed original articles focused on studying the onset of DILI by using preclinical in vitro human models were included. The reliability of the studies was assessed using a modified version of the software-based “Toxological data Reliability Assessment Tool” (ToxITool). Drugs most commonly used as DILI-positive and negative controls in the literature were selected for in-depth analysis.

**Results:** The search strategy retrieved 2936 studies from the above-mentioned databases. After screening, 2885 studies were excluded, as they were duplicates or did not meet the inclusion criteria. 51 articles were finally included. Most studies were categorized as reliable without restrictions (58.6%). The mean number of drugs tested was 55 DILI-positive and 30 DILI-negative compounds. Diclofenac was the drug most used as DILI-positive control (88%), followed by troglitazone (80%) and flutamide (71%). Regarding DILI-negative controls, buspirone (49%), dexamethasone (41%), and diphenhydramine (35%) were the most tested compounds. Acetylsalicylic acid, fluoxetine, or warfarin were widely used as DILI-negative controls (33%, 25%, and 22%, respectively), but also as DILI-positive compounds (22%, 20%, and 16%). Moreover, up to 19% of the drugs used as DILI-negative controls had clinical hepatotoxicity cases reported within different DILI registries. The drug concentrations used varied remarkably. Although 49% of studies chose the drug concentrations based on the Cmax values, the Cmax assumed for the
same drug in different studies diverged. Most studies assessed drug effects in the short term (≤72 h; 71%). Cytotoxicity was the end point most evaluated (82%). Nevertheless, several studies included the assessment of functional parameters, such as biotransformation activity (20%), albumin (20%), or urea secretion (12%). A few studies included mechanistic end points such as cholestasis (24%) or mitochondrial damage (22%).

**Conclusion:** This systematic study has shown a lack of consensus in terms of in vitro DILI modelling. Since no single system serves as a universal test for the multifactorial process of DILI, a portfolio of robust and well-characterized predictive platforms with a well-defined purpose is required. Moreover, there is a need for consensus about the reference drugs to be used for the DILI assay validations, including recommendations about the concentrations to test and criteria for interpreting the data. Funding: P19/00883, PEMP-2020-0127, PI21/01248, P18-RIT-3364, PI-0310-2018, ISCIII CIBERehd, POSTDOC_21_00780, CD20/00083, CD2100198.

**FRI-404**

A systems medicine approach for the identification of potential prognostic biomarkers in patients with acute decompensation of cirrhosis

Estefanía Huergo Iglesias1, Sara Palomino1, Ana Rosa López-Pérez1, Nuria Planell2, Vincenzo Laganì3, Ferran Aguilar4, Patricia Sierra5, Paolo Caraceni2, Alberto Q. Farias6, Jonel Trebicka7,8, Joan Clària4,8,9, Pierre-Emmanuel Rautou10, David Gomez-Cabrero1.

1Navarrabiomed, Group of Translational Bioinformatic, Pamplona, Spain; 2CIMA Navarra University, Computational Biology, Spain; 3Ilia State University, Intitute of Chemical Biology, Georgia; 4European Foundation for the Study of Chronic Liver Failure, Spain; 5University of Bologna, Department of Medical and Surgical Science, Italy; 6University of Sao Paulo School of Medicine, Department of Gastroenterology, Brazil; 7University of Münster, Department of internal medicine, Germany; 8Hospital Clinic-IDIBAPS, Biochemistry and Molecular Sciences, Spain; 9Universitat de Barcelona, Department of Biomedical Sciences, Spain; 10Université Paris-Cité, Inserm, Centre de recherche sur l'inflammation, France

Email: estefania.huergo.iglesias@navarra.es

**Background and aims:** Patients with acute decompensation (AD) of cirrhosis have a high short-term mortality due to a lack of a complete understanding of the pathophysiology of the disease and the wide heterogeneity of patients. Hence, it is necessary to better understand the disease at a systems level. Therefore, the aim of this work was to understand at systems level the pathophysiology of AD cirrhosis by using a systems approach to integrate multi-omic profiling with clinical data.

**Method:** Clinical and omics data from three well-characterized cohorts of patients with AD cirrhosis -CANONIC (572 patients), PREDICT (766 patients) and ACLARA (580 patients)- were used to perform a multi-omic analysis applying a systems medicine framework to characterize AD ([Figure](#)), as part of the H2020 funded project DECISION. A multi-state survival analysis was performed using bootstrapping and permutation test to estimate confidence intervals and permuted p values for each feature. Non-Parametric Combination (NPC) analysis was conducted using custom gene-gene and gene-CpG maps (among others) and the STATegRA R package. Network analysis was conducted using custom methods, FEM and Cytoscape available tools. MXM R package was used to identify subsets of variables with maximal predictive power.

**Results:** We conducted the five-step analysis described in the Method section in the PREDICT cohort. In the first step, we explored the correlation between omics, observing a low coordination in general, but metabolites and RNA-Seq as specific candidates. Secondly, we conducted an uni-omic analysis for each feature of each omic, that allowed us to identify, among thousands of features, statistically robust candidate biomarkers. However, we identified limited features of interest, so that we required to leverage over the multi-omic profiling of each individual. To this end, as a third step, we used an NPC analysis, so the number of features identified was increased. As a result, we gathered enough statistical power to conduct the fourth step: a network analysis. From this analysis, we identified systems-based feature combinations that are associated with ACLF; mortality and/or liver transplant. As a final step, using the identified features, we generated predictive models for prognosis in AD patients, which are being validated in the two additional cohorts, CANONIC and ACLARA.

**Conclusion:** Our study shows that, while AD patients are very heterogeneous explaining why classical statistical analysis are very limited in power, the use of multi-omic approaches can overcome partly such limitation. We observed that making use of feature-feature connections, systems medicine allows for increased power in the identification of disease mechanisms, but even more important, may allow for candidate biomarkers discovery.

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 847949. This reflects only the author’s view and the Commission is not responsible for any use that may be made of the information it contains.

**FRI-405**

Kelch-like ECH-associated protein-1 deletion rescues cell death associated with glutathione-glutathione peroxidase 4 knockdown in hepatocytes in acute models of liver injury

Júlia Grube1, Leticia Colyn1, Chaochao Wang1, Christian Traftwein1.

1University Hospital RWTH, Internal Medicine III, Aachen, Germany

Email: ctrautwein@ukaachen.de

**Background and aims:** Recently, acute liver injury (ALI) has been described to be mediated by ferroptosis in mice models. Ferroptosis is a type of cell death initiated by iron accumulation, reactive oxygen species (ROS) generation, and subsequent lipid peroxidation leading to membrane damage and cell death. The Kelch-like ECH-associated protein-1 (KEAP1)/erythroid 2-related factor 2 (NRF2) axis is of major relevance for ferroptosis, modulating the expression of genes associated with iron metabolism and inducing the cellular response to ROS through the activation of enzymes such as glutathione peroxidases (GPXs). Among them, GPX4 plays a crucial role in ferroptosis, as its inactivation leads to lipid peroxidation. Here, we sought to define the effect of NRF2 activation during acute liver injury in a model of ferroptosis.
Method: We generated a genetic model of ferroptosis by hepatocyte-specific deletion of GPX4 (GPX4 deltahepa). To study the activation of the NRF2 axis, we crossed GPX4 deltahepa mice with mice in which KEAP1 was specifically deleted in hepatocytes (KEAP1 deltahepa), generating GPX4 deltahepa/KEAP1 deltahepa mice. We performed acute models of liver injury—CCl4 injection and bile duct ligation (BDL) for 48 hours.

Results: Hepatocyte-specific deletion of GPX4 results in increased liver injury associated with elevated serum transaminase levels and increased macrophage recruitment. Interestingly, histological analysis of GPX4 deltahepa livers showed no evidence of ferroptosis as indicated by immunohistochemical staining for 4-hydroxynonenal. They also showed no evidence of necrosis or pyroptosis, but we found a strong increase in apoptosis. Deletion of KEAP1 in hepatocytes leads to activation of the NRF2 pathway, as confirmed by its upregulation and activation of target genes. In CCl4-challenged GPX4 deltahepa/KEAP1 deltahepa mice, the damage observed in GPX4 deltahepa mice is reversed, as evidenced by serum transaminase levels and liver histology. KEAP1 deletion markedly inhibits apoptosis-mediated cell death as indicated by TUNEL assay, cleaved caspase-3 staining, and gamma-H2AX protein levels. We also observed an upregulation of the anti-apoptotic protein BCL2 in GPX4 deltahepa/KEAP1 deltahepa livers.

Conclusion: Our results indicate that in the GPX4 deltahepa mice challenged with CCl4 injection and bile duct ligation for 48 hours, there is no evidence of ferroptosis, although we observed extensive tissue damage associated with increased apoptosis. Activation of the NRF2 pathway by deletion of KEAP1 rescues acute liver injury. This effect may be mediated by the upregulation of the anti-apoptotic protein BCL2.

FRI-406
Altered intestinal permeability in patients with drug-induced liver injury and other forms of acute liver injury: a sequential analysis of serum levels of LBP, CD14 and CD163

Daniel E. Di Zeo-Sánchez1,2, Marina Villanueva1, Alejandro Cueto-Sanchez2, Jose Pinazo Bandera1, Miren Garcia Cortes1, Enrique del Campo Herrera1, Ana Bodoque-García1, Gonzalo Matilla1, M Robles-Díaz1,2, Maria Isabel Lucena1,2, Raul J. Andrade1,2, Camilla Stephens1,2.

Background and aims: The disruption of the intestinal barrier might be a major contributor to the pathogenesis of various liver disorders, including drug-induced liver injury (DILI), through impairment of hepatic immunotolerance. It has been speculated that pathogen-associated molecular patterns (PAMPs) may reach the liver as a consequence of an increase in intestinal permeability caused by alterations in the intestinal microbiota. Consequently, innate immune cells would initiate an inflammatory response that can be lethal to hepatocytes or trigger an adaptive immune response. LBP (lipopolysaccharide binding protein), CD14 and CD163 have been linked to intestinal permeability, as they play a key role in the innate immune response to bacterial endotoxins (e.g., LPS), by binding to them or by exerting an immunomodulatory role. Our aim was to conduct an exploratory study to assess the intestinal permeability status of DILI patients by quantification of LBP, CD14 and CD163 proteins in serum.

Method: Peripheral blood serum was collected from 8 healthy volunteers, 8 DILI patients and 8 patients with acute liver injury (ALI) other than DILI and stored at −80°C until analysis. The drugs responsible for toxic liver injury were antibiotics, antitumor drugs, dietary supplements and statins; whilst ALI cases were mostly viral hepatitis. Patients were followed from the detection of the acute episode (visit 1) until >30 days after detection (visit 3). Serum levels of LBP, CD14 and CD163 were measured by Luminex (RandD Systems) and results were statistically analyzed using Kruskal-Wallis and Friedman tests.

Results: The concentration (mean ± standard deviation) of LBP, CD14 and CD163 proteins was >300-fold higher in DILI (LBP: 1.14 × 10⁷ ± 3.4 × 10⁶; CD14: 1.98 × 10⁶ ± 5.8 × 10⁵ and CD163: 2.8 × 10⁶ ± 1.1 × 10⁶ pg/ml) compared to healthy controls (LBP: 3.8 × 10⁴ ± 9790; CD14: 6369 ± 950 and CD163: 6273 ± 425 pg/ml) at visit 1. The levels of these proteins decreased significantly at visit 3, although they remained elevated compared to controls (p < 0.05). No significant differences were detected between DILI and ALI.

Conclusion: The elevated concentration of LBP and CD14 proteins detected in DILI patients could be indicative of increased translocation of bacterial products due to an altered intestinal permeability. This theory is further supported by the elevated levels of CD163 protein, which has been considered a marker of macrophage activation, associated with intestinal permeability and dysbiosis.

Alcohol-related liver disease

WEDNESDAY 21 TO SATURDAY 24 JUNE

TOP-073
AKR1B10 as a novel molecular driver of alcohol-associated hepatitis

Maria Hernandez-Tejero1,2,3,4, Ana Clemente1,5, Luma Melo1, Samhita Ravi6, Josep Maria Argemi7, Stephen Atkinson7, Juan Pablo Arab1,2,3, Daniel Cabrera2, Paula Rivera8, Luis Antonio Diaz8, Francisco Idalsoaga9, Sheng Cao2, Vijay Shah1, Jaideep Behari1,10, Gavin Arteel1,10, Ramon Bataller1,11, Francisco Idalsoaga9, Sheng Cao2, Vijay Shah1, Jaideep Behari1,10, Ramon Bataller1,11, Francisco Idalsoaga9, Sheng Cao2, Vijay Shah1, Jaideep Behari1,10, Ramon Bataller1,11, Francisco Idalsoaga9, Sheng Cao2, Vijay Shah1, Jaideep Behari1,10, Ramon Bataller1,11.

Background and aims: Alcohol-associated hepatitis (AH) is a severe condition that needs novel targeted therapies. We recently showed by integrated multi-OMICs that severe AH is characterized by profound deregulation of glucose metabolism (Massey et al, Gastroenterology 2021). The polyol pathway is an alternative and potential harmful way to metabolize glucose and is governed by AKR1B10 and other aldose reductases. AKR1B10 metabolizes glucose to produce sorbitol that is oxidized by SORD to produce fructose. This study aimed at analyzing whether this pathway is deregulated in AH.

Method: 55 patients with probable and definite diagnosis of AH according to the NIAAA were included. We also included 10 healthy controls and 45 diseased controls (15 alcohol-associated cirrhosis, 15 NASH and 15 chronic hepatitis C). Hepatic gene expression profiling was assessed by DNA microarray, qPCR and RNAseq was performed to confirm results. To assess the expression of ductular reaction genes, microdissection of KT7 positive and negative areas was performed in 6 AH patients. Protein expression was assessed by IHC and western blotting. scRNAseq were performed in 12 patients including healthy controls, AH, PSC, alcohol-associated and NASH cirrhosis.

Results: AKR1B10 was found to be the most upregulated gene in liver with AH (>400-fold). The expression of SORD, another gene of the polyol pathway that metabolizes sorbitol, was downregulated by 2-fold compared to normal livers. AKR1B10 gene expression correlated with AST (p = 0.009), bilirubin (p = 0.008), and glucose (p = 0.01) levels at admission in patients with AH. AKR1B10 expression also correlated with severity of liver disease according to MELD (p = 0.004), portal hypertension (p = 0.01), and increased the mortality at 180 days (p = 0.02). AKR1B10 mRNA expression was increased in DR cells from patients with AH (p = 0.0059). Density plots stratified by severity showed an inverse correlation between disease severity and the AKR1B1/SORD ratio. In addition, IHC indicates that AKR1B10 overexpression is predominantly in hepatocytes. scRNAseq studies demonstrated that AKR1B10 is expressed in hepatocyte and cholangiocyte cell populations compared. Figure 1.

Conclusion: The polyol pathway is dysregulated in AH and correlated with disease severity. Targeting key genes such as AKR1B10 and SORDs represents a potential novel therapy for AH. Further studies should evaluate the use of aldose reductase inhibitors in models of AH.

TOP-078
Pyroptotic MAITs link microbial translocation with severity of alcohol-related liver disease

Li-Ping Zhang1, Hui-Fang Wang1, Xing-Ran Zhai2, Chun-Bao Zhou2, Jin-Hong Yuan3, Ye-Nv Ma4, Zeng-Tao Yao2, Shuo Huang2, Wei-Zhe Li2, Yan-Mei Jiao2, Fu-Sheng Wang2, Zhengsheng Zou2, Ji-Yuan Zhang2, Qing-Lei Zeng1. 1The First Affiliated Hospital of Zhengzhou University, Department of Infectious Diseases and Hepatology, China; 2The Fifth Medical Center of Chinese PLA General Hospital, Treatment and Research Center for Infectious Diseases, China; 3The Fifth Medical Center of Chinese PLA General Hospital, Department of Liver Disease, Senior Department of Hepatology, China; Email: zengqinglei2009@163.com

Background and aims: Mucosal-associated invariant T cells (MAITs) are markedly reduced in patients with alcohol-related liver disease (ALD); however, the potential mechanism underlying MAITs loss
remains elusive. Hence, we aimed to explore what induced MAITs loss and its clinical significance.

**Method:** The characteristics of pyroptotic MAITs were evaluated in a cohort of patients with ALD, including 41 patients with alcoholic liver cirrhosis (ALC) and 21 patients with ALC complicated with severe alcoholic hepatitis (ALC+SAH).

**Results:** In patients with ALD, blood MAITs were significantly decreased, hyperactivated and displayed enhanced cell death through pyroptosis. The frequencies of pyroptotic MAITs increased with disease severity in patients with ALC and patients with ALC+SAH. These frequencies were negatively associated with the frequencies of MAITs and positively correlated with the levels of MAITs activation, plasma levels of intestinal fatty acid-binding protein (a marker of intestinal enteroocyte damage), soluble CD14, lipopolysaccharide binding protein and peptidoglycan-recognition proteins (surrogate markers of microbial translocation). Pyroptotic MAITs were also found in the liver of patients with ALD. Interestingly, MAITs underwent further activation and pyroptosis in vitro under stimulation by *Escherichia coli* or direct bilirubin. Notably, blocking interleukin-18 signaling could reduce the activation and frequencies of pyroptotic MAITs.

**Conclusion:** The loss of MAITs in patients with ALD is, at least in part, due to cell death from pyroptosis and is closely associated with the severity of ALD. Such increased pyroptosis may be affected by dysregulated inflammatory responses to intestinal microbial translocation or direct bilirubin.

---

**FRIDAY 23 JUNE**

**FRI-407**
Platelets proteome dynamics and its association with liver severity in severe alcoholic hepatitis
Rupinder Kalra1, Jaswinder Maras1, Abhishak Gupta1, Nupur Sharma1, Gaurav Tripathi2, Manisha Yadav1, Babu Mathew1, Vasundhara Bindal1, Neha Sharma1, Sushmita Pandey1, Sadam H. Bhat1, 1Institute of Liver and Biliary Sciences, Molecular and Cellular Medicine, New Delhi, India
Email: jassil2param@gmail.com

**Background and aims:** Platelet activation mediates inflammation, oxidative stress, and contributes to disease severity in patients with SAH. The liver is a target organ of platelet dysfunction, which may provide the reason for the increase in severity in SAH patients. Temporal change (Baseline, Day1, Day3 and Day7) in the liver of patients with SAH patients is distinct and could help in stratifying patients with early mortality.

**Method:** Platelet proteomics was performed in (n = 20) SAH patients and (n = 20) controls at baseline, Day1, Day3, and Day7 respectively. Weighted Protein Correlation Network Analysis (WPCNA) identified the temporal increase in SAH significant proteins clusters which were correlated to clinical parameters and outcome. Most prominent predictors of early mortality were identified and validated in a separate cohort of (n = 60) SAH patients.

**Results:** Platelet activation (PF4, TSP1, and P-selectin) were significantly higher in SAH patients compared to controls (p < 0.05). Temporal proteomics evaluation identified 1236 proteins of them (baseline) 468 were differentially expressed (206-up, 262 down-regulated) in SAH as compared to controls (p < 0.05). Proteins cargo significantly increased were linked to platelet activation, ATP synthesis, oxidative phosphorylation and others whereas those significantly decreased were linked to Detoxification of Reactive Oxygen Species, Protein processing, Antigen Presentation and others (p < 0.05). Proteomic analysis at Day 1 (196 up- and 311 Dn), Day3 (279 up- and 469 Dn) and Day7 (207 up- and 562 Dn) showed significant change in DEP counts (p < 0.05, FC>1.5, FDR<0.01). Venn integration identified 42 proteins commonly up- linked to platelet activation, degranulation, complement activation, dissolution of fibrin clot and others and 32 proteins downregulated linked to Detoxification of Reactive Oxygen Species, cGMP-PKG signalling pathway, Signalling by NGF and others (p < 0.05). WPCNA of platelets identified 18 proteins clusters (p < 0.05), which correlated to the severity indices (MELD, DF) and provided insight in to inflammation and severity of SAH patients (p < 0.05, R2 > 0.5). Blood transcriptome module (BTM) enrichment analysis showed that platelets in SAH patients are activated and carry inflammatory cargo of activated neutrophils, myeloid cells and monocytes, coagulation and TGF beta signalling and others (p < 0.05). Interestingly, proteins linked to TGF Beta such as Fibulin-5 (FBLN5), Peroxiredoxin-2 (PRDX-2) and others were temporally increased in SAH platelets. Validation experiments confirmed that platelets PRDX2 level increase with time showed direct correlation with the severity indices (MELD, mDF) and inhibit development of PDGF levels altering the molecular regeneration capacity of platelet in SAH patients.

**Conclusion:** Platelets in SAH are activated; energy deprived and carries inflammatory mediators and was able to stratify SAH patients with early mortality. Temporally these platelets accumulate PRDX2 which inhibit development of PDGF and regenerative support. Our proteomics study underlines PRDX2 as a novel target for therapeutic intervention for hyper-inflammation in SAH patients.

---

**FRI-408**
Characterization of fibrogenesis in severe alcohol-related hepatitis using a 3D model of coculture of organoids and fibroblasts from patients
Line Carolle Ntandja Wandji1,2, Mohamed Bou Saleh3, Cyril Sobolewski4, Viviane Gennemi3, Emmanouel Boleslawski4, Fabrice Bray5, Christian Rolando6, Philippe Mathurin1,2, Laurent Dubouquier2, Alexandre Louvet1,2, 1CHU Lille, Service des maladies de l'appareil digestif et de la nutrition, Lille, France; 2Univ. Lille, Inserm, CHU Lille, U1286-INFINITE-Institute for Translational Research in Inflammation, Lille, France; 3CHU Lille, Service d'Anatomopathologie, France; 4CHU Lille, Service de Chirurgie Digestive et Transplantations, France; 5Univ. Lille, CNRS, USR 3290-MSAP-Miniaturisation pour la Synthèse, l'Analyse et la Protéomique, France
Email: carollewandji@yahoo.fr

**Background and aims:** Since few data are available on liver fibrogenesis during alcohol-related hepatitis (AH), the interplay between injured hepatocytes and fibrogenic cells needs to be studied in more details. Indeed, YAP-mediated impaired hepatocyte regeneration plays an important role in AH but its impact on fibrogenesis remains unknown. Our objectives were to characterize fibrosis during AH and to evaluate the impact of YAP in hepatocytes on the fibrogenic process observed in AH.

**Method:** Using PCR, immunohistochemistry and proteomic analysis, we characterized the molecular profile of fibrosis in liver explants from patients with AH not responding to steroids (n = 22) or alcohol-related cirrhosis (Cirrh, n = 24), and healthy livers (Ctrl, n = 15). From the explants, we also generated organoids which were cocultured with hepatic myofibroblasts to study their activation, their production of cytokines and their proliferation. We also transduced organoids from Cirrh liver with an active YAP and cocultured them with myofibroblasts to evaluate their contribution to fibrogenesis.

**Results:** In AH livers, standard histology and immunohistochemistry showed a specific intralobular fibrosis associated with specific markers (alpha-SMA, PDGF alpha, COL1A1, lamininA2 etc.). PCR and proteomic analysis showed a specific extracellular matrix (ECM) signature (Figure 1) and an increased expression of fibroblast
activation markers (alpha-SMA, PDGFR alpha), fibrillar collagens (COL1A1, COL3A1), lamininA2, cytokines (PDGF\(\alpha\), CCL5, MCP1), and a dysregulation of TIMP1 and MMP9. Ex vivo, the mRNA expression of alpha-SMA, PDGFR alpha, COL1A1, TIMP1, PDGF alpha, CCL5, MCP1 were higher in myofibroblasts cocultured with AH organoids compared to fibroblasts cocultured with Cirrh organoids. Proliferation of myofibroblasts was also increased when cocultured with AH organoids. Compared to non-transduced Cirrh organoids, transduction of YAP in Cirrh organoids led to a greater proliferation of myofibroblasts and increased alpha-SMA, PDGFR alpha, COL1A1, TIMP1, PDGF alpha, CCL5 and MCP1, a profile which mimics coculture with AH organoids.
Figure: (abstract: FRI-407).

**Conclusion:** AH is characterized by a specific fibrosis profile and organoids from AH patients induce activation, proliferation and release of inflammatory cytokines in myofibroblasts. Hepatocytic YAP appears to play an important role in the fibrogenesis during AH.

**FRI-409**
An increase in the number of activated regulatory T cells is associated with an improvement in liver function of patients with severe alcoholic hepatitis after steroid therapy
Soon Kyu Lee1,2, Minwoo Kang3, Ji Won Han1,3, Jung Hyun Kwon1,2, Soon Woo Nam1,3, Jong Young Choi2,3, Jeong Won Jang2,3, Seung Kew Yoon2,3, Pil Soo Sung2,3. 1Incheon St. Mary's Hospital, College of Medicine, The Catholic University of Korea, Division of gastroenterology and hepatology, Department of Internal Medicine, Korea, Rep. of South; 2College of Medicine, The Catholic University of Korea, The Catholic University Liver Research Centre, Korea, Rep. of South; 3Seoul St. Mary’s Hospital, College of Medicine, The Catholic University of Korea, Division of Gastroenterology and Hepatology, Department of Internal Medicine, Korea, Rep. of South
Email: pssung@catholic.ac.kr

**Background and aims:** Alcoholic liver disease is one of major cause of acute and chronic liver failure worldwide. Although steroid therapy is treatment of choice in severe alcoholic hepatitis, there has been limitation in the treatment of alcohol-related liver disease because of no improvement in the long-term survival after steroid therapy. Moreover, the role of regulatory T (Treg) cells, inhibiting T cell proliferation and cytokine production, in patients with alcoholic liver disease remains unclear. Here, we investigated the population and potential roles of activated Treg cells in patients with alcohol-related liver disease including severe alcoholic hepatitis using steroid treatment.

**Method:** A total of 30 patients with alcoholic liver disease were consecutively enrolled from two academic hospitals in our study. Among 30 patients, 11 patients had severe alcoholic hepatitis treated with steroid (steroid group) and the others (n = 19) had mild alcohol-induced liver injury without steroid treatment (no steroid group). Peripheral blood mononuclear cells (PBMCs) were isolated from patients at the time of enrollment and 7 days after treatment. Frequency of CD4+CD25+Foxp3highCD45RA− Treg cell was examined by flow cytometry and compared between the steroid and no steroid group. Moreover, we evaluated the population of Treg according to the steroid treatment response. Single cell RNA sequencing analysis using paired PBMCs was also performed and compared between patients with steroid responder and non-responder.

**Results:** Among 30 included patients, the steroid group (n = 11) had significant higher score of model for end-stage liver disease (MELD) than in the no steroid group (n = 19) (median MELD score, 24.0 vs.
Background and aims: Severe alcoholic hepatitis (SAH) has a high mortality and corticosteroid therapy non-response is seen in ~60% patients. Corticosteroid therapy is known to cause lipid profile abnormalities. Thus we speculated that lipids may represent a useful tool to characterise responders (R) and non-responders (NR) to corticosteroid therapy and outcome.

Method: Plasma lipidomics and metaproteomics (metagenomics) was performed in 80 SAH (R = 55 and NR = 25) at baseline, day 4 and day 7 to identify signatures capable of early detection of nonresponse. Temporal change in lipidome was assessed by Weighted Lipid Correlation Network Analysis (WLCNA). Baseline Metaproteome and lipidome profiles were subjected to cross correlation network analysis followed by correlation with clinical parameters. Bacterial specific lipid species which could predict severity and outcome were identified and validated in a test cohort of (n = 100). SAH patients using Machine learning approach.

Results: Plasma samples showed significant alteration of lipidome and microbiome as indicated by multivariate PLS-regression analysis and alpha, beta diversity indices (p < 0.05). Significant reduction of lipid species and increase in bacterial taxa (baseline) were observed in NR (p < 0.05, LogFC > 1.5, FDR < 0.01). Baseline plasma level of TG 48:4 was higher whereas level of PS and PE (known for maintaining body cortisol level) were lower in NR (p < 0.05). Temporal analysis of lipidomic profile showed significant increase in lipid metabolism in R, whereas the NR showed specific increase in triglycerides already reported for promoting steatosis and inflammation (p < 0.05). NR specific Meta- proteomic signatures/functionality directly correlated with lipid species and clinical parameters; severity indices (mDF, MELD and others; p < 0.05). Baseline increase in TG 48:4 showed direct correlation with increased bacterial taxa; Escherichia coli, Bacillales, Streptococcus, Enterobacteriaceae and their functionality in NR (r² > 0.5, p < 0.05). Baseline reduction of PS and PE were associated Lactobacillus, Nocardiopsaceae and others along with their functionality in NR (r² > 0.5, p < 0.05). Lipidomic and metaproteomic signature based probability of detection of NR was >90% (p < 0.05). Baseline decrease in PS (PS a41:5, PS a43:6, PS a43:4, PS a43:5, PS a41:0) with (AUC > 0.85, p < 0.05) predicted Non-response and segregated Non survivors (HR = 0.80 (0.75-0.90), p < 0.05) in SAH patients. Validation of 5 lipid species using 5 machine learning algorithms in the validation cohort (n = 100; R = 80, NR = 20) showed accuracy (95%), sensitivity/specificity (98%) for NR detection in SAH.

Conclusion: Our data suggest that an increase in the number of activated regulatory T cells is associated with an improvement in the liver function of patients with severe alcoholic hepatitis after steroid therapy.

Financial Support: This work was performed by the Research Foundation of Internal Medicine, The Catholic University of Korea (S.K.L.). This work was also supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (No. 2021R1I1A1A01050954, S.K.L.). This work was also supported by the Research Fund of Seoul St. Mary’s Hospital, The Catholic University of Korea (P.S.S.).

FRI-411
In-silico identification and ex-vivo validation in humans of distinct oncogenic potential of aldo-keto reductase AKR1B10 in hepatocellular carcinoma from alcohol induced liver injury

Background and aims: Development of hepatocellular carcinoma (HCC) is complex. It is a major cause of cancer-related mortality with a minority diagnosed at an early stage. Chronic alcohol abuse, and hepatitis B and C viral (HBV and HCV) infections are major risk factors. However, pre-cancer alterations which also affect the prognosis are not well known. We aimed to investigate (i) the in-silico
transcriptional alterations among HCC patients induced by alcohol liver injury compared to those with hepatitis B and C, (ii) to identify the gene classifier for better prognosis of the disease and validate existing methods in human samples.

**Method:** We systematically interrogated The Cancer Genome Atlas (TCGA, n = 433) to search for genes that contribute to HCC. First, we compared the survival of HCC patients who had a history of alcohol abuse vs. Hepatitis B or C alone via Kaplan-Meier analysis. Next, we tested the differential gene expression utilizing dataset, GSE28619, containing healthy (n = 7) and alcohol associated cirrhosis (AAC, n = 15). Gene dysregulation was determined using the ‘characteristic direction method’ of the Enrichr algorithm. Using GEO database we performed a machine learning technique nearest-shrunken centroid analysis. Further, AKR1B10 expression was validated on human liver tissue from AAC (AAC, n = 5), hepatitis C related HCC (HCC–HCV, n = 5), alcohol cirrhosis related HCC (HCC-AC, n = 5) and normal tissue (control, n = 5) using immunohistochemistry (IHC).

**Results:** Patients with HCC due to chronic alcohol abuse had worse prognosis than patients with hepatitis B or C related infection (p = 0.011). Gene enrichment analysis showed 500 differentially expressed genes. The family of aldo-keto reductase (AKR) enzymes were statistically enriched in patients with alcohol associated hepatitis (AAH). Using machine learning, a singular gene classifier of AAH was identified as aldo–keto reductase AKR1B10. This is widely expressed in the gastrointestinal tract. However, it is virtually undetectable in normal liver tissue. Then we performed GSEx microarrays analysis between healthy and cirrhotic livers. AKR1B10 was the 5th most statistically upregulated gene. Further, we confirmed that AKR1B10 is upregulated in HCC using unbiased IHC samples from the Human Protein Atlas (Figure A). Additionally, AKR1B10 was an independent marker for poor patient survival in the large TCGA sample (n = 433). Importantly, in patients with HCC and an initial alpha fetoprotein (AFP) value of greater than 400, poor survival was associated with AKR1B10 expression (Figure B, red line). Alcohol associated HCC had higher AKR1B10 expression than those without a history of alcohol abuse (RR = 1.6, p = 0.0076, Figure C). We confirmed this in human tissue. There was no expression in controls and >2-fold increase in AAC. This was further increased in HCC–AC in contrast to minimal expression in HCC-HCV.

**Conclusion:** Alcohol associated HCC are more aggressive than viral hepatitis infected patients. We identified a novel classifier AKR1B10, as precancerous marker of alcohol induced liver injury, alcohol associated cirrhosis and HCC. Additionally, AKR1B10 prognosticated HCC. This promising marker provides a platform to understand mechanism of alcohol induced hepatocarcinogenesis and merits further validation.

---

**Figure:**

**Conclusion:** Alcohol associated HCC are more aggressive than viral hepatitis infected patients. We identified a novel classifier AKR1B10, as precancerous marker of alcohol induced liver injury, alcohol associated cirrhosis and HCC. Additionally, AKR1B10 prognosticated HCC. This promising marker provides a platform to understand mechanism of alcohol induced hepatocarcinogenesis and merits further validation.
infections or treatment for a severe infection. In this time frame, the level of serum bilirubin can change in both ways compared with the level at admission time. There is no clear recommendation about the specific moment when baseline data needs to be collected in order to calculate the Lille score.

Our aim is to determine how important is the time interval between admission and first day of corticosteroids in the dynamics of Lille score and to evaluate the accuracy of different scores to predict short term mortality.

Method: We retrospectively analysed all consecutive patients with a history of alcoholism, suggestive liver chemistry, biopsy proven AH, Maddrey score >32, treated with corticosteroids, were included between January 2016–December 2022. Biological data was recorded at admission (T0) and prospectively at day 1 (T1), day 7 (T7) of corticosteroid therapy. We excluded patients who didn’t receive corticosteroids because of uncontrolled infections, recent gastrointestinal hemorrhage. 40 mg Prednisone or 32 mg Methylprednisolone was given for 28 days for all patients.

Results: One hundred sixty-four patients were included, mean age was 52 ± 9, 76.4% were males. 89.1% were decompensated (ascites 83.6%, hepatic encephalopathy 35.2%), 32.1% had infection at admission, 98% had an AHHS score >3. Out of all patients, 81.0% responded to the corticotherapy treatment, assessed by Lille score at day 7. The survival of these patients was 77.6% at one month, 69.7% at three months, 42.7% overall. Out of all patients, one hundred had the blood analysis required to assess both the Lille T0 and Lille T1. There are no significantly differences regarding Meld score, Maddrey score and serum bilirubin at T0 compared to T1, p > 0.05. AUROC curve for survival at 1 month for Lille T0 was 0.84 ± 0.04 (95% CI: 0.74–0.93), Lille T1 0.85 ± 0.04 (95% CI: 0.75–0.93), Maddrey T0 0.73 ± 0.06 (95% CI: 0.61–0.85), Maddrey T1 0.76 ± 0.05 (95% CI: 0.68–0.87), Maddrey T0 0.62 ± 0.71 (95% CI: 0.48–0.76) and Maddrey T1 0.72 ± 0.06 (95% CI: 0.60–0.84). Lille T0 is significantly higher than Maddrey T0. AUROC for survival at 3 and 6 months is not significantly different between Lille T0 and Lille T1. Survival at one month in the group of patients who responded to corticotherapy according to Lille T1 was 83.0%, at three months 74.6% and at six months 72.4%. In comparison, the responders to Lille T0 survival at one month was 80.5%, at three months 72.2% and at six month 71.4%. The median follow-up duration was 13 months (varying between 0 and 78 months, range 78), 55% of the patients died at the end of the follow-up. Corticosteroids response assessed by Lille T1 predicts better overall survival than Lille T0, HR: 2.26 (95% CI: 1.19–4.29), p = 0.01, respectively HR: 2.03 (95% CI: 1.05–3.91), p = 0.03.

Conclusion: Therefore, our data showed that the time between admission and corticosteroid initiation does not significantly change the dynamic of Lille score and does not impact the prognostic and survival. However, further studies need to be done with larger number of patients.

FRI-414
Low doses of different hepatotoxins induce alcohol-related liver disease and drive hepatocellular carcinoma
Brisa Rodope Alarcón-Sánchez1,2, Osiris German Idelfonso García2, Verónica Rocío Vásquez-Garzón2, Pablo Muriel4, Julio Isabel Pérez-Carreón2, Saül Villa-Treviño3, Jaime Arellanes-Robledo1,5, 6Center for Research and Advanced Studies of the National Polytechnic Institute, Laboratory of Fibrosis and Cancer, Oaxaca, Mexico; 7National Institute of Genomic Medicine-INMEGEN, Laboratory of Liver Diseases, Mexico City, Mexico; 8Faculty of Medicine and Surgery, Benito Juárez Autonomous University of Oaxaca-UIABJO, Laboratory of Fibrosis and Cancer, Oaxaca, Mexico; 9Center for Research and Advanced Studies of the National Polytechnic Institute, Laboratory of Experimental Hepatology, Mexico City, Mexico; 10National Council of Science and Technology-CONACYT, Directorate of Cátedras, Mexico City, Mexico
Email: brisa.alacon@cinvestav.mx

Background and aims: Treatment of severe alcoholic hepatitis relies on corticosteroids. Lille score is used to identify patients with severe alcoholic hepatitis receiving corticosteroids, that respond or not to treatment. This model uses baseline data and the change in bilirubin level at day 7. However, many patients receive corticotherapy after several days of hospitalization because they need screening for...
Background and aims: Chronic alcohol abuse is one of the main causes of morbidity and mortality since promotes alcohol-related liver disease (ALD) worldwide. This condition may be attributed to multiple hits driving several liver alterations. Excessive ethanol intake promotes the production of reactive oxygen species (ROS) and increases both portal and systemic circulation of lipopolysaccharides (LPS), which exacerbate ROS and potentiate the liver damage. Since hepatocellular carcinoma (HCC) may be the late ALD stage, the synergistic effect of ethanol and diethylnitrosamine (DEN), a hepatic carcinogen, also has been tested. The aim of this work was to determine if the simultaneous administration of ethanol and low doses of LPS and DEN induces HCC as an in vivo multi-hit ALD model, as occurs in humans.

Method: C57BL/6J female mice were administered with ethanol and low doses of LPS and DEN. Firstly, after an ethanol adaptation period, mice were allowed to drink ad libitum a mixture of 20% (w/v) sucrose containing 20% ethanol for 18 weeks as the only source of drinking fluid, and DEN and LPS were dissolved in PBS and intraperitoneally injected twice a week. While DEN was administered at 7 mg/kg body weight (BW) for 15 weeks during ethanol consumption, LPS was administered at 1 mg/kg BW alongside the period of time of ethanol consumption. In addition to animals subjected to ethanol, LPS and DEN (ELD group), another group was administered with 20% sucrose as controls (C) or DEN plus 20% sucrose as DEN control (DEN). ELD groups were euthanized at 6, 9, 12, 15, 18 and 25 weeks; and C and DEN groups were euthanized at 18 and 25 weeks.

Results: We showed that ELD scheme interfered with BW gain and induced liver structural disarrangement, inflammatory infiltration, steatosis, and fibrosis, as illustrated in the figure (images from C, DEN and ELD groups treated for 18 weeks); which was accompanied by increased levels of the proliferation markers proliferating cell nuclear antigen (PCNA) and Ki-67, those of ethanol metabolism cytochrome P450 2E1 (CYP2E1) and alcohol dehydrogenase (ADH), that of hepatocarcinogenesis glutathione S-transferase P 1 (GSTP1), as well as, that of LPS-inducible myeloid differentiation primary response protein MyD88 (MVD88) and toll-like receptor 4 (TLR4), and that of inflammation interleukin-6 (IL6).

Conclusion: Considering that ALD progression naturally occurs as the result of combined effects of multiples hits, we provide evidence showing that the simultaneous administration of ethanol, and low doses of LPS and DEN exacerbates ALD-associated alterations by inducing more deleterious effects on the liver and HCC as compared with those induced by DEN alone. Thus, here we introduce a promising multi-hit ALD model to better recapitulate ALD-associated pathogenesis and eventually, to identify therapeutic targets for the treatment of ALD stages.
HNA1/HNA2 increases. However, the time at which the infused albumin (HMA) undergoes oxidative modification and changes in cognate circulating metabolites are not known. Our study aims to decipher the time dynamics of oxidized albumin and associated changes in the circulating metabolome in a rat model of ALD.

**Method**: ALD model was developed by feeding Lieber-DeCarli liquid diet (40% ethanol) to Long Evans rats for 28 weeks. Liver histology (ballooning, steatosis and neutrophil infiltration) and AST/ALT levels confirmed active ALD. HMA, in-vitro modified HNA1 and in-vitro modified HNA2 (2.5 g/kg) were injected intraperitoneally to the ALD rats (n = 3 each) at three time points: baseline, 24 hours and 48 hours. Plasma was collected at baseline, 5 minutes, 15 minutes, 30 minutes, 1 hour, 24 hours, 48 hours, 72 hours and post euthanasia. Oxidized albumin measurement and untargeted metabolomics was performed.

**Results**: At baseline (before injection), the ALD rats showed significant increase in HNA1 (42.61%) and HNA2 (24.99%). HMA infused ALD rats showed temporal increase in HMA levels (15%) (5 min to 72 hours) with a slight dip between 5 minutes and 1 hour. HNA1 levels decreased by 18% and there was no significant change in HNA2 levels. Untargeted metabolomics also showed temporal increase in histidine (anti-inflammatory), purine/pyrimidine, glutathione and pantotenate metabolism (p < 0.05) indicating the protective and anti-inflammatory activity of HMA. Interestingly, infusion of HNA1 to ALD rats showed significant temporal increase (5 minutes to 72 hours) in HNA2 (10% to 32%) with simultaneous decrease in the HMA (10%) levels suggesting that HNA1 infusion increases the irreversible oxidation of HMA/HNA1 to HNA2. Metabolomics also showed temporal increase in spermidine synthesis (pro-inflammatory polyamines), ammonia recycling and phosphatidylcholine synthesis (pro-apoptotic phospholipids) (p < 0.05) documenting the pro-inflammatory and pro-apoptotic activity of HMA. Unfortunately, HNA2 infused ALD rats died after 4 hours. We observed significant temporal increase of HNA2 (15%) (5 minutes to 4 hours) with significant and apparent decrease in HNA1 and HMA. Results of metabolomics analysis revealed an increase in fatty acid, amino-sugar, tryptophan, fructose, mannose and sphingolipid metabolism suggesting the increase of inflammatory metabolites in HNA2 infused ALD rats. The advanced oxidative state (AOS) of albumin was highest in HNA2 infused rats (p < 0.05).

**Conclusion**: Our results show that HMA infusion temporally decreases HNA1 levels with simultaneous increase in anti-inflammatory metabolites. HNA1/HNA2 infusion causes irreversible oxidation of albumin to HNA2 and increase in pro-inflammatory/pro-apoptotic metabolites in the circulation. Albumin modification time dynamics significantly correlate with their cognate plasma metabolism and could be used as putative indicators of increasing inflammation and severity over time.

**FRI-417**

Multi-omics analysis reveals the therapeutic effect and mechanism of the Chinese herbal JiGuCao capsule on acute alcoholic hepatitis in mice

Yue Chen1, Hening Chen1, Wenyjing Qi1, Xu Cao1, Ruijia Liu1, Zao Xiaobin1,2, Yong-an Ye1,3, 1Dongzhimen Hospital, Beijing University of Chinese Medicine, China; 2Key Laboratory of Chinese Internal Medicine of Ministry of Education and Beijing, Dongzhimen Hospital, Beijing University of Chinese Medicine, China; 3Institute of Liver Diseases, Beijing University of Chinese Medicine, China

Email: chen.yue123456@163.com

**Background and aims**: Alcoholic hepatitis (AH) is a kind of alcohol-related liver disease (ALD), caused by alcohol abuse, with high morbidity and mortality, which increases the risk of liver failure, liver cirrhosis and hepatocellular carcinoma, and the current treatment methods are still limited. Its pathogenesis is closely related to inflammatory response, intestinal mucosal permeability changes, bile acid circulation disorders, and other mechanisms. Traditional Chinese medicine (TCM) has shown a therapeutic effect to treat AH. JiGuCao capsule (JGC) is a commonly used marketed TCM for the treatment of acute and chronic hepatitis. However, the therapeutic effect and mechanism of JGC in the prevention and treatment of AH are still unclear and need further study.

**Method**: A mouse model of AH was established with 14 days of 5% (v/v) ethanol liquid diet and a single dose of 31.5% (v/v) ethanol liquid diet gavage (Figure A). At the same time, the treatment group was given by gavage of an aqueous solution of JGC. The therapeutic effect of JGC on AH was determined by serological analysis of liver function and histopathological examination of hematoxylin-eosin (HE) and oil red (OR) staining. At the same time, transcriptomics and non-target metabolomics of liver tissues, and 16S ribosomal DNA sequencing (16S seq) of gut microbiota were used to investigate the protective effects of JGC on AH. The differently expressed genes (DEGs) and differently expressed metabolites (DEMs) between the model and the JGC groups were screened out to perform further enrichment analyses including the Gene Ontology (GO) and the Kyoto Encyclopedia of Genes and Genomes (KEGG).

**Results**: Compared with the model group, the intervention of JGC reduced serum levels of alanine aminotransferase and aspartate aminotransferase (Figure B). In histology and pathology, HE and OR staining showed that ethanol exposure significantly increased the number of steatosis and necrotic cells in the liver of the model group, and a large number of fat vacuoles appeared. Meanwhile, the villi structure of the small intestine was scattered, the cells were shed, and the small intestinal glands were increased. Compared with the model group, JGC alleviated hepatic steatosis and restored the integrity of the intestinal structure (Figure C). The enrichment analyses of DEGs showed that JGC may affect KEGG pathways of Bile secretion, retinol metabolism, fatty acid degradation, Gastric cancer and GO pathway of cellular response to interferon-beta, response to cytokine, symbiont-containing vacuole membrane, endoplasmic reticulum membrane, GTPase activity, GTP binding (Figure D–F). The enrichment analyses of DEMs showed that JGC could regulate amino acid metabolism, protein digestion and absorption, and ABC transporter pathways (Figure H–J). And in the gut microbiota level, the results of 16S seq showed that at the genus level, the JGC treatment restored the content of norank_F_Muribaculaceae and Prevotellaceae_UCG-001 (Figure K–L).

**Conclusion**: Histopathological and multi-omics analysis studies showed that JGC could have good preventive and therapeutic effect on AH.It could restore the normal function of the gut-liver axis by regulating the transport of bile acids and the ecological structure of intestinal flora. And JGC could effectively alleviate liver inflammation, restore the liver and intestinal injury caused by alcohol.

**FRI-418**

Strategies are needed to support people with alcohol use disorder and alcohol-related liver disease to take part in randomised clinical trials: results from the MIRAGE pilot trial of functional imagery training

Ashwin Dhanda1,2, Victoria Allgar1, Jackie Andrade1, Lynne Callaghan1, Benjamin Hudson1, Wendy Ingram1, Angela King1, Victoria Lavers5, Joe Lomax1, Anne McCune1, Crispin Musicha1, Richard Parker4, Christopher Rollinson4, Siobhan Creanor8.
Background and aims: Treatment of alcohol use disorder (AUD) in people with alcohol-related liver disease (ARLD) reduces the risk of disease progression and mortality. However, there are no effective evidence-based therapies. Functional Imagery Training (FIT) is a novel therapy combining motivational interviewing techniques with imagery to strengthen motivation for behaviour change. We conducted a pilot trial of FIT to test whether people with AUD and ARLD could be recruited and retained in a trial and how well FIT could be delivered within the UK National Health Service (NHS).

Method: We conducted a multicentre randomised pilot trial of FIT with treatment as usual (TAU) versus TAU alone in patients with unplanned hospital admissions with AUD and ARLD. Primary outcomes were recruitment and retention rates. Secondary outcomes included self-reported alcohol use by timeline follow-back. Alcohol liaison nurses were trained to deliver FIT to participants who received the first session in hospital and a further 8 sessions over 6 months by phone. Follow-up of all participants was by phone for Days 28 and 90 and in-person at Day 180 (D180), the primary end point. To help retention, participants were asked to provide contact details for a nominated second person and offered a financial incentive at the final trial visit.

Results: Of 121 patients approached, 54 were recruited (45% recruitment rate) and randomised (TAU: 28; FIT+TAU: 26): mean (SD) age 49 (11), 63% male, 52% had cirrhosis with mean MELD 24 (5.5). Non-participation was mainly due to eligibility (n = 11), lack of interest (n = 17) and logistical challenges (n = 28). 14 (26%) participants were not retained to D180 due to death (n = 5) and withdrawal (n = 9). Of the remaining 40 participants, 23 (58%) attended the D180 visit. 9, 17 and 17 participants did not attend trial visits at Days 28, 90 and 180, respectively. Most alcohol liaison nurses delivered FIT with adequate fidelity. 50% of participants randomised to FIT+TAU received the first 2 sessions (considered an adequate dose of the intervention). Based on all available data, median alcohol use per week fell from 1568 g (range 788, 2128) pure ethanol at baseline to 0 g (0, 180) at D180 and from 1120 g (610, 1784) to 0 g (0, 196) in TAU and FIT+TAU groups, respectively.

Conclusion: This study demonstrates the importance and challenges of recruitment and retention. Although we showed that alcohol workers in the UK NHS could successfully deliver FIT to people with AUD and ARLD, low retention limited interpretation of clinical outcomes. The implemented retention plan was inadequate as participants frequently changed phone number or did not respond to calls. Robust strategies to support recruitment and retention of people with AUD and ARLD must be incorporated in future clinical trials to enable the evaluation of new interventions in this underserved patient population.

FRI-419
Supplementation of choline attenuates the onset of alcohol-related liver disease
Victor Sánchez1, Anja Baumann1, Franziska Kromm1, Annette Brandt1, Ina Bergheim1, 1University of Vienna, Department of Nutritional Sciences, Austria
Email: ina.bergheim@univie.ac.at

Background and aims: Alcohol-related liver disease (ALD) is still one of the most common liver diseases worldwide. Besides altering liver
metabolism due to its metabolism, chronic elevated ethanol intake has also been shown to be accompanied with alterations of intestinal microbiota composition and intestinal barrier dysfunction. Despite intense research efforts, molecular mechanisms involved in the damaging effects of ethanol on intestinal barrier function are not fully understood. Chronic alcohol intake has also been shown to be associated with alterations of choline metabolism in the liver. Here, we assessed the effects of an oral choline supplementation on the
Method: After an adaptation phase, female C57BL/6J mice (n = 8/group) were either pair-fed a liquid control diet (C), or a Lieber deCarli liquid diet (E, 5% ethanol) ± 2.7 g choline/kg diet for 29 days. Markers of liver damage and intestinal permeability were determined. Additionally, effects of choline on ethanol-induced intestinal permeability were assessed ex vivo in an everted tissue sac model.

Results: As expected, chronic intake of ethanol was associated with the development of liver steatosis and early signs of inflammation as determined by liver histology, number of neutrophils, NOx concentration in liver tissue and ALT activity in plasma (p < 0.05 for all parameters compared to C-fed mice). Supplementing the ethanol diet with choline significantly attenuated the development of ALD with markers of inflammation, steatosis, number of neutrophils and NOx concentration in the liver all being significantly lower in E + choline-fed mice compared to E-fed mice (p < 0.05). The protective effects of choline were associated with significantly lower permeability of small intestinal tissue. In line with the in vivo findings, choline also significantly attenuated the ethanol-induced intestinal barrier dysfunction in small intestinal everted tissue sacs ex vivo, while the concomitant treatment with a choline oxidase inhibitor (dimbutanol) almost completely abolished these protective effects of choline.

Conclusion: Our results indicate that an oral supplementation of choline may attenuate the development of ALD in mice and that this at least in part is related to a protection against ethanol-induced intestinal barrier dysfunction.

FRI-420
Increased concentration of 4-hydroxyphenyllactic acid in patients with alcohol-related liver disease could promote the growth of Lactobacillus spp

Background and aims: Alcoholic liver disease (ALD) is caused by excessive alcohol consumption. It is increasing in prevalence. ALD is a progressive disease that is dangerous and can eventually lead to death. However, no specific treatment has been found to date. In the past decade, studies on the microbiome and metabolites have been conducted to develop disease mechanisms and medicines. Therefore, in this study, to identify metabolites and microorganisms related to alcoholic liver disease metabolites and microorganisms from feces of patients with alcoholic liver disease and healthy subjects will be analyzed. In addition, the correlation between the metabolite and intestinal bacteria that identified in this study will be analyzed.

Method: Stools were sampled from 17 healthy subjects, 26 subjects with alcoholic hepatitis, 20 patients with alcoholic cirrhosis. Metabolites were analyzed using a Q-Exactive Plus Orbitrap-MS-connected Ultimate-3000 UPLC system. The obtained data were analyzed using Metaboanalyst 5.0. For analysis of microbiome, the Illumina MiSeq platform was used. The obtained data was analyzed using the comparative microbiome taxonomic profiling analyzer of EZBioCloud. Based on metabolite and microbiome data, Lactobacillus spp. were pre-cultured in RCM media and subcultured to same media containing 4-HPA or containing SDW. After 2 days, colony forming unit was assessed by smearing on RCM agar medium.

Results: As alcoholic liver disease progressed, 4-HPA was increased. The family Lactobacillaceae was elevated in the microbiome of liver disease patients identified as having this substance. On the other hand, no increase in Lactobacillaceae was observed in patients without an increase of 4-HPA. Co-cultured with 4-HPA and Lactobacillus spp. in vitro, colony forming units were increased compared to without 4HPA.

Conclusion: In this study, 4-HPA, a metabolite that is increased followed by the process of alcoholic liver disease, can increase the population of Lactobacillus spp. Research on the 4-HPA and correlation between the microbiome might be helpful to develop the mechanisms and treatments for alcoholic liver disease.
Conclusion: Compared to historical controls, GMA significantly improved overall survival at 180 days in patients with CS-non-responsive or CS-intolerant SAH. As GMA has already been applied to other diseases with good safety profiles, immediate needs may be met as a salvage therapy following CS. Further investigations are warranted.

FRI-422
Diabetes increases risk of mortality in alcohol-related liver disease
Mark Theodoreson1, Guruprasad Aithal2,3, Michael Allison4,5, Mayur Brahmania6,7, Ewan Forrest8, Hannes Hagström9, Alisa Likhitsup10,11, Steven Masson12, Anne McCune13, Neil Rajoriya14, Ian Rowe15, Richard Parker1. 1Leeds Teaching Hospitals NHS Trust.

Figure: (abstract: FRI-420): A, one-way ANOVA and post-hoc tests with 16 phenolic compounds. B, significantly increased compound among 16 phenolic compounds. C, partial least squares discriminant analysis with HC (healthy control), AH (alcoholic hepatitis), and AC (alcoholic cirrhosis or cancer). D, hierarchical clustering heatmaps between 16 phenolic compounds and human subjects. E and F, ACE diversity and phylogenetic diversity based on microbiome of HC (healthy control) without 4-HPA, HC (healthy control) with 4-HPA, MD (cirrhosis) without 4-HPA, MD with 4-HPA, and sever (more than cirrhosis) with 4-HPA. G, relative abundances of cecal microbiome at Family level in different experimental groups. H, colony forming units of Lactobacillus spp.
Background and aims: Diabetes Mellitus (DM) is a significant risk factor for metabolic associated fatty liver disease (MAFLD), and increases the risk of adverse outcomes. There have been multiple studies looking at the relationship between alcohol intake and the relative risk of developing diabetes, but few of these look specifically at individuals with cirrhosis. We used platform Rayyan® for the selection process, which was divided in a screening phase (evaluation of title/abstract) and an eligibility phase (full-text examination). Records were reviewed by four independent investigators divided in pairs. Data collection was performed by the same reviewers. The primary outcome was defined as percentage of alcohol abstinence (AA). Secondary outcomes were related to safety, amount of consumption and time to lapse/relapse. The meta-analysis was based on a random-effects model and heterogeneity was quantified using $I^2$.

Results: Seven hundred and four patients were included (median age 51.09 + standard error (SE) 0.44, 269 females, mean BMI 28.7, (range 16.3–48.9)). During follow-up there were 215 episodes of LACE and 407 patients died (n = 380; 54.0%) and 47 had a liver transplant. At baseline 106 patients had DM (15.1%), and 246 (34.9%) had at least one previous decompensation episode. Median follow-up was 1591.5 days + SE 872.8, during which a further 51 patients (7.24%) developed DM (total diabetes n = 157 [22%]).

In univariable analysis DM was a significant risk factor for all-cause mortality (HR 1.38, 1.01–1.89, p = 0.041) and for incident cardiovascular disease (HR 2.29, 1.33–2.94, p < 0.001), and associated with increased risk of LACE, although this did not reach statistical significance (HR 1.48, 0.96–2.27, p = 0.074). In multivariable analysis controlling for fibrosis stage, decompensation at baseline, obesity and abstinence, DM remained significantly associated with all-cause mortality (HR = 2.08, 1.41–3.05, p < 0.001).

Conclusion: DM is a frequent co-morbidity in persons with ArLD and is associated with a higher risk of mortality. Clinicians managing those with ArLD should actively review diabetic status and ensure adequate treatment as required.

Figure: Cox-proportional hazard regression with diabetes as time dependent variable.

Method: The WALDO study is an international multi-centre collaboration to gather a cohort of patients with biopsy proven ArLD and associated outcome data. The presence of DM at baseline or during follow-up was noted. Clinical events after index biopsy were noted in univariable analysis DM was a significant risk factor for all-cause mortality (HR 1.38, 1.01–2.94, p < 0.001), and associated with an overall increase in AA of 26% (risk ratio 1.13; I2 = 76%). With respect to safety, none of the studies reported higher incidence of severe adverse events in the treatment groups.

Figure: Random-effects model analysis of the relative risk of active alcohol consumption in patients with cirrhosis treated with pharmacological treatments for AUD or control therapy.
Conclusion: Pharmacological treatment for AUD in patients with cirrhosis increases the probability of AA by 26% and has a good safety profile. Further prospective, high-quality studies are needed to establish a robust recommendation for the use of these treatments in patients with liver disease.

FRI-424
Binge drinking acutely induces fatty liver with increased liver stiffness which is readily reversed
Kristoffer Kjærgaard1, Jeppe Yeoman1, Anne Catrine Daugaard Mikkelsen1, Peter Lykke Eriksen1, Emilie Eifer Møller1, Ann-Sophie Wietz1, Lars Gormsen1, Sara Heeboll1, Hendrik Vilstrup1, Karen Louise Thomsen1. 1Aarhus University Hospital, Department of Hepatology and Gastroenterology, Denmark; 2Aarhus University Hospital, Department of Nuclear Medicine and PET, Denmark; 3Aarhus University Hospital, Department of Endocrinology and Internal Medicine, Denmark
Email: krikje@clin.au.dk

Background and aims: Alcohol-related liver disease is the leading cause of liver-related morbidity and mortality worldwide. Excessive alcohol consumption in a short period of time, also known as ‘binge drinking’, is a highly prevalent modus of alcohol intake. Binge drinking is often considered particularly harmful, however, the immediate effects on the development of a fatty liver representing the earliest alcohol-related liver injury, are not well established. The aim of this study was to investigate the acute effects of binge drinking on the liver and reversibility.

Method: We performed a cohort study of healthy adults attending a three-day music festival in June 2022 with the intention to binge drink. The participants were examined before, the day after, and 10 days after the festival. The participants were alcohol abstinent one week prior to the first visit and between the two last. Each visit included Magnetic Resonance Imaging (MRI) with measurement of liver fat content (Proton Density Fat Fraction; MRI-PDFF), liver stiffness (MR Elastography), and blood samples. During the festival, the participants were monitored with breathalyzer blood alcohol concentrations and app-based self-reported alcohol and food intake.

Results: Fifteen participants (9 male, 6 female) aged 35 ± 5 years with a BMI of 23.4 ± 2.7 kg/m² completed the study. The participants consumed on average 18.6 ± 5.6 units (186 ± 56 g alcohol) per day. Binge drinking induced a 2.5-fold increase in the hepatic fat fraction from 1.9% (IQR 1.6%-2.5%) to 4.6% (IQR 2.4%-5.7%; p <0.0001) resulting in definitive steatosis (≥5%) in six participants. This was accompanied by an elevation of liver stiffness from 2.5 ± 0.3 kPa to 2.7 ± 0.3 kPa (p = 0.04). Also, binge drinking caused increased AST/ALT ratio and GGT, and a decrease in LDL-cholesterol. There was no change in plasma triglycerides or glucometabolic measurements. 10 days after binge drinking, all outcome measures were normalized.

Conclusion: In almost all of the healthy participants, a three-day bout of binge drinking caused unambiguous hepatic fat accumulation, which was accompanied by increased liver stiffness. This early alcohol liver injury was readily reversible upon only 10 days of alcohol abstinence. The study demonstrates a definite and potentially harmful fat accumulation in the liver caused by binge drinking. However, our findings imply that binge drinking is possibly not as dangerous as often assumed if binges are separated by a period of alcohol abstinence.

FRI-425
Disentangling the contributions of alcohol and alcohol-related liver disease towards dementia
Sixian Zhao1, Linnea Widman1, Hannes Hagström1, Ying Shang1. 1Karolinska Institutet, Sweden
Email: ying.shang@ki.se

Background and aims: Previous studies have shown an association between alcohol use disorder (AUD) and dementia. However, both alcohol itself and alcohol-related liver disease (ALD) can have detrimental impacts on the brain, yet the relative weights of their contributions remain unknown. We aimed to disentangle the contributions of alcohol and ALD towards dementia by independently assessing the association between AUD alone or combined with ALD, and dementia.

Method: We identified patients with ALD or AUD from the DELIVER dataset, an ongoing nationwide register-based cohort including all patients diagnosed with chronic liver disease and up to ten matched controls from the general population in Sweden between 1987 and 2020. Three groups were identified through the linkage to the National Patient Register (NPR): AUD alone, ALD with co-existing AUD, and controls without any of these two diseases. The NPR and the Cause of Death Register were used to identify diagnoses of dementia. Cox regression models were used to assess the associations between AUD alone, or ALD, with dementia and dementia subtypes. Cumulative incidences were calculated accounting for competing risks of death.

Results: 128,884 individuals with AUD alone, 17,754 with ALD and 2,479,049 controls were identified. During a median follow-up of 8.9 years, 13,395 (10.4%), 2,187 (12.3%), and 138,925 (5.6%) dementia cases were identified in these groups. This translated into an increased dementia rate in the AUD alone group (adjusted HR [aHR] = 4.6, 95% CI 4.5–4.6), and a greater rate was observed in the ALD group (aHR = 8.6, 8.3–9.0) compared to the controls. AUD alone was also associated with a significantly increased rate of vascular (aHR = 2.3, 2.2–2.5) and Alzheimer’s dementia (aHR = 1.4, 1.3–1.4), while ALD was associated with an increased rate of vascular (aHR = 2.7, 2.3–3.2) but not with Alzheimer’s dementia (aHR = 0.9, 0.7–1.2). On average, the age at dementia diagnosis was younger in patients with AUD alone (67 years, IQR 56–76) and ALD (63 years, IQR 56–71) compared to controls (85 years, IQR 79–89). After stratifying by age at baseline, both AUD alone and ALD had disproportionately increased rates of dementia in the younger <40 yrs and 45–65 yrs groups. Both AUD and ALD had higher cumulative incidences of dementia, but not Alzheimer’s or vascular dementia (Figure).
FRI-426
Nucleoredoxin-dependent functioning is dysregulated by chronic alcohol consumption and is associated with the establishment of cellular senescence in the liver of aged mice

Osiris German Idelfonso García1,2, Brisa Rodope Alarcón-Sánchez1,3, Verónica Rocío Vásquez-Garzón4,5, Saúl Villa-Treviño5, Pablo Muriel6, Héctor Serrano2, Julio Isael Pérez-Garreón1, Jaime Arellanes-Robledo1,5, 1National Institute of Genomic Medicine-INMEGEN, Mexico; 2Metropolitan Autonomous University-Iztapalapa Campus, Department of Health Sciences, Mexico; 3Center for Research and Advanced Studies of the National Polytechnic Institute–CINVESTAV-IPN, Department of Cell Biology, Mexico; 4Faculty of Medicine and Surgery, Benito Juárez Autonomous University of Oaxaca-UABJO, Mexico; 5National Council of Science and Technology–CONACYT, Mexico; 6Center for Research and Advanced Studies of the National Polytechnic Institute–CINVESTAV-IPN, Department of Pharmacology, Mexico

Email: oidelfonso@inmegen.edu.mx

Background and aims: Aging, a natural process associated with abnormal oxidative stress production, involves several cellular and molecular changes that ultimately compromise the well-functioning of organs and systems in multicellular complex organisms. Aging is associated with a progressive and generalized deterioration of cellular functions, e.g., liver function is declined and involves alterations in hepatic structure, and function, thereby leading to the development of age-related liver disease. Aging also declines the liver metabolic capability and as a consequence, the efficiency to eliminate toxic agents is significantly decreased. These alterations are closely related with an increased production of reactive oxygen species (ROS) which is exacerbated by the chronic alcohol consumption; however, the underlying mechanisms had not been clarified. Nucleoredoxin (NXN) is both an oxidoreductase that targets ROS and a redox-sensitive enzyme that regulates key cellular processes trough redox protein–protein interactions; however, the role of NXN during aging has not been investigated. Here, we aimed to determine the involvement of NXN in alcoholic liver disease (ALD) during aging in the mouse liver.

Method: ALD was recapitulated in 7-week-old (young) C57BL/6J female mice, 12-month-old (adult) and 18-month-old (aged) by the chronic ethanol consumption (20%) in 20% of sucrose for eight weeks and a single dose of lipopolysaccharide (1 mg/kg). We evaluated histological and cellular alterations, cellular senescence markers, NXN protein level and NXN-dependent protein–protein interaction status, as well as, the gene expression profile changes.

Results: During aging, chronic alcohol consumption exacerbated liver structural disarrangement, steatosis and inflammatory infiltration which was accompanied by increased levels of proliferation markers namely proliferating cell nuclear antigen (PCNA) and Ki67, as well as, cellular senescence markers such as senescence-associated beta-galactosidase, H2AX, Poly ADP ribose and interleukin 6. Interestingly, the level of oxidized proteins was significantly increased, and protein level of NXN and that of its interacting proteins FLII, MYD88, DVL and PP2A were also modified; as well as, the ratio of NXN/FLII interaction complex was significantly disrupted by the chronic alcohol consumption during aging. A RNA-seq analysis revealed that chronic alcohol consumption modified the expression of genes related with cell cycle arrest, oxidative stress regulator, induction of cellular senescence and lipid metabolism in aged mice.

Conclusion: Our results indicate that chronic alcohol consumption exacerbates both the structural and physiological damage, as well as, the cell proliferation and senescence in aged livers. Of note, the level of NXN redox-sensitive enzyme was decreased in the liver of mice subjected to ALD model during aging, but more interestingly, the interaction ratio of NXN-regulated proteins such as FLII was modified, likely, due to the increased protein oxidation induced by the ALD model. Thus, this evidence strongly suggests that ROS produced by the chronic alcohol consumption oxidize proteins and sensitize the liver cells and as a result, the NXN-dependent regulation is altered, a phenomenon that might accelerate the establishment of cellular senescence in the liver of aged mice.

FRI-427
Risk of alcohol-related liver disease in offspring of individuals with alcohol-related liver disease: a nationwide cohort study in Denmark

Peter Jepsen1, Colin Crooks2, Joanne Morling2, Frederik Kraglund1, Anna Emilie Kann3, Joe West2, Gro Askgaard1, 1Aarhus Universitetshospital, Aarhus, Denmark; 2University of Nottingham, United Kingdom; 3Zealand University Hospital, Konge, Denmark

Email: gask@dadle.net.dk

Background and aims: Offspring of individuals with alcohol-related liver disease (ALD) may have an increased risk of ALD and therefore be potential candidates for screening for liver fibrosis. We compared the risk of ALD and the survival after ALD diagnosis in offspring of individuals with ALD to that of matched controls.

Method: We used nationwide healthcare registries to identify offspring of individuals diagnosed with ALD (ICD-10: K70.x) in Denmark from 1996 to 2018 and age- and gender-matched controls (20:1). Offspring and controls were followed for ALD diagnosis through 2018. We used landmark competing risk analyses to estimate the 10-year absolute and relative risk of ALD according to current age. To compare survival from ALD diagnosis between offspring and controls who developed ALD, we used Cox regression with adjustment for confounders of gender, age, and calendar year of ALD diagnosis.

Results: During the follow-up, ALD was diagnosed in 385 of 60,708 offspring and 2838 of 1,213,380 controls with an incidence rate ratio of 3.0 (95% CI 2.4–3.0). Offspring were slightly younger than controls at the time of ALD diagnosis (median age of 47 vs. 49 years) and the proportion who had cirrhosis at ALD diagnosis was similar in offspring and controls (57% vs. 56%). The 10-year absolute risk of ALD increased for confounders of gender, age, and calendar year of ALD diagnosis.

Discussion: During aging, chronic alcohol consumption exacerbated liver structural disarrangement, steatosis and inflammatory infiltration which was accompanied by increased levels of proliferation markers namely proliferating cell nuclear antigen (PCNA) and Ki67, as well as, cellular senescence markers such as senescence-associated beta-galactosidase, H2AX, Poly ADP ribose and interleukin 6. Interestingly, the level of oxidized proteins was significantly increased, and protein level of NXN and that of its interacting proteins FLII, MYD88, DVL and PP2A were also modified; as well as, the ratio of NXN/FLII interaction complex was significantly disrupted by the chronic alcohol consumption during aging. A RNA-seq analysis revealed that chronic alcohol consumption modified the expression of genes related with cell cycle arrest, oxidative stress regulator, induction of cellular senescence and lipid metabolism in aged mice.
Results: Among 36,349 respondents, 479 were with ALD (mean age 45, 70% male, 73% non-Hispanic White). The prevalence of ALD was stable throughout (1999–2002: 1.4% [95%CI 1.1–1.8%]; 2015–2018: 1.4% [95%CI 1.0–1.8%]). The prevalence of MetS among ALD increased (1999–2002: 36.4% [95%CI 27.7–46.1%]; 2015–2018: 52.7% [95%CI 38.6–66.3%]) vs. non-ALD (1999–2002: 30.4% [95%CI 28.6–32.2%]; 2015–2018: 40.4% [95%CI 38.0–42.9%]). Increases in MetS among ALD were observed among all demographic subgroups (age, sex, race) (Figure). Increases in MetS were driven by increases in high waist circumference, hypertension, and diabetes, not hypertriglyceridemia or low HDL. The prevalence of ALD with high FIB-4 increased significantly (1999–2002: 0.08% [95%CI 0.03–0.2%]; 2015–2018: 0.25% [95%CI 0.14–0.45%]; absolute difference: +0.17% [95%CI +0.005 to +0.34%] p = 0.04), but was stable when excluding ALD with MetS (1999–2002: 0.06% [95%CI 0.02–0.19%]; 2015–2018: 0.10% [95%CI 0.03–0.28%]; absolute difference: +0.04% [95%CI −0.08 to +0.17%] p = 0.52). In multivariable regression, ALD was associated with female sex (aOR 1.73, p = 0.004), increasing alcohol use (aOR 1.97 per +10 g/day, p < 0.001), and MetS (aOR 1.93, p < 0.001). The association between ALD and alcohol use was 27% higher among those with MetS (interaction p < 0.001).

Conclusion: Between 1999–2018, while the national prevalence of ALD has been stable, the prevalence of ALD with advanced fibrosis has increased significantly, which was no longer apparent when cases with concomitant MetS were excluded. Thus, the rise in MetS among ALD may be an important contributor to the surge in ALD-related mortality observed in the last decade. Interventions to screen and treat MetS among patients with ALD may be relevant to clinicians and policymakers addressing the ALD epidemic.
recorded in 19,363 (29.4%) patients. Alcohol rehabilitation ≥ 1 month after alcoholic hepatitis was associated with death or liver transplantation (p < 0.001 with the log-rank test, see Figure). Alcohol rehabilitation [aHR 0.73, (95% CI 0.70, 0.77) p < 0.001] and liver disease progression to a liver-related complication [aHR 2.14, (95% CI 1.61, 2.84) p < 0.001] were protective and risk factors for death or liver transplantation, respectively.

Figure: (abstract: FRI-428).

Conclusion: Alcohol rehabilitation is the most critical clinical intervention to reduce mortality or liver transplantation from 1 month after alcoholic hepatitis. Currently only ~10% of patients have access to this treatment in France.

FRI-430
The role of HSD17B13 and MBOAT7 during alcohol detoxification: different effects on fibrosis and inflammation
Johannes Mueller1, Vanessa Rausch1, Philipp Brosi2, Sascha Müller2, Peter Studer2, Mathias Worni2, Felix Sticker1,2, Sebastian Mueller1,2.
1University of Heidelberg, Center for Alcohol Research, Germany; 2Viscera AG, Bern, Switzerland; 3University Hospital Zürich, Department of Gastroenterology and Hepatology, Switzerland
Email: sebastian.mueller@urz.uni-heidelberg.de

Background and aims: In genome wide association studies PNPLA3, MBOAT7, TM6SF2 and HSD17B13 were identified as important risk genes for the development of alcohol-related cirrhosis, however, their functions and molecular mechanisms are still incompletely understood. We here present first data on the role of these genotypes on liver stiffness (LS), steatosis (CAP) and inflammation during alcohol withdrawal.

Method: Patients with alcohol use disorders and heavy active alcohol consumption (n = 550) hospitalized for alcohol withdrawal were prospectively enrolled and genotyped for PNPLA3 rs738409, MBOAT7 rs626283, TM6SF2 rs58542926 and HSD17B13 rs72613567 variants. The Hardy-Weinberg-equilibrium was fulfilled for all loci. All patients had routine laboratory, abdominal ultrasound and measurement of liver stiffness (LS) and hepatic steatosis by controlled attenuation parameter (CAP) both using FibroScan platform (Echosens, Paris) at admission. For 415 patients, additional follow-up data after 6.3 days of alcohol withdrawal were available for analysis.

Results: Patients were predominantly male (72%), with a mean age of 51 (±12) years, mean BMI of 25.3 kg/m2 and mean alcohol consumption of 199 (±147) g/day. At admission, no difference between the genotypes of the four genes was seen regarding age, BMI, gender, alcohol consumption or serum transaminase levels. Subjects with MBOAT7 CC genotype had significantly higher LS values than those with the GG variant (22.5 kPa vs 10.4 kPa, p < 0.0001). The HSD17B13 TA/TA variant had non-significantly lower levels of AST and LS. After detoxification, PNPLA3 GG had significantly higher inflammation as reflected by higher AST levels (p < 0.05) and more steatosis (CAP 320 vs 280 dB/m, p < 0.01). MBOAT7 CC carriers had significantly higher LS measurements (15 vs 9 kPa). HSD17B13 TA/TA had significantly less inflammation (AST 69 vs 125 U/L) and lower LS (7 vs 12 kPa). The results were confirmed in a multivariate model using values after withdrawal. HSD17B13 T and PNPLA3 G alleles were
associated with increased inflammation (AST >50 U/L) (OR = 0.53, p < 0.001 and OR = 1.33, p = 0.08, respectively). Best association with steatosis (Cav >250 dB/m) was seen for PNPLA3 G (OR = 1.39, p = 0.09). HSD17B13 T and MBOAT7 C were both significantly associated with elevated LS (LS >6 kPa) (OR = 0.57, p < 0.001 and OR = 1.41, p < 0.05, respectively). No associations were seen for TM6SF2.

Conclusion: We found important differences between the studied genes during the alcohol detoxification phase. The PNPLA3 G allele seems to be associated with steatosis and inflammation. The MBOAT7 C allele seems to affect fibrosis without inflammation while HSD17B13 TA appears to be protective against inflammation and fibrosis.

FRI-431

Patients with alcohol-related cirrhosis who recompensate on follow-up have a characteristic metabolic profile with differential concentrations of lipid and amino-acid metabolites

Helena Hernández-Èvole1, Jordi Gratacos 1, Emma Avitabile 1, Juanjo Lozano2, Martina Perez 1, Julia Sidorova 2, Alex Guillamon Thiery3, Adria Juanola1, Anna Soria1, Isabel Graupera1, Ana Belén Rubio1, Marta Cervera1, Marta Carol1, Núria Fabrellas4, Pere Ginès1,4, Elisa Pose1, 1Hospital Clínica de Barcelona, Liver Unit, Barcelona, Spain; 2Centro de investigación Biomédica en Red | Enfermedades Hepáticas y Digestivas, Spain; 3Facultat de Medicina-Universitat de Barcelona, Barcelona, Spain; 4Institut d’Investigacions Biomèdiques August Pi i Sunyer (IDIBAPS), Barcelona, Spain

Email: hernandez.ievole@gmail.com

Background and aims: A notable proportion of patients with alcohol-related decompensated cirrhosis will experience resolution of clinical decompensations, which is a relevant phenomenon for prognosis of this population. The mechanisms and metabolic pathways involved in the recompensation of alcohol-related cirrhosis (ArC) are unknown. The aim of this study was to define the metabolic profile of patients with ArC that will recompensate in the follow-up.

Method: Patients with ArC were selected from a prospective cohort collected between 2016 and 2020 and classified into 4 groups: 0) patients compensated at inclusion and during follow-up, 1) decompensated at inclusion but with subsequent recompensation, 2) decompensated at inclusion and during follow-up and 3) decompensated at inclusion who died the first 3 months of follow-up. Recompensation was defined as the absence of clinical decompensation without requiring specific treatment for ascites or encephalopathy during the year prior to the end of follow-up. Plasma samples were analyzed at baseline for metabolomic profile assessment by high-performance liquid chromatography-tandem mass spectroscopy.

Results: 63 patients with ArC were included: 18 in group 0, 15 in group 1, 15 in group 2 and 15 in group 3. Groups were comparable in terms of age and sex. Baseline MELD score was 8, 17, 16 and 27, respectively. Regarding alcohol follow-up, 11/18 (61%), 7/15 (47%) and 3/15 (20%) patients maintained abstinence at follow-up (p = 0.04). Median follow-up was similar between groups 1 and 2 (3.5 and 3.3 years). Patients in the 4 groups presented a differentiated metabolic profile. When comparing group 1 and 2 (recompensated vs. decompensated patients) different concentrations in 32 metabolites were identified: 20 lipids were at higher concentrations in recompensated patients: 12 polyunsaturated fatty acids (docosahenoic acid and docosapenanoic acid at concentrations 2.1 and 2.6 times higher (p <0.05)) and 7 acylcarnitine and acylcholine metabolism compounds; 7 amino acids, including phenyl-lactate (3.1 times lower concentrations in the recompensated group (p = 0.04)); and 5 vitamins.

Conclusion: Patients who were recompensated at follow-up presented a differentiated metabolic regarding compounds involved in the metabolism of polyunsaturated fatty acids, acylcarnitines and amino acids such as phenyl-lactate. It is likely, therefore, that these metabolic pathways play a role in the recompensation of ArC.

FRI-432

A cost-comparison of the LiverPRO score with FIB-4, ELF, and FibroScan in 6,032 study participants

Katrine Prier Lindvig1,2,3, Maria Kjaergaard1,2, Katrine Thorhauge1,2, Ellen Jensen1,2, Johanne Krag Hansen1,2, Camilla Dalby Hansen1,2, Stine Johansen1,2, Mads Israelson1,2, Peter Andersen1, Nikolaj Torp1,2, Helle Lindholm Schnfeld1,2, Sönke Detlefson3,5, Mathias Posselt5, Nanna Kastrup6, Taus Holtug3, Aleksander Kraig1,2, Maja Thiele1,2, 1Odense University Hospital, Department of Gastroenterology and Hepatology, Odense C, Denmark; 2University of Southern Denmark, Institute of Clinical Research, Odense C, Denmark; 3Evido, Taastrup, Denmark; 4Odense University Hospital, Department of Pathology, Odense C, Denmark; 5University of Southern Denmark, Department of Clinical Research, Faculty of Health Sciences, Denmark; 6Zealth, Copenhagen, Denmark; 7Aalborg University, Danish Center for Healthcare Improvements, Aalborg, Denmark

Email: katrine.prier.lindvig@rsyd.dk

Background and aims: Fatty liver disease is an increasing burden to the healthcare system. A key challenge is that most patients go undetected until the disease reaches its end stage. Therefore, an urgent need for cost-effective referral pathway from primary to secondary care is needed. LiverPRO is a diagnostic prediction model for liver fibrosis developed for primary care based on routine blood samples. We aimed to perform a cost analysis to assess the short-term
compared to the other pathways. Consisting of LiverPRO followed by FibroScan has the lowest cost per patient when diagnosing significant fibrosis (≥F2) was a) 65%, b) 96%, c) 95%, respectively (Figure). For advanced fibrosis (≥F3) was a) 97%, b) 96%, c) 95%, and d) 99%, respectively. According to the pathway, the mean cost per test was: a) €21 per test, b) €7 per test, c) €253 per test, targeting the identification of significant fibrosis (≥F2), defined as TE>8 kPa. Costs for missed cases are not included. We reported the results as mean cost per patient on each pathway.

Results: This cost analysis is based on a study with 6,032 participants screened for chronic liver disease. Here, 48% were male, and the median age was 57 years (52–63 IQR). 30% were at risk of ArLD, 44% of NAFLD and 26% had no risk factors. The four pathways correctly classified patients according to the risk of significant fibrosis (≥F2, defined as TE>8 kPa); a) at 65%, b) at 85%, c) at 93%, and d) at 95%, respectively (Figure). For advanced fibrosis (≥F3, defined as TE>12 kPa) the pathways correctly classified: a) 65%, b) 96%, c) 95%, and d) 99%, respectively. According to the pathway, the mean cost per patient when diagnosing significant fibrosis (≥F2) was a) €97 b) €103 c) €36, and d) €38 for the four pathways, respectively. The pathway c) consisting of LiverPRO followed by FibroScan has the lowest cost compared to the other pathways.

Figure:

Conclusion: This cost analysis shows that using LiverPRO followed by FibroScan has the lowest cost compared to other pathways including FIB-4 and ELF. At the same time, LiverPRO followed by FibroScan correctly classifies 93% of patients with significant fibrosis. This is a notable increase compared to the pathways using FIB-4 and ELF as the initial tests.

FRI-433

Alcohol use disorder in patients undergoing bariatric surgery is associated with a worse prognosis

Edilmar Alvarado-Tapia1,2,3,4, David Marti-Aguado2,5, Concepción Gómez2,5, Claudia Pujol1,4, Ana Brujats1,4, Rubén Osuna-Gómez2, Albert Guinart-Cuadra4, Josepmaria Argemí2,3,6, Carlos Fernández-Carrillo2,7, Meritxell Ventura Cots2,3,8, Dalia Morales Arrea2,9, Ana Clemente4,10, Ángels Escorsell1,3, Cándid Villanueva1,3, Ramon Bataller2,3,11

1Barcelona, Department of Gastroenterology, Hospital Sant Pau, Institut de Recerca Sant Pau, Universitat Autònoma de Barcelona, Barcelona, Spain; 2Pittsburgh, Center for Liver Diseases, Division of Gastroenterology, Hepatology and Nutrition, Pittsburgh Liver Research Center, University of Pittsburgh Medical Center, Pittsburgh, PA, United States; 3Madrid, Centro de Investigación Biomédica en Red de Enfermedades Hepáticas y Digestivas (CIBERehd), Instituto de Salud Carlos III, Madrid, Spain; 4Barcelona, Inflammatory Diseases, Institut de Recerca de l’Hospital de la Santa Creu i Sant Pau, Biomedical Research Institute Sant Pau (IIB Sant Pau), Barcelona, Spain; 5Valencia, Digestive Disease Department, Clinic University Hospital, Biomedical Research Institute INCLIVA, Valencia, Spain; 6Pamplona, Liver Unit, Clinica Universidad de Navarra (CUN), Hepatology Program, Centro de Investigacion Medica Aplicada (CIMA), Instituto de Investigacion de Navarra (IdiSNA), University of Navarra, Pamplona, Spain; 7Barcelona, Liver Unit, Hospital Universitari Vall d’Hebron, Vall d’Hebron Institute of Research (VHRI), Universitat Autònoma de Barcelona, Barcelona, Spain; 8Tenerife, Department of Gastroenterology, Hospital Universitario de Canarias, Tenerife, Spain; 9Madrid, Liver Unit, Department of Digestive Diseases, Hospital General Universitario Gregorio Marañón, Madrid, Spain; 10Barcelona, Hospital Clinic de Barcelona, Universidad de Barcelona, Liver Disease department, Barcelona, Spain

Email: ealvaradot@santpau.cat

Background and aims: Alcohol use disorder has been described in patients undergoing bariatric surgery, but its impact on long-term outcomes is unknown. The aim of this study is to evaluate the prevalence, associated factors, and clinical impact of AUD prior to bariatric surgery.

Method: Prospective study of patients undergoing bariatric surgery and included in the LABS-2 (Long-term effect of Bariatric Surgery) registry. The study cohort was completed at 10 hospitals in the United States between 2006 and 2009 (Coordinated by University of Pittsburgh: ClinicalTrials.gov: NCT00465829). All cases with AUD performed prior to surgery and at least 7 years of follow-up after the bariatric procedure were included. AUD was defined as an AUDIT score ≥8 points. Cases with liver biopsy were histologically evaluated with the NASH-CRN system and Scheuer score to grade iron deposits. Survival analysis was performed with Kaplan-Meier curves and Cox regression adjusted for age, sex, BMI, smoking, diabetes, and cardiovascular events.

Results: A total of 2,271 patients were included (71% Y-De Roux, 25% gastric band, 4% other procedures), of which 16% had AUD prior to surgery. The factors associated with AUD were female gender (72.8% vs 27.2%; p = 0.006), age (40 ± 11 vs. 47 ± 11 years; p < 0.001), smoking (4.8% vs. 2.1%; p = 0.005) and the consumption of other drugs (15% vs. 4%; p < 0.001). Patients without AUD had higher prevalence of metabolic syndrome (57.1% vs. 44.1%; p < 0.001), arterial hypertension (73.4% vs. 60.3%; p < 0.001), diabetes (37.4% vs. 21.2%; p < 0.001), dyslipidemia (38.6% vs. 26.4%; p < 0.001), and cardiovascular events (10% vs. 5.1%; p = 0.003). Liver biopsy was performed in 286 subjects, 42% of whom had AUD. Patients with AUD had higher iron stores (41.7% vs. 22.6%; p = 0.02), with no differences in the presence of significant fibrosis (15.2% vs. 24.6%; p = 0.17) and steatohepatitis (41.7% vs. 22.6%; p = 0.02), with no differences in the presence of significant fibrosis (15.2% vs. 24.6%; p = 0.17) and steatohepatitis (41.7% vs. 22.6%; p = 0.02). Cases with AUD had a higher risk of mortality during follow-up (4.5% vs. 2.4%; log rank p = 0.026 (Figure 1). The factors associated with lower survival in Cox regression were: AUD (HR: 2.90 [95%CI 1.59–5.29] p < 0.001), age (HR: 1.04 [95%CI 1.01–1.07] p = 0.002), diabetes (HR: 2.22 [95%CI 1.30–3.79] p = 0.003), and BMI (HR: 1.03 [95%CI 1.01–1.06] p = 0.001).
Background and aims: Alcohol-related hepatitis (AH) and alcohol-related cirrhosis are grave conditions with poor prognoses. Altered hepatic lipid metabolism may differentiate between different alcohol-related liver diseases. Therefore, assessment of individual lipidomic and/or metabolomic factors might help to predict short-term mortality. We aimed to investigate the influence of lipidomics and metabolomics on different stages of alcohol-related liver diseases and their impact on survival.

Method: Patients with newly diagnosed alcohol-related cirrhosis with current alcohol use (ALC-A), alcohol-related cirrhosis without current alcohol use (ALC) and AH were compared to each other and to liver-healthy individuals (HC). Circulating lipids and metabolites were analysed using high-performance liquid chromatography and mass spectrometry detection. Concentrations were measured as relative values compared to HC.

Results: Plasma samples from 207 patients were analysed; 40 patients with ALC; 95 patients with ALC-A; 30 patients with AH; and 42 HC. Lipidomics showed significant differences among patient groups and the healthy controls; most lipids decreased in patients compared to healthy. Nine of ten analysed free fatty acids differentiated the cirrhosis groups by increases with a relative change of 19.73 in the ALC group, 31.29 in the ALC-A group and 80.38 in the AH group compared to HC (all p values <0.0001). Low sphingolipid (d42:1) and (d41:1) levels in the three patient groups had a high accuracy in predicting 90 days mortality (AUC = 0.922, 0.893; p = 0.007, 0.008) and performed better than MELD score (AUC = 0.700, p = 0.19).

Conclusion: Lipidomics classes decrease between stages of alcohol-related liver disease, and low sphingolipid levels predict poor prognosis.

FRI-435
Cause-specific mortality in patients with alcohol-related liver disease: a nationwide Danish cohort study

Anna Emilie Kann1,2,3, Peter Jepsen2, Lone Madsen1, Joe West4,5, Gro Askggaard1,2, 4, Zealand University Hospital, Section of Gastroenterology and Hepatology, Konge, Denmark; 2Aarhus University Hospital, Department of Hepatology and Gastroenterology, Aarhus, Denmark; 3Bispedjerg and Frederiksberg Hospital, Center for Clinical Research and Prevention, Frederiksberg, Denmark; 4Nottingham University Hospitals NHS Trust and the University of Nottingham, NIHR Nottingham Biomedical Research Centre (BRC), United Kingdom; 5University of Nottingham, Population and Lifespan Sciences, United Kingdom

Background and aims: Knowledge of the pattern of causes of death is essential to prevent premature death in alcohol-related liver disease (ALD). We examined cause-specific mortality, including death due to specific cancers, in 15 years after diagnosis of ALD.

Method: We used the nationwide health registries to identify individuals diagnosed with ALD from 2002 to 2017 in Denmark and followed them for the underlying cause of death through 2019. We calculated the cause-specific mortality and investigated whether the pattern of cause-specific mortality differed by age (<60 and >60 years), gender, and ALD stage at diagnosis (cirrhotic and non-cirrhotic).

Results: The study included 23,385 individuals newly diagnosed with ALD with a median age of 58 years; 68% were men, and 64% had cirrhosis. During 110,322 person-years of follow-up, 15,692 (67%) died. Liver disease (Figure 1, red area) was the leading cause of death during the first five years after ALD diagnosis, and 26.0% (95% CI 25.5–26.6%) of patients died from liver disease within five years. Beyond five years of ALD diagnosis, cancer (orange and yellow area), alcohol abuse disorder (green area), and cardiovascular disease (blue area) became more important. The 10-year risk of death from cancer other than hepatocellular carcinoma (HCC) (orange area) was 8.5% (95% CI: 8.1–8.9%). HCC (yellow area) was the dominant cause of cancer death, followed by lung cancer, with 10-year risks of 2.5% (95% CI: 2.3–2.7%) and 19% (95% CI: 1.7–21.1%), respectively. Alcohol abuse disorder (green area) continued to cause death even many years after ALD diagnosis, with a 10-year risk of 5.6% (95% CI: 5.3–6.0). Death due to liver disease was similar according to age and gender but lower for those diagnosed with non-cirrhotic rather than cirrhotic ALD (10-year risk of death due to liver disease of 20.2% vs. 38.4%). Individuals aged >60 years were more likely to die due to extrahepatic causes.
compared to younger individuals (10-year risk of death due to extrahepatic causes of 48% vs. 32%).

Conclusion: In the first five years after the ALD diagnosis, liver disease caused the majority of deaths. Beyond five years, death caused by cancer, alcohol abuse disorder, and cardiovascular disease rose. The figure shows that liver disease is the leading cause of death in the first five years after diagnosis. Beyond five years, deaths due to cancer, alcohol abuse disorder, and cardiovascular disease rose.

Figure: The cumulative risk of cause-specific death according to time since diagnosis of alcohol-related liver disease from 2002 to 2017 in Denmark, n = 23,385. Each color represents an underlying cause of death. The figure shows that liver disease is the leading cause of death in the first five years after diagnosis. Beyond five years, deaths due to cancer, alcohol abuse disorder, and cardiovascular disease rose.

FRI-436
Risk of primary liver cancer in alcohol-related cirrhosis-Danish and English cohort studies

Morten Daniel Jensen1, Joe West1,2,3, Peter Jepsen1,2, Aarhus University Hospital, Department of Hepatology and Gastroenterology, Aarhus N, Denmark; University of Nottingham, Lifespan and Population Health, School of Medicine, United Kingdom; Nottingham University Hospitals NHS Trust and the University of Nottingham, NIHR Nottingham Biomedical Research Centre (BRC), United Kingdom
Email: moje@clin.au.dk

Background and aims: Patients with alcohol-related cirrhosis (ALD cirrhosis) have an increased risk of primary liver cancer (PLC), i.e., hepatocellular carcinoma (HCC) or intrahepatic cholangiocarcinoma (iCCA). Screening for HCC may identify both cancers but is only recommended in England, not in Denmark. We set out to identify the risk and the high-risk-groups among patients with ALD cirrhosis in a Danish and English cohort.

Method: We included all Danish patients (N = 20,265) with ALD cirrhosis in the Danish National Patient Registry (1994–2021) and all English patients (N = 16,763) with ALD cirrhosis in the Clinical Practice Research Datalink (CPRD) (2000–2016). We computed incidence rates (IR) and cumulative incidence (CI) of PLC with death and transplantation as competing risks, stratifying by compensation, age, and sex.

Results: The IR of PLC per 10,000 person-years was 66 (95% CI 61–71) in Denmark and 62 (95% CI 56–68) in England. The 5-year risk of PLC was 2.24% (95% CI 2.03–2.46) in Denmark and 2.18% (95% CI 1.95–2.43) in England. The 5-year risk of iCCA and HCC was, respectively, 0.04% (95% CI 0.02–0.07) and 2.20% (95% CI 2.00–2.42) in Denmark vs. 0.07% (95% CI 0.04–0.13) and 2.11% (95% CI 1.88–2.36) in England. In both countries, the risk of PLC was higher in men than in women and increased with increasing age; this pattern was seen for both iCCA and HCC. Men had a 5-year PLC risk of 2.92% (95% CI 2.63–3.23) in Denmark and 2.80% (95% CI 2.48–3.15) in England, while men or women aged 70–79 year had a 5-year PLC risk of 3.91% (95% CI 3.04–4.94) in Denmark and 3.94% (95% CI 2.91–5.39) in England. No clear association was found with decompensation. In all patient subsets, HCC constituted the vast majority of PLCs (>96% of PLCs among men, >95% among women).

Conclusion: The risk of PLC is the same in Danish and English patients with ALD cirrhosis indicating that few PLCs are overlooked in Denmark, and that despite guidance recommending HCC screening in England this has not led to higher risks being observed. Male sex and older age were risk factors for both PLCs, while the effect of decompensation was uncertain. In both countries HCCs constituted >96% of PLCs, so the potential for overlooking iCCAs is likely to be small when discussions about moving from imaging-based to blood-based HCC surveillance are undertaken.

FRI-437
Beneficial effects of a screening programme for alcohol-related liver fibrosis with transient elastography in people with alcohol use disorder promoting alcohol abstinence

Emma Avitabile1,2, Helena Hernandez Evole1, Jordi Gratacos1,2,3, Pol Bruquera4, Luisa Ortega4, Anna Lligoña4, Martina Perez1,2,3, Ana Belén Rubio1,2,3, Ramon Bataller4,5, Pere Ginès1,2,3,5, Hugo Lopez4, Elisa Pose1,3,5,1Hospital Clinic de Barcelona, Liver Unit, Barcelona, Spain; 2Universitat de Barcelona, Barcelona, Spain; 3Institut d’Investigacions Biomèdiques August Pi i Sunyer (IDIBAPS), Barcelona, Spain; 4Hospital Clinic de Barcelona, Psychiatry, Barcelona, Spain; 5CIBER-Center for Biomedical Research Network, Madrid, Spain
Email: EPOSE@clinic.cat

Background and aims: There are few screening programmes for detection of liver fibrosis in at-risk population of alcohol-related liver disease. The aims of this study were 1) to investigate risk factors of liver fibrosis in a population with high-risk alcohol consumption studied with Transient Elastography (TE); 2) to investigate the effect of the screening on alcohol consumption.

Method: Subjects attending the Addiction Unit of the Hospital Clinic of Barcelona for alcohol use disorder (AUD) between 2019 and 2022 were prospectively included (study cohort), excluding those with known liver disease or current alcohol consumption <21 or 14 SU/week in men and women, respectively, considering 1 SU = 10 g of alcohol. Subjects underwent a first visit in the Hepatology Clinic with collection of medical history and blood tests + TE with Liver Stiffness (LS) and a second visit to explain tests’ results and for a brief intervention on healthy daily habits. Subjects with increased liver stiffness (LS ≥ 8 kPa) underwent follow-up in the Hepatology Clinic. Abstinence was defined as a minimum of 2-months negative follow-up according to medical records and/or negative ethylglucuronide (ETG) in urine or discharge due to abstinence. Results were compared with a matched control cohort attending the Addiction Unit for AUD treated immediately before the study period between 2017 and 2019.

Results: 314/345 subjects (91%) accepted to enter the study cohort, 68% were men with average 70 SU/week of alcohol consumption. Prevalence of increased LS was 12% (38/315). Presence of diabetes, male gender and higher ferritin and GGT values were independently associated with increased LS at the multivariate analysis. At 6 months, 142/314 (45%) subjects were abstinent compared to 31% in the control cohort (n = 148) were comparable in terms of baseline characteristics. At 6 months follow-up, abstinence was higher in the study cohort (45% vs 32%, p = 0.01) and median consumption among active consumers was lower (18 vs 21 SU/week, p = 0.008). Factors independently associated with abstinence in both cohorts considered together (n = 463) were older age (OR = .97 p = 0.001) and being part of the study cohort (OR = 1.69 p = 0.01).
Conclusion: a screening program of liver fibrosis in subjects with high-risk alcohol consumption and AUD appears to have an added beneficial effect to the alcoholological treatment for achievement of alcohol abstinence.

FRI-438
Epidemic within pandemic: alcohol-related hepatitis and COVID-19
Natalie Marlowe1, David Lam2, Suthat Liangpunsakul3, 1DURECT Corporation, United States; 2Pharma Analytics, United States; 3Indiana University, United States
Email: natalie.marlowe@durect.com

Background and aims: We recently reported a steady increase in the total number of hospitalized alcohol-related hepatitis (AH) patients in the US; approximately 5.4% annually between 2015 and 2019. Alcohol consumption is a common coping mechanism for psychological distress. Alcoholic beverage sales increased significantly during the peak of the COVID-19 pandemic in the US. As a result, a rise in alcohol-associated liver disease cases was reported, however there is no published nationwide data on the prevalence of hospitalized AH cases in the US during the COVID-19 pandemic. In this study, we investigated the rate of AH hospitalizations in 2020 during the peak of the COVID-19 pandemic and its impact on patient outcomes and healthcare burden.

Method: We analyzed the US Nationwide Inpatient Sample data from 2019–2020. Patients with a primary or secondary diagnosis of AH were identified using International Classification of Diseases-10. We described associated comorbidities such as ascites, cirrhosis, hepatic encephalopathy (HE), acute renal failure (ARF), GI bleeding, pneumonia, and sepsis in AH patients, with or without COVID-19. The in-hospital mortality, length of stay (LOS), and hospital charges during the study period were calculated and compared.

Results: We observed ~16% annual increase in cases of hospitalized AH patients from 136,620 in 2019 to 157,885 in 2020, a significant increase from an average of 5.4% per annum. The overall US hospitalizations declined by 8.7% in 2020. Men younger than 40 comprised the fastest growing AH group (23% increase) in 2020. There were 154,985 (98.2%) AH hospitalizations without COVID-19 and 2,900 (1.8%) AH with COVID-19. In-hospital mortality was 4.1% for AH+COVID (−) vs. 11.37% for AH+COVID (+) patients. Average LOS was 2.5 days longer for AH+COVID (+) patients (8.6 vs. 6.1 days). Mean hospital charges were 41.3% higher ($93,670) for AH+COVID (+) patients compared to $66,283 for AH+COVID (−) patients. The most common comorbidities in AH+COVID (−) patients were cirrhosis (38.9%), ascites (27.5%), ARF (24.7%), coagulopathy (17%), HE (14.7%), GI bleeding (11.1%), sepsis (10%) and pneumonia (1.5%). In contrast, pneumonia (275% increase) and sepsis (50% increase) were the most common comorbidities in AH+COVID (+) patients followed by GI bleeding (24%), ARF (37%), and HE (27%).
Figure:

Conclusion: Our study documented a significant increase in AH hospitalizations, in-hospital mortality, and healthcare cost and utilization among hospitalized AH patients, notably in those who were infected with SARS-CoV2. Our results underscore an unmet and urgent medical need to identify effective therapies for hospitalized AH patients.

FRI-439
Alcohol use disorder among patients admitted with non-alcohol related conditions: a retrospective cohort study in secondary care
Mohsan Subhani1,2, Shamas Ul Haq3, Guruprasad Aithal1,2, Stephen Ryder1,2, Joanne Morling1,2,4.
1Nottingham Digestive Diseases Biomedical Research Centre (NDDC), School of Medicine, University of Nottingham, United Kingdom; 2NIHR Nottingham Biomedical Research Centre, Nottingham University Hospitals NHS Trust and the University of Nottingham, Nottingham, United Kingdom; 3Nottingham University Hospitals, United Kingdom; 4Division of Epidemiology and Public Health, Nottingham University Hospitals NHS Trust and the University of Nottingham, Nottingham, United Kingdom
Email: mohsan.subhani@nottingham.ac.uk

Background and aims: A substantial number of hospitalised patients drink alcohol harmfully. Only a proportion of those people at risk will have an ICD-10 diagnosis of alcohol-specific or alcohol-related disorders. We aim to determine the prevalence of alcohol use disorder (AUD) in patients admitted with non-alcohol related conditions and ascertain the shared high-risk characteristics.

Method: Retrospective cohort included adult patients admitted to Nottingham University Hospitals (NUH) between 1st-April-2019 to 31st-March-2020 with non-alcohol related disorders. Data were analysed to determine the epidemiology of alcohol use disorder (AUD), identify associated high-risk characteristics, and describe the distribution of AUD in non-alcohol related ICD-10 discharge diagnosis group as defined by an alcohol-attributable fraction.

Results: A total of 36,121 patients presented with a non-alcohol related condition of them 35,080 (97.1%) who had alcohol assessment by AUDIT-C score were included. The mean age of the cohort was 62.2 years (SD ± 20.4), 18,595 (53.0%) were male, and 24,939 (90.6%) were white. Based on AUDIT-C 5, 626 (16.0%) had AUD (increased risk n = 3,559, 63.3%, high risk n = 1,482, 26.3%, possible dependence n = 585, 10.4%). Patients with AUD compared to those without AUD were significantly younger (mean age difference 8.7 years ±0.29, p < 0.001), were more likely to be male (p < 0.001), white (p < 0.001), not in a relationship (<0.001), admitted as an emergency (p = 0.048), and cared for by surgical specialities (p < 0.001). A significant (p < 0.001) higher proportion of patients with possible alcohol dependence compared to other AUD risk groups were from the most deprived areas (Table 1). General medicine, trauma and orthopaedics, general surgery, urology, and respiratory medicine were top five inpatient specialities of care for patients with AUD. Injury, poisoning, diseases of musculoskeletal and connective tissues, neoplasms, and diseases of the digestive system were the most common ICD-10 diagnosis groups for patients with AUD.

Table 1: Characteristics of AUD individual risk groups compared to no AUD (low risk)

<table>
<thead>
<tr>
<th>Low risk (n=29,414)</th>
<th>Increased risk (n=3,559)</th>
<th>High Risk (n=1,482)</th>
<th>Possible dependence (n=585)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (SD)</td>
<td>62.1 (SD 20.4)</td>
<td>65.2 (SD 20.5)</td>
<td>69.2 (SD 25.1)</td>
</tr>
<tr>
<td>Gender</td>
<td>Male 57.3%</td>
<td>Male 68.6%</td>
<td>Male 65.3%</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>White 94.7%</td>
<td>White 88.5%</td>
<td>White 55.6%</td>
</tr>
<tr>
<td>AUD score</td>
<td>4 (SD 3)</td>
<td>5 (SD 2)</td>
<td>6 (SD 3)</td>
</tr>
<tr>
<td>Mode of admission</td>
<td>Emergency 36.7%</td>
<td>Emergency 38.4%</td>
<td>Emergency 32.2%</td>
</tr>
<tr>
<td>Speciality</td>
<td>Other 54.8%</td>
<td>Other 55.2%</td>
<td>Other 45.2%</td>
</tr>
<tr>
<td>Length of Stay (days)</td>
<td>4.0 (SD 2.49)</td>
<td>4.3 (SD 2.18)</td>
<td>4.9 (SD 2.69)</td>
</tr>
</tbody>
</table>

Figure:

Conclusion: One in six admitted patients with non-alcohol related conditions had AUD. Majority of these patients had either increased or high-risk AUD and were cared for by surgical specialities. Efforts to identify AUD and unidentified liver disease early should be focused on areas of high burden which are outside the specialist wards and units.

FRI-440
Histological inflammation in severe alcohol-related hepatitis is the main pre-treatment factor associated to glucocorticoid response
Mialy Randrianarisoa1, Laetitia Oertel2, Pierre Mayer1, Lucile Heroin1, Simon Tripon1,3, François Habersetzer1,3, Lawrence Serfaty1, Thomas Baumert1,3,4, Antonio Saviano1,3,4,1 Service d’hépatogastroentérologie, Institut Hospitalo-Universitaire, Pôle hépato-digestif, Hôpitaux Universitaires de Strasbourg, Université de Strasbourg, France; 2Service d’anatomopathologie, Hôpitaux Universitaires de Strasbourg, Université de Strasbourg, France; 3Institut de recherche sur les maladies virales et hépatiques, Inserm UMR_S1110, Strasbourg, France; 4Institut Universitaire de France, France
Email: saviano@unistra.fr

Background and aims: Severe alcohol-related hepatitis is a condition associated with a significant mortality. Apart from liver transplantation, glucocorticoid is the only validated treatment. Treatment response is usually evaluated at day 7 by the Lille score. Clinical and histological pre-treatment features that could predict this response are unknown. The alcoholic hepatitis histological score, based on pre-treatment liver biopsy and developed to predict outcomes of patients with severe alcohol-related hepatitis, was not able to predict...
glucocorticoid response and its prognostic value was not confirmed in an independent cohort.

The aim of this study was to characterize histological inflammation in severe alcohol-related hepatitis and to assess its predictive value of glucocorticoid response.

Method: This retrospective study included patients with histologically proven severe alcohol-related hepatitis treated with glucocorticoids at Strasbourg University Hospital, France, between 2014 and 2021. Pre-treatment liver biopsies stained with HandE were analyzed by QuPath v 0.3.2 to identify and quantify immune cells. Portal spaces, portal-lobular interfaces and lobules were annotated to describe the distribution of the immune cells.

The predictive value for glucocorticoids non-response (Lille score at day 7 >0.56) was evaluated by univariate and multivariate logistic regression analysis.

Results: Among the 61 patients included, 18 (29.5%) were non-responders and 43 (70.5%) were complete or partial responder. Most of the patients were cirrhotic in both groups (respectively 72.2% and 76.7%, p = 0.962). Liver disease was more severe in non-responders (median MELD 30 vs 24 p < 0.001; median Maddrey score 82.36 vs 61.74, p = 0.003). Total inflammatory cell infiltration was significantly lower in non-responders (median 3170 cells/mm², range 815–3906, p = 0.018) than in responders (median 3539 cells/mm², range 1779–5198).

The multivariate logistic regression analysis using pre-treatment clinical and histological variables, identified the following factors associated with glucocorticoids non-response: a high level of bilirubin (OR 1.02, CI 95% 1.01–1.03, p = 0.016) and a high IGSII score (OR 1.19 CI 95% 1.07–1.46, p = 0.012) and a low total inflammatory infiltration (OR 38.9, 95% CI 2.54–3056, p = 0.031). Regarding the localization of the inflammation, portal immune cells were significantly lower in non-responders [1604/mm² (range 965–2370) vs 2273/mm² (range 1653–2766), p = 0.012] as well as in portal interface [341/mm² (range 269–397) vs 487/mm² (range 315–603), p = 0.012]. There was no difference between the two groups in terms of intralobular infiltration.

Conclusion: Low histological inflammation is the strongest pre-treatment factor associated to glucocorticoids non-response in severe alcohol-related hepatitis. Automatic quantification of inflammatory cells from conventional HandE slides could be used for early detection of patients with a high risk of treatment failure in whom alternative medical therapies should be evaluated and early liver transplantation should be discussed.
FRI-442
Baclofen is effective on abstinence and improvement of Child-Pugh score in patients with cirrhosis: results of a meta-analysis
Gildas Fantognon1, Jean-François Cadranel1, Honoré Zougmoré1, Mourad Medmoun2, Ryad Smadhi2, Philippe Pulwermacher1, Jean Rene Ngele Efole1, Camille Barrault1, Oumarou Nabili3. 1GHPSO, CREIL, France; 2CH INTERCOMMUNAL de CRETEIL, Digestive Disease and Addiction Unit, Creteil, France; 3Washington University School of Medicine ETA, United States
Email: honoretz87@gmail.com

Background and aims: Baclofen is one of the treatments recommended for abstinence (withdrawal) in patients (pts) with alcoholic cirrhosis (1). A few randomized and observational studies suggest a positive effect on abstinence and improvement of liver function in cirrhotic patients (2). However, despite obtaining marketing authorization in 2021, it’s impact on alcoholic abstinence and liver function improvement remains debated. The aim of this meta-analysis was to evaluate the effect of baclofen in patients with alcoholic cirrhosis on abstinence and improvement of the Child Pugh score.

Method: Analysis studies on baclofen treatment in alcoholic cirrhotic patients published in extenso between January 1, 2020 and August 31, 2022. Randomized controlled studies and observational studies studies involving a large number of patients followed over a period of 12 months were included (for observational studies) were selected for analysis. The search for publications was based on a systematic search of in MEDLINE, PubMed, Google Scholar, Web of Sciences, Academic Search Premier, Cochrane Library and SCOPUS. We have collected and analyzed the individual data of the patients included in the different studies to assess the effects of baclofen on abstinence and improvement of the Child Pugh score in patients with alcoholic cirrhosis. The size of the effects of baclofen on abstinence and Child Pugh score was assessed using relative relative risks (RR) and their 95% confidence intervals. We considered that there was improvement in the Child Pugh score when there was a change from a Child Pugh score at inclusion to stage A at the end of follow-up. Otherwise, it was considered no benefit. Assessment of bias and heterogeneity were using the I2 and funnel plot. A p value <0.05 was considered statistically significant.

Results: Six studies were included in the final analysis, including four randomized trials (318 cirrhotic patients treated with baclofen and 147 patients treated with placebo) and two observational studies (100 pts). The median dose of baclofen was 30 mg per day. In despite the high heterogeneity (I2 = 79%), our results show a positive effect of baclofen on alcohol withdrawal and abstinence (RR 1.48, CI95% 1.25–1.76, p = 0.003 and 1.76, CI95% p = 0.0083 respectively). Similarly, baclofen showed a beneficial effect on improvement on the severity of liver injury as assessed by the Child Pugh score (RR 2.50, CI95% 1.48–4.18, p < 0.001).

Conclusion: Global improvement of the Pugh child. This meta-analysis shows that baclofen is an interesting treatment for abstinence from alcohol consumption in patients with alcoholic cirrhosis and could improve liver functions in patients with alcoholic cirrhosis. Alcohol-related cirrhosis.

FRI-443
Hemoglobin is a short-term prognostic factor in decompensated alcohol-associated cirrhosis: a multicenter prospective study
José Ursic Bedoya1, Claire Espérance2, Safia Aouinti2, Ludovic Caillol3, Magdalena Menzarowska3, Marie Pierre Ripault4, Laura Jaubert2, Adrien Ardavan Prost3, Lucy Meunier2, Stéphanie Faure2, Cathy Soularyac2, Hélène Donnadieu2, Boris Guiri2, Nicolas Molinari2, Jérôme Dumortier2, Georges-Philippe Pageaux2, 1CHU Montpellier, Montpellier, France; 2CHU Montpellier, France; 3CHU de Nîmes, France; 4CH Narbonne, France; 5Edouard Herriot Hospital, Lyon, France
Email: jose.ursicbedoya@chu-montpellier.fr

Background and aims: Acute decompensation of alcohol-associated cirrhosis can lead to acute-on-chronic liver failure development or death without liver transplantation (LT). LT can be avoided in some patients who spontaneously recover. Classic prognostic scores (such as Meld) are insufficient to discriminate between patients who recover and those needing LT. We aimed to identify new prognostic factors in the setting of acute decompensation (AD) of alcohol-associated cirrhosis.

Method: This prospective observational study included patients from two tertiary care centers (one with a LT team) and a secondary care center. Inclusion period ranged from 01/04/2018 to 30/09/2019 and patients were followed for a minimum of 12 months. Adults admitted for an AD of alcohol-associated cirrhosis, without hepatocellular carcinoma, previous TIPS placement or active viral hepatitis were included. Primary end points were overall and 3-month transplant-free survival (TFS).

Results: 131 patients were included (mean [SD] age, 58.4 [9.3] years; 96 men [73.3%]); median follow-up was 15 months. 3 and 12-month TFS were 74.8% and 64.1% respectively. Main etiologies for decompensation were alcohol-associated hepatitis (n = 52, 39.7%) and ascites flare (n = 35, 26.7%). Multivariate Cox regression identified baseline hemoglobin ([HR]: 0.558, [95% CI: 0.383; 0.813]) and Meld score ([HR]: 1.307, [95% CI: 1.171; 1.457]) as the variables associated with 3-month TFS. We constructed a score combining hemoglobin and Meld score with an AUROC of 0.91 (95% CI: 0.84; 0.98), showing higher prognostic performance than Meld, Meld-sodium and ACLF-AD scores. Our model was validated in an independent cohort of 49 patients.

Conclusion: Baseline hemoglobin shows potential short-term prognostic value in patients admitted for AD of alcohol-associated cirrhosis (Clinical Trials number 03508388).
Impact of heavy alcohol consumption on mitochondrial metabolism


1Beth Israel Deaconess Medical Center, Division of Gastroenterology and Hepatology, Boston, United States; 2LabCorp Corporate Office, Diagnostics Research and Development, Morrisville, United States; 3Indiana University School of Medicine, Division of Gastroenterology and Hepatology, Indianapolis, United States; 4VCU School of Medicine, Division of Gastroenterology and Hepatology, Richmond, United States; 5Mayo Clinic, Department of Internal Medicine, Rochester, United States

Email: sminchen@bidmc.harvard.edu

Background and aims: Excessive alcohol consumption results in cumulative damage to mitochondria which has profound implications for cellular metabolism. Changes in mitochondrial metabolism result in altered circulating metabolites, such as citrate and ketone bodies. We have previously demonstrated that high levels of circulating ketone bodies and citrate are associated with increased mortality. Herein, we hypothesize that excessive alcohol consumption and alcoholic hepatitis are associated with elevated ketone bodies and Krebs cycle metabolites due to mitochondrial injury.

Method: Translational Research and Evolving Alcoholic Hepatitis Treatment (TREAT) was a prospective observational study of patients with alcoholic hepatitis (AH) (n = 196) and matched heavy drinkers (n = 169). Study participants were evaluated at baseline, 6 months, and 12 months. Metabolite levels were quantified from baseline plasma samples using nuclear magnetic resonance profiling. The relationship between metabolites and patient outcome was analyzed using multivariable regression and Cox proportional hazard models.

Results: Heavy drinkers have lower levels of citrate (88.1 ± 26.6 μM), but higher levels of ketone bodies (344 ± 578 μM) compared to healthy controls. Patients with AH have significantly increased levels of ketone bodies and citrate when compared to heavy drinkers (Figure). The increase in citrate and ketone body levels positively correlates with both Maddrey and MELD scores, suggesting liver injury in AH is directly linked to maladaptive mitochondria metabolism. In Cox proportional hazard models, the Citrate level is strongly associated with mortality at 90 days with HR ratio of 2.9 (95% CI 1.5–5.4, p < 0.01), while no significant association was observed with ketone bodies.

**Variables**

<table>
<thead>
<tr>
<th></th>
<th>Heavy drinkers N = 169</th>
<th>Alcoholic hepatitis N = 196</th>
<th>P value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td>44.4 ± 12.40</td>
<td>45.5 ± 10.90</td>
<td>0.437</td>
</tr>
<tr>
<td>Gender (male), n (%)</td>
<td>110 (65)</td>
<td>117 (60)</td>
<td>0.28</td>
</tr>
<tr>
<td>ALT (U/L)</td>
<td>26.5 ± 12.36</td>
<td>62.15 ± 63.78</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>AST (U/L)</td>
<td>28.45 ± 10.65</td>
<td>136.75 ± 85.50</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>ALP (U/L)</td>
<td>76.52 ± 31.14</td>
<td>188.0 ± 137.07</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Creatinine (mg/dl)</td>
<td>0.88 ± 0.27</td>
<td>1.01 ± 0.91</td>
<td>0.170</td>
</tr>
<tr>
<td>Maddrey score</td>
<td>2.83 ± 9.60</td>
<td>42.97</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>MELD score</td>
<td>7.30 ± 2.35</td>
<td>22.55 ± 6.75</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Ketone bodies (KB)</td>
<td>Total KB</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>344.1 ± 577.7</td>
<td>608.5 ± 517.6</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td></td>
<td>Beta-hydroxybutyrate</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>237.1 ± 407.8</td>
<td>449.3 ± 354.2</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Acetocetate</td>
<td>71.3 ± 124.4</td>
<td>64.5 ± 85.9</td>
<td>0.29</td>
</tr>
<tr>
<td>Acetone</td>
<td>35.6 ± 58.7</td>
<td>94.6 ± 188.7</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Small molecule metabolites</td>
<td>Glucose</td>
<td>92.2 ± 80.9</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td></td>
<td>Citrate</td>
<td>88.1 ± 26.6</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

*Mann-Whitney U test for continuous and chi square for categorical.

Conclusion: Heavy alcohol use and AH are associated with elevated levels of ketone bodies. While an increase in circulating citrate level is associated with mortality in 90 days in AH, potentially indicative of mitochondrial biogenetic failure. Mitochondrial damage may trigger a buildup of Krebs cycle metabolites that would shift acetyl-CoA to ketone body production. This study is the first to describe the changes in mitochondria metabolites in alcohol-related liver disease.

Recompensation following an episode of alcohol-associated hepatitis mostly occurs in the first year of follow-up and is related to Child-Pugh score, levels of GGT and platelets, and alcohol abstinence

Jordi Gratacos1, Pilar Ruiz-Zafría2, Miriam Celada-Sendino3, Aina Martí-Barretero4, Claudia Pujol5, Rosa Martín-Mateos6, Víctor Echavarria7, Luis Frías-Cancho2, Sonia García-García2, Mónica Barrales Valbuena9, Javier Tejerido-Tejada4, Sergio Vazquez Rodríguez12, Nuria Cañete13, Carlos Fernández-Carrillo14, María Valenzuela15, David Martí-Agüado16, Diana Horta17, Marta Quíones18, Vanessa Bernal Monterde19, Silvia Acosta-López20, Tomás Artaza Varasa11, José Pinazo Banderas22, Carmen Villar23, Ana Clemente24, Esther Badía-Aranda25, Conrado Fernández-Rodríguez18, Virginia Aguilera Sancho28, Pau Sancho-Brú26, Joaquín Cabezas2, Meritxell Ventura Cots4, Santiago Tomé27, Joan Caballéria1, Elisa Pose1, 1Hospital Clinic de Barcelona, Liver Unit, Barcelona, Spain; 2Virgen del Rocio University Hospital, Sevilla, Spain; 3Central University Hospital of Asturias, Oviedo, Spain; 4Vall d’Hebron University Hospital, Barcelona, Spain; 5Hospital de la Santa Creu i Sant Pau, Barcelona, Spain; 6Ramón y Cajal Hospital, Madrid, Spain; 7Marqués de Valdecilla University Hospital, Santander, Spain; 8Hospital Parc Taulí de Sabadell, Sabadell, Spain; 9La Fe University and Polytechnic Hospital, Valencia, Spain; 10University Hospital October 12, Madrid, Spain; 11Hospital de Cabueñes, Gijón, Spain; 12Álvaro Cunqueiro Hospital, Vigo, Spain; 13Hospital del Mar, Barcelona, Spain; 14Puerta de Hierro Majadahonda University Hospital, Majadahonda, Spain; 15Hospital Universitari de Girona Doctor Josep Trueta, Girona, Spain; 16Hospital Clin Universitari, Valencia, Spain; 17Hospital Universitari Mútua Terrassa, Terrassa, Spain; 18Hospital Universitario Fundación Alcorcón, Alcorcón, Spain; 19 Miguel Servet University Hospital, Zaragoza, Spain; 20Our Lady of Candelaria University Hospital, Santa Cruz de Tenerife, Spain; 21Hospital General Universitario de Toledo, Toledo, Spain; 22Hospital Universitario Virgen de la Victoria, Málaga, Spain; 23Salamanca University Hospital, Salamanca, Spain; 24Gregorio Marañón General University Hospital, Madrid, Spain; 25Burgos University Hospital, Burgos, Spain; 26Institut d’Investigacions Biomédiques August Pi i Sunyer (IDIBAPS), Barcelona, Spain; 27Santiago Clinic Hospital CHUS, Santiago de Compostela, Spain

Email: EPOSE@clinic.cat

Background and aims: several studies have recently described the phenomenon of resolution of clinical complications in patients with decompensated cirrhosis. There is currently no evidence regarding the incidence of this event following an episode of alcohol-associated hepatitis (AH), nor the factors associated to its occurrence.

Method: we collected data from a retrospective cohort of patients from 30 Spanish hospitals with a clinical diagnosis of AH between 2014 and 2021. We selected all patients that met the following criteria: 1) were alive after first hospitalization; 2) presented with a Model for End-stage Liver Disease (MELD) score >20. Recompensation was defined as: 1) compensated liver disease over the previous 3 months; 2) no specific treatment (diuretics, laxatives or rifaximin) over the previous 3 months; 3) improvement of liver function defined by MELD <12. We evaluated the percentage of recompensated patients at 1 and 3 years, and we performed a logistic regression to assess factors associated to recompensation.

Results: five hundred forty-eight patients were included. The majority were men (72%), with a median age of 52 years and a median MELD score of 22 at diagnosis. At 3-year follow-up, 105 patients (19%) met criteria for recompensation; of those, 74 patients (70%) already met the same criteria at 1-year follow-up. A lower Child-Pugh (CP) score (OR 1.66, CI [1.27–2.19]) at diagnosis, higher
levels of platelets (OR 1.04, CI [1.01–1.08]) and GGT (OR 1.07, CI [1.07–1.12]), and total alcohol abstinence during follow-up (OR 2.72, CI [1.48–5.00]), were the only factors associated to recompensation at 1 year. Baseline probability of recompensation at 1 year ranged from 6.6% in patients with Cp >9 and low platelets (<75.5 x 10^9/L) and GGT (<172 U/L), up to 28.3% in patients with Cp <9 and high platelets and GGT levels.

**Figure:** Probability of recompensation at 1 year according to baseline Child-Pugh score and levels of platelets and GGT.

**Conclusion:** A significant percentage of patients diagnosed with AH achieve recompensation of cirrhosis, mainly during the first year after discharge. Recompensation is associated to alcohol abstinence, CP score and levels of platelets and GGT.

**FRI-446**

A prospective study of hepatic fibrosis evaluation in an alcohol withdrawal unit of an university hospital center: role of FIB-4 and elastometry. Fibre-addict study

Armand Abergel1, Benjamin Buchard1, Leon Muti1, Dominique Boulier1, Maud Leautaud1, Brigitte Chanteranne1, Carine Nicolas1, Sylvie Massoulier1, Frédéric Faure1, Anne Audrey Schmitt-Dischamp2, Georges Brousse2,1 CHU Clermont-Ferrand, Medecine Digestive, Clermont-Ferrand, France; 1CHU Clermont-Ferrand, Service d’addictologie, Clermont-Ferrand, France

**Background and aims:** Excessive alcohol consumption is the major cause of liver-related death and the leading cause of liver transplantation in France. Many patients are seen too late, at a decompensated stage. Early diagnosis of cirrhosis would allow early diagnosis for esophageal varices, screening for hepatocellular carcinoma and reinforcement of addictive behaviour care. This project is part of a process of screening for hepatic fibrosis, by elastography, in patients hospitalized in an addictology unit for alcohol withdrawal.

**Method:** 216 patients benefited from measurement of liver stiffness (LS) (Fibroscan®) upon entering in the unit (day 0 = D0). This measurement was repeated before the patients had left the unit (21 days on average). A LS>25 kPa ruled in advanced fibrosis (15 patients), and a LS<10 kPa ruled out advanced fibrosis (183 patients) (Legros et al. CGEH 2022). If the patients had a LS of between 10 and 25 kPa at D0, the status was determined by the second LS realised at the end of hospitalisation. If the patient had LS>10 kPa, they were considered to have advanced fibrosis (7 patients). Five patients had LS<10 kPa (no advanced fibrosis) and six patients had no second measurement, they were excluded from the analysis. Then 22 patients had an advanced fibrosis (F3 or F4 META VIR) and 188 patients had no advanced fibrosis (F0F1F2). We also studied the diagnostic performance of FIB-4, prothrombin time and ASAT/ALAT>1 with the objective to reduce the number of LS measurements.

**Results:** In the total population (210 patients), mean age of the patients was 49±12 years and sex ratio was 2.81. The percentage of patients with a FIB-4 less than 2.6 was less than 2.6 and had an excellent negative predictive value to exclude advanced fibrosis and then could be able to reduce the number of LS measurements (up to 80% of the patients). The combination of FIB-4 and LS should be studied on a larger number of patients to validate this algorithm, preferably within the framework of a multicentre study. This study suggests that screening for advanced fibrosis should be performed in all hospital units for alcohol withdrawal.

**Conclusion:** Ten percent (22/210) of patients admitted to an addictology unit had an advanced fibrosis. A FIB-4 less than 2.6 had an excellent negative predictive value to exclude advanced fibrosis and could be able to reduce the number of LS measurements (up to 80% of the patients). The combination of FIB-4 and LS should be studied on a larger number of patients to validate this algorithm, preferably within the framework of a multicentre study. This study suggests that screening for advanced fibrosis should be performed in all hospital units for alcohol withdrawal.

**FRI-447**

The prevalence and prognostic impact of bariatric surgery in patients hospitalized with alcoholic liver disease

Louis Ongena1,2,3, Sander Lefere2,3, Laurissa Demeulenae2, Yves Van Nieuwenhove1, Anja Geerts2,3, 1Ghent University Hospital, Department of Human Repair and Structure, Department of Gastrointestinal Surgery, Gent, Belgium; 2Ghent University Hospital, Liver Research Center Gent, Ghent University, Ghent University Hospital, Gent, Belgium; 3Ghent University Hospital, Department of Internal Medicine and Paediatrics, Hepatology Research Unit, Gent, Belgium

**Email:** Louis.ongena@ugent.be

**Background and aims:** Patients with a history of bariatric surgery (BS) are susceptible to developing alcohol use disorder. We and others have previously shown that these patients can develop severe alcohol-related liver disease (ARLD), often at a younger age and despite lower cumulative alcohol intake when compared to ALRD patients without BS. However, there is still a paucity of data. Our aim was to describe the demographics and mortality of a hospitalized population diagnosed with alcohol-related liver disease, in relation to BS.

**Method:** We included patients hospitalized at the University Hospital in Ghent between 1/1/2018 and 31/12/2022 with ARLD. Data were retrieved retrospectively from the most recent hospitalization. Statistical analysis was performed using Mann-Whitney U and Chi² tests.

**Results:** 12.3% (35/284) of patients admitted with ARLD had a history of bariatric surgery, of which 28 (80.0%) underwent Roux-en-Y gastric bypass. Pre-BS BMI was 41.3 ± 5.6 on average, with a one-year post-BS BMI of 27.0 ± 4.7. Patients with a history of BS were predominantly female (77.1%), in contrast to the non-BS population (30.1%) (p < 0.0001) and despite being significantly younger (52.0 (45.0, 60.0) vs 63.0 (53.0, 69.0) years old) (p < 0.0001), had a similar survival (68.6%...
Conclusion: Among patients with ALD listed for LT, A1AT levels were independently associated with waitlist dropout, and may have prognostic value in assessing the severity of liver disease for LT. Additional studies are needed to evaluate the effect of protein nutrition deficiency in patients with ALD to identify and intervene on those at risk for waitlist dropout.

FRI-449
Type VII collagen degradation biomarker (C7M): a new marker of alcohol-induced gut injury and bacterial translocation in steatotic liver disease

Emil Deleuran Hansen1,2, Nikolaj Torp1,2, Ida Lønsmann1,2, Emilia Stankovic1,2, Stine Johansen1,2, Camilla Dalby Hansen1,2, Bjørn Stæhr Madsen1, Helene Bæk Juel1, Katrine Lindvig1, Katrine Thorhauge1,2, Karine Bech1,2, Ellen Jensen1,2, Peter Andersen1, Ida Ziegler Spedtsberg1,2, Johanne Kragh Hansen1,2, Charlotte Wernberg2, Ida Villesen1,2, Morten Karstal1, Maja Thiele1,2, Torben Hansen1, Diana Leeming3, Mads Israelen1, Aleksander Krag1,2, Oddes University Hospital, Department of Gastroenterology and Hepatology, Odense, Denmark; 2University of Southern Denmark, Institute of Clinical Research, Odense, Denmark; 3Nordic Bioscience A/S, Hepatic Research, Herlev, Denmark; 4University of Copenhagen, Novo Nordisk Foundation Center for Basic Metabolic Research, Copenhagen, Denmark

Email: emil.deleuran.hansen@rsyd.dk

Background and aims: The gut barrier is a treatment target in alcohol-related liver disease (ALD) and non-alcoholic fatty liver disease (NAFLD), but biomarkers to assess gut injury and bacterial translocation are lacking. Alcohol induces gut injury and bacterial translocation. Type VII collagen is abundant in the extracellular matrix (ECM) of the gut wall, which may be affected during gut injury. IL-6 is secreted by the Kupffer cells in response to microbial products. We aimed to investigate circulating markers of type VII collagen and IL-6 in response to acute alcohol intoxication as markers of gut injury and bacterial translocation.

Results: A total of 122 patients were listed with ALD, of which, 69% of patients were male and 61% were Caucasian, with median MELD at listing of 27 (IQR: 13–32). With regards to hepatic decompensation, 38% had a history of gastroesophageal variceal bleeding and/or required variceal ligation. Overall, 16% of ALD patients died or were removed due to medical deterioration and median time from waitlisting to dropout was 56 days. At the time of listing, 14% of patients had low albumin ([mean] 3.1 g/dL), 70% of patients had low zinc (46.1 μg/mL), 19% had low ceruloplasmin (23.5 mg/dL), and 7% had low A1AT (149.6 mg/dL) levels. As a continuous predictor (increments of 1 mg/dL), higher A1AT levels was associated with reduced risk of waitlist dropout on univariate analysis (odds ratio [OR] 0.98, 95% confidence interval [CI]: 0.95–0.99). As a categorical variable, low A1AT levels (<100 mg/dL) was observed to increased risk of dropout, but did not meet statistical significance (OR 3.32, 95% CI: 0.99–11.16) on univariate analysis. Serum ceruloplasmin and zinc levels, and deficiencies were also not found to be associated with waitlist dropout.

Table 1. Univariate and Multivariate Analysis of Continuous and Categorical Predictors of Waitlist Dropout Due to Medical Deterioration Among ALD Patients Listed for LT

<table>
<thead>
<tr>
<th>predictor</th>
<th>Univariate</th>
<th>Multivariate</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1AT (mg/dL)</td>
<td>0.98 (0.96–0.99)</td>
<td>0.97 (0.96–0.99)</td>
</tr>
<tr>
<td>Ceruloplasmin (mg/dL)</td>
<td>0.97 (0.96–0.99)</td>
<td>0.97 (0.96–0.99)</td>
</tr>
<tr>
<td>Zinc (μg/mL)</td>
<td>0.96 (0.94–0.98)</td>
<td>0.95 (0.93–0.98)</td>
</tr>
<tr>
<td>Albumin (g/dL)</td>
<td>0.95 (0.94–0.96)</td>
<td>0.94 (0.92–0.96)</td>
</tr>
</tbody>
</table>

Conclusion: vs 61.0%) and a higher likelihood of transplant listing (25.7% vs 14.2%) (p = 0.085). The cause of death was acute-on-chronic liver failure in 77.8% of BS patients, compared to only 15.0% of those without a history of BS (p < 0.0001). Conversely, and in keeping with the younger age, no BS patients died of non-hepatological causes or HCC. There were no differences in comorbidities (diabetes, ischemic heart disease), complications of liver disease (ascites, spontaneous bacterial peritonitis, esophageal varices, and hepatic encephalopathy), nor in BMI at the time of the latest hospitalization. ALT (p = 0.043) and AST (p = 0.012) were significantly elevated in the BS group, whereas the MELD score was comparable (p = 0.727). More than half of the BS cohort suffered from psychiatric illness, compared to a quarter of the non-BS population (51.4% vs 28.1%) (p = 0.010), paralleled by the number of patients currently treated with psychological counseling (51.4% vs 21.0%) (p < 0.0001). Alcohol abstinence was near identical to the MELD score was comparable (p = 0.727). More than half of the BS cohort suffered from psychiatric illness, compared to a quarter of the non-BS population (51.4% vs 28.1%) (p = 0.010), paralleled by the number of patients currently treated with psychological counseling (51.4% vs 21.0%) (p < 0.0001). Alcohol abstinence was near identical.
**Method:** We performed a pathophysiological intervention study including 39 patients with three different hepatic phenotypes; healthy controls (HC), ALD and NAFLD. The intervention was 2.5 ml/kg of 40% ethanol in 9 mg/ml NaCl administrated through a nasogastric tube for over 30 minutes. After the intervention, blood samples were collected simultaneously through the hepatic vein at eight-time points during a 180-minute study period. Markers of type VII collagen degradation (C7M) and formation (PRO-C7) were measured using competitive ELISA. IL-6 was measured using O-link technology.

**Results:** Mean age was 53 (±11) years, 61.4% were males and the median transient elastography was 4.5 (3.9–5.0)/8.9 (5.9–11.0)/10.4 (9.5–11.4) kPa (HC/ALD/NAFLD). At baseline, the hepatic venous mean concentration of C7M was 7.8 (±6.8)/16.6 (±11.0)/10.9 (±8.9) ng/ml (HC/ALD/NAFLD). A significant difference of C7M between ALD and HC was observed at baseline (p = 0.026). Baseline PRO-C7 was comparable between groups with a mean of 39.1 (±27.3)/41.6 (±30.2)/37 (±26.6) ng/ml (HC/ALD/NAFLD), p = 0.73. In all groups, the hepatic venous concentration of C7M increased gradually during the first 90 minutes and decreased to near baseline values after 180 minutes (Figure). The area under the curve (AUC) for C7M was 1,659 (±1,225)/2,456 (±1729) ng/ml (HC/ALD/NAFLD) during the 180 minutes (Figure). AUC\text{HC} for C7M was significantly higher than AUC\text{HC} (p = 0.0074, 95% CI: 495–2846) but not AUC\text{NAFLD} (p = 0.15, 95% CI: −350–2098). The difference between AUC\text{NAFLD} and AUC\text{HC} was not significant (p = 0.22, 95% CI: −513–2107). Hepatic and systemic IL-6 was significantly increased after 180 min (mean Normalized Protein eXpression (NPX) 0.62, 95% CI: 0.02–0.80, p = 0.03 and mean NPX 0.41, 95% CI 0.62, 95% CI: 0.24–1.01, p < 0.001, respectively). No change was observed in the hepatic venous concentration of PRO-C7 (Figure).

**Conclusion:** Acute alcohol intake induces a rapid increase in hepatic type VII collagen degradation assessed by C7M, indicative of gut-driven ECM damage. The associated IL-6 increase, suggests elevated inflammatory activity from a potential increased bacterial translocation.

**FRI-450 Implementation and outcomes of liver health check clinics in community alcohol services**
Islam Nassar1, Michael Griffiths1, Susan Kemp1, Douglas Macdonald1.
1Royal Free Hospital London, Hepatology, London, United Kingdom
Email: islam.nassar@nhs.net

**Background and aims:** According to the English National Drug Treatment Monitoring Service, 3105 clients drinking more than 50 units of alcohol a week are engaged in community alcohol services across Hertfordshire and North Central London. These services do not provide an assessment of liver disease. The earlier identification of cirrhosis in this group may facilitate detection of hepatocellular carcinoma (HCC) at a curable stage through surveillance and risk mitigation of complications of portal hypertension.

**Method:** As part of a National Cancer Program service evaluation, we implemented “Liver Health Check Clinics” (LHCC) in 9 community alcohol services in this region. These were delivered by clinician assistants who provided Fibroscan liver stiffness measurement (LSM) to pre-booked, self-booked and walk-in patients. Individuals with an LSM between 8.5 and 11.4 kPa were offered repeat elastography in 1 year. Those with an LSM >11.4 were offered immediate blood tests including a full liver screen and onward referral to local hepatology services with a liver ultrasound before their first appointment. All patients were given an information sheet with their LSM and an explanation of its significance.

**Results:** 344 clients attended LHCC for assessment between 15/09/2022 and 27/01/2023. 60% were pre-booked and 40% were walk-ins. 100% gave a history of drinking at least 50 units of alcohol for at least 1 month. A further 120 clients were booked but did not attend (36%). Figure 1 shows the distribution of valid LSM results. 37 patients (10.8%) had LSM >15 kPa and may benefit from long-term HCC surveillance. 24 patients (7%) met Baveno VI criteria for varices assessment (LSM >20 kPa or platelets <150), 15 (4.3%) patients had an LSM >25 kPa predictive of a high risk of decompensation and 10 patients (3%) had biochemical evidence of decompensation (low albumin, raised bilirubin and/or INR). The cumulative non-attendance rate at the first booked liver ultrasound was 8%.

**Conclusion:** Although there is a substantial non-attendance rate in LHCC, these slots can be readily filled by walk-in clients. Subsequent engagement in follow-up ultrasound has been high. 11% of clients have an LSM with a high predictive value for cirrhosis and may benefit from long-term HCC surveillance. A significant minority have evidence of clinically significant portal hypertension requiring varices assessment and/or prophylactic beta blockade. The impact of LHCC assessment and feedback on harmful alcohol use and repeat LSM will be assessed prospectively.
Background and aims: Increased alcohol sales during the COVID-19 pandemic restrictions have led to a significant increase of alcoholic hepatitis admissions in Alberta early in the pandemic. We aimed to evaluate the impact of the COVID-19 pandemic on hospitalizations in patients with AH in Alberta, Canada.

Method: We used the definition of the National Institute of Alcohol Abuse and Alcoholism (NIAAA) to identify patients admitted with AH in patients with AH in Alberta, Canada.

Results: We identified 1,413 hospitalizations for AH (552 pre-pandemic, 462 during the first year, and 399 during the second year of the pandemic). Women admissions were similar during these stages (40.2%, 39.8%, and 45.1%, respectively, p = 0.22). AH admissions were more likely in younger patients (median age: 48, 44, and 44 years old, respectively, p < 0.001) and those living in rural areas (22.5%, 39.2%, and 31.8%, respectively, p < 0.001). Average MELD-Na was similar between the three stages (24, 25, and 25, respectively, p = 0.39). The hospitalization rates significantly increased during the first year of the pandemic (133/100,000 hospitalizations) and second year of the pandemic (102/100,000 hospitalizations), compared to pre-pandemic (65/100,000) p < 0.001, Figure 1.

Conclusion: Since the beginning of the COVID-19 pandemic, AH admissions have particularly involved younger patients living in rural areas. Furthermore, admissions for AH peaked during the first year of the pandemic but remained elevated during the second year compared to pre-pandemic rates.
Conclusion: ALD patients showed a marked risk of developing CVD. While those who developed CVD had a significantly higher PRO-C6 at baseline, PRO-C6 did not show good prognostic accuracy in the current population.

**FRI-453**

**Bariatric surgery in alcohol dependence and alcohol-related liver disease**

Thomas Williams1,2, Andrew Palmer1,2,3, Gerald Holtmann1,2, Jason Connor4, Paul Clark1,2,3, 1Princess Alexandra Hospital, Department of Gastroenterology and Hepatology, Brisbane, Australia; 2University of Queensland, School of Medicine, Brisbane, Australia; 3Princess Alexandra Hospital, Alcohol and Drug Assessment Unit, Brisbane, Australia

**Background and aims:** Increased risk of alcohol dependence (AD) is recognised following bariatric surgery. Altered gastrointestinal anatomy and alcohol metabolism leads to more rapid increases and higher peaks of blood alcohol concentration. Such changes may enhance reward circuits, reinforcing alcohol ingestion and tolerance. Interactions of AD on liver disease has not been well-characterised using validated measures. We aimed to assess changes in AD and liver fibrosis, using validated tools, following bariatric surgery in patients reviewed within our quaternary Alcohol and Drug Assessment Unit (ADAU).

**Method:** Treatment seeking patients attending the ADAU with prior sleeve gastrectomy (SG) or Roux-en-Y gastric bypass (RYGB) were retrospectively identified. Patient demographics, comorbidities and surgical details were collected. Validated measures of AD, including Alcohol Use Disorders Identification Test (AUDIT) and brief Michigan Alcohol Screening Test (bMAST), were assessed pre- and post-surgery. FIB4 and APRI non-invasively assessed liver fibrosis before and after surgery.

**Results:** 20 patients with SG and 10 with RYGB were identified. Mean age at review was 49.0 years with 73.3% female. Mean reduction in body mass index (BMI) post-surgery was 14.5 ± SD 9.2 (d = 1.5, p < 0.001). Metabolic comorbidities were less frequent following surgery. Overall, mean AUDIT scores were low pre-operatively (10.2, SD 8.9), though 9 patients met criteria for AD (AUDIT score ≥13 in females, ≥15 in males). Mean AUDIT increased significantly post-surgery (18.1, SD 11.6; d = 1.6, p < 0.001). Interestingly, 29 patients met criteria for AD post-operatively. In those with pre-operative dependent-level AUDIT scores (mean AUDIT 22.5, SD 5.2), the mean AUDIT increased by 8.4 (p < 0.05). Patients with low risk AUDIT scores before surgery (mean 4.9, SD 2.6), observed more marked increases in mean AUDIT score post-surgery (mean change in AUDIT 26.8, p < 0.001). Changes in bMAST post-operatively reflected the AUDIT. Despite lower metabolic risk after surgery, mean FIB4 increased (mean change 0.98, SD 1.8; d = 0.5, p = 0.003). The mean increase in APRI score was 0.41 ± SD 0.83 (d = 0.49, p = 0.006).

**Conclusion:** Post-bariatric surgery, significant increases in AD were observed in patients seeking treatment. While validated scores of dependence worsened in those with likely unrecognised AD, larger increases in dependent-level AUDIT score occurred in those with low pre-operative AUDIT-screened risk. Liver fibrosis scores increased for many despite reduction in metabolic risk factors, suggesting an alternate driver of disease progression. This suggests de novo AD may be important in explaining poor liver outcomes for some after surgery. Our work supports more intensive assessment and possibly lower thresholds of risk screening for AD and liver disease pre-bariatric surgery.

**FRI-454**

**Risk factors for acute myocardial infarction in patients with alcohol-related liver cirrhosis—a nationwide register-based nested case-control study**

Emma Celia Herting1, Konstantin Kazankov1, Peter Jepsen1, 1Aarhus University Hospital, Hepatology and Gastroenterology, Aarhus, Denmark

**Background and aims:** Alcohol-related cirrhosis (ALD cirrhosis) predisposes patients to bleeding as well as to thrombosis. Its effect on acute myocardial infarction (MI) is weaker than its effect on other arterial or venous thromboses, and the reasons for this pattern are unclear. The aim of this study was to describe risk factors of MI amongst patients with ALD cirrhosis.

**Method:** This nationwide register-based nested case-control study included all Danish patients diagnosed with ALD cirrhosis in 2000–2019. Patients with first-time MI after the diagnosis of ALD cirrhosis were identified as cases. Per case, 10 ALD cirrhosis patients with no history of MI were selected as controls, using risk-set sampling. Controls were matched on time since cirrhosis diagnosis and calendar year. We used conditional logistic regression to study the association between risk factors and incidence rate ratio (IRR) of MI. Risk factors included gender, age, comorbidities, and events occurring less than 30 days before MI.

**Results:** 373 cases with MI were included and matched with 3,730 controls. The median age was 59.0 years in cases and 56.0 years in controls. 76.4% of cases and 65.2% of controls were male (adjusted IRR 2.61 [95% CI 2.15–3.17]). We identified the following risk factors for MI: history of atherosclerosis (26.5% of cases versus 11.0% of controls, aIRR 2.15 [95% CI 1.27–3.61]), history of cardiac ischemia (23.1% of cases versus 31.0% of controls, aIRR 2.75 [95% CI 1.93–3.90]), hospitalization for infection (aIRR 2.09 [95% CI 1.27–3.43]), recent surgery (aIRR 1.83 [95% CI 1.19–2.82]) or recent out-of-hospital treatment with antibiotics (aIRR 1.46 [95% CI 1.00–2.75]).
Figure: Associations between potential risk factors and incidence rate ratio of acute myocardial infarction

<table>
<thead>
<tr>
<th></th>
<th>Crude IRR(95% CI)</th>
<th>Adjusted IRR(95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>1.72 (1.35–2.11)</td>
<td>1.65 (1.27–2.15)</td>
</tr>
<tr>
<td>Age, pr year</td>
<td>1.04 (1.03–1.06)</td>
<td>1.03 (1.02–1.04)</td>
</tr>
<tr>
<td>Events in the previous 30 days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospitalization of infection</td>
<td>2.69 (1.74–4.15)</td>
<td>2.09 (1.27–3.43)</td>
</tr>
<tr>
<td>Hospitalization of complication of liver disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ascites</td>
<td>1.39 (0.86–2.26)</td>
<td>1.18 (0.69–2.00)</td>
</tr>
<tr>
<td>Spontaneous bacterial peritonitis</td>
<td>2.00 (0.23–17.12)</td>
<td>1.12 (0.12–10.50)</td>
</tr>
<tr>
<td>Gastrointestinal bleeding</td>
<td>2.11 (1.18–3.75)</td>
<td>1.42 (0.74–2.75)</td>
</tr>
<tr>
<td>Prescribed Antibiotics</td>
<td>1.83 (1.30–2.58)</td>
<td>1.46 (1.00–2.14)</td>
</tr>
<tr>
<td>Surgery</td>
<td>2.95 (2.02–4.31)</td>
<td>1.83 (1.19–2.82)</td>
</tr>
<tr>
<td>Comorbidities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atherosclerosis</td>
<td>3.12 (2.40–4.06)</td>
<td>1.93 (1.43–2.61)</td>
</tr>
<tr>
<td>Cardiac ischemia</td>
<td>10.58 (7.62–14.68)</td>
<td>6.99 (4.93–9.90)</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease</td>
<td>2.89 (2.13–3.92)</td>
<td>2.20 (1.58–3.08)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>1.67 (1.29–2.16)</td>
<td>1.15 (0.86–1.55)</td>
</tr>
</tbody>
</table>

Conclusion: Among patients the ALD cirrhosis, the incidence rate of MI was higher for those who had history of atherosclerosis or cardiac ischemia, were hospitalized because of infection, had surgery, or received antibiotics treatment in the community in the previous 30 days. Our findings contribute to the understanding of risk factors for MI in patients with ALD cirrhosis. They may have clinical implications e.g., for the decision to offer thromboprophylaxis.

FRI-455

Opportunistic cirrhosis casefinding in alcohol dependent inpatients through alcohol specialist nurse assessment and transient elastography: early detection in a high risk group

Ann Archer1, 2, Molly Thorpe1, Saswata Roy1, Charlotte E. Davies1, Rosie Parnham1, Grace Cameron1, Lucy Krouma1, Fiona Gordon1, Kushala Abeysekera1, 2. 1University Hospitals Bristol and Weston NHS Foundation Trust, Bristol, UK, Liver Medicine, Bristol, United Kingdom; 2University of Bristol, Population Health Science, Bristol, United Kingdom

Email: ann.archer@uhb.w.nhs.uk

Background and aims: Europe has the highest per capita alcohol consumption and alcohol-related loss of disability adjusted life years compared with other WHO regions, with many countries seeing a rapid rise in alcohol related harms. Despite this, there is still widespread failure to recognise alcohol-related liver disease early before patients present with decompensation. Many patients with alcohol use disorder present frequently with unscheduled admissions to hospital, providing an opportunity for engagement with addiction and hepatology services. We sought to evaluate opportunistic testing for cirrhosis in this vulnerable patient group who often experience barriers to accessing healthcare.

Method: Our transient elastography (TE)-trained alcohol specialist nurses (ASNs) offered TE to patients with alcohol dependence and no previous diagnosis of cirrhosis. Those with elevated liver stiffness measurements (LSM) of ≥12 kPa were offered follow-up in hepatology clinic or assessed during their admission by a hepatologist. Paired t-test was used to assess mean differences between groups pre- and post-intervention.

Results: Between April and December 2022, 94 patients at the Bristol Royal Infirmary, UK were offered TE during emergency admissions by ASNs (23% F; median age 55 (IQR 18.5)); 27 people (30.8%) with LSM of ≥12 kPa (median IQR/M 11.5%) were identified as having probable alcohol related cirrhosis. Of these, 9 had LSM ≥25 kPa suggestive of clinically significant portal hypertension (CSPH). 27% (n = 25/94) of patients post-TE subsequently engaged with outpatient addiction services. Of those who had recorded alcohol consumption (n = 38/94), a trend towards lower units consumed post ASN review and TE assessment was observed; pre admission mean alcohol consumption was 31 units/day (SD: 25.8) falling to 20.5 units/day (SD: 25; t (37) = 3.2; p = 0.003) post admission. Of the 94 patients screened, 4 patients died within the nine month period, 2 of whom had been identified with cirrhosis.

FRI-456

Potential gut microbial biomarkers for detection of sarcopenia in alcohol-related liver disease patients

Haripriya Gupta1, Sang Joon Yoon2, Jin-Ju Jeong2, Satya Priya Sharma2, Raja Ganesan2, Sung-Min Won2, Ki Tae Suk2, 3. Hallym University, Institute for Liver and Digestive Diseases, Korea, Rep. of South; 2Institute for Liver and Digestive Diseases, Hallym University, Korea, Rep. of South; 3Institute for Liver and Digestive Diseases, Hallym University College of Medicine, Department of Internal Medicine, Korea, Rep. of South

Email: ktsuk@hallym.ac.kr

Background and aims: Sarcopenia and alcohol-related liver disease (ALD) are closely related. Not only the liver, but excessive intake of alcohol also increases the catabolism of proteins under stress and inflammation conditions affecting function of skeletal muscles. Gut dysbiosis is thoroughly studied in ALD, however gut dysbiosis under sarcopenia condition in ALD is not well known. So, we aim to determine predictors of sarcopenia using gut microbiota and correlation with the sarcopenia indices in patients with ALD with or without sarcopenia.

Method: Total 177 subjects (healthy control (HC), sarcopenia control (SC) and ALD patients) were enrolled for this study. ALD patients were further categorized under non-sarcopenia (HC, n = 48 and ALD, n = 68) and sarcopenia groups (SC, n = 11 and S-ALD, n = 50) according to the appendicular skeletal mass (ASM) divided by height (meter) squared index. Liver function test, sarcopenia indices were performed, and stool microbiome analysis by 16S rRNA-based sequencing were examined through EzBioCloud Database.

Results: Analysis of variance of sarcopenia indices (subcutaneous, visceral, and appendicular skeletal muscle, ASM/H2 index) between the four groups (HC, SC, ALD and S-ALD) revealed significant decreased in S-ALD vs ALD group (p < 0.01). In gut microbiome analysis revealed significant shifts in the gut microbiome in sarcopenia group vs non-sarcopenia groups in ALD. Relative abundance of phylum Bacteroides and Proteobacteria was found to significantly decrease (p < 0.001) and increase (p < 0.05) respectively in S-ALD vs ALD group. Species Phocaeicola arenii, Phocaeicola
**Poster Presentations**

**FRI-457**

**Validation of the Lille 4 score on a cohort of romanian severe alcoholic hepatitis patients**

Bumbu Andreea Livia¹, Adelina Horhat², Mina Ignat³,  
Horia Stefanescu⁴, Bogdan Procopet²,³,  
Juliu Hatjeancu University of Medicine and Pharmacy, Gastroenterology, Cluj-Napoca, Romania;  
University of Medicine and Pharmacy, Cluj Napoca, Romania;  
Regional Institute of Gastroenterology and Hepatology, Cluj Napoca, Romania;  
Regional Institute of Gastroenterology and Hepatology, Liver Unit and Clinical Ultrasound Department, Cluj Napoca, Romania

Email: andreea_bumbu@yahoo.com

**Background and aims:** Severe alcoholic hepatitis (sAH) has a high mortality rate. Corticoids are the only pharmacological means to improve short term survival, though burdened by their side effects. We aimed to validate the Lille 4 score on a population of sAH from our center in Cluj-Napoca, Romania.

**Method:** We enrolled 103 consecutive patients with a clinical suspicion of sAH (Maddrey DF>32). All patients underwent transjugal liver biopsy. The indication of prednisone was based on histological criteria, i.e. AHHS>6. The Lille 4 and Lille 7 scores were calculated and the correlation between these and the short (1 month) and medium/long term survival was analysed. Secondly, we analysed the benefit of subdividing the cut-off values into the intervals proposed by Mathurin et al in 2011- complete responders (Lille score ≤0.16), partial responders (Lille score 0.16–0.56) and null responders (Lille score ≥0.56).

**Results:** The bivariate analysis showed a high correlation between the responders at day 4 (Lille <0.45) and the ones at day 7 (Pearson coefficient 0.766, p < 0.001) and a very high correlation between the responders at day 7 and the ones at day 4 (Pearson coefficient 1, p < 0.001), respectively.

In the Lille 7 responder group, 12 patients (11.6%) died in the first month (p = 0.047), while in the Lille 4 responder group, 8 patients (7.7%) died in the first month (p = 0.041). The analysis of the Lille subgroups showed that out of 103 patients, 43 (41.74%) were situated in the complete responder group (Lille score ≤0.16), 39 (37.86%) in the partial responders group (Lille score 0.16–0.56) and 21 (20.38%) in the null responders group (Lille score ≥0.56), respectively. The mean survival of complete responders was 19.3 months (14.4–24.2; 95% CI), of partial responders was 18.6 months (12.6–24.7; 95% CI) and of null responders was 2.2 months (0.5–4.0; 95% CI) (Figure).

**Conclusion:** The Lille 4 score is a good substitute for Lille 7, and it’s validation has the potential to lower the infectious and bleeding events rate. The responder status correlates with the short term survival, but doesn’t influence the long term. The subdivision into the proposed intervals highlights a group of patients-the partial responders- that have a similar survival to the complete responders. The null responders have a significantly lower survival.

**FRI-458**

**Evaluation of histological differences between cirrhosis due to alcoholic-related liver disease and non-alcoholic steatohepatitis using automated fibrosis phenotyping of liver histology**

Masanori Fukushima¹, Hisamitsu Miyaka¹, Yasuhiko Nakao¹,  
Kyu Sasaki¹, Satoshi Miuma¹, Shinji Okano¹, Kazuhiko Nakao¹,  
Masanori Fukushima¹, Hisamitsu Miyaka¹, Yasuhiko Nakao¹,  
Masanori Fukushima¹, Hisamitsu Miyaka¹, Yasuhiko Nakao¹,  
¹Nagasaki University Graduate School of Biomedical Sciences, Department of Gastroenterology and Hepatology, Japan; ²Nagasaki University Graduate School of Biomedical Sciences, Department of Pathology, Japan

Email: ma-fukushima@nagasaki-u.ac.jp

**Background and aims:** Cirrhosis due to alcoholic-related liver disease (ALD) and non-alcoholic steatohepatitis (NASH) are different diseases with similar histopathology, and histological discrimination can be difficult. Although the distinction between ALD and NASH is defined by the amount of alcohol consumed, there is no sufficient consensus because of individual differences in the effects of alcohol. Therefore, it is desirable to establish new diagnostic criteria to objectively diagnose ALD and NASH. In recent years, digital analysis of pathology has become possible with whole slide imaging systems, which can convert pathology specimens into high-resolution digital images, enabling comprehensive quantitative analysis of pathological parameters using AI. The purpose of this study was to find histological differences between ALD and NASH by analysing more than 300 histological fibrosis phenotypic features.

---

![Image](image-url)
Method: Thirty-six patients with cirrhosis due to ALD and 17 patients with cirrhosis due to NASH who underwent liver transplantation at Nagasaki University Hospital between January 2000 and December 2020 were included. Tissues of recipient-extracted livers were stained with SiriusRed and imported for digital pathology imaging. The FibroNest™ quantitative digital pathology platform (PharmaNest, Princeton, NJ, USA) was used to quantify the histological phenotype of fibrosis, including collagen amount and structure (12 traits), morphometric traits of the collagen fibres (13 traits), and architecture of fibrosis (7 traits). Each trait considers mean, variance, skewness, kurtosis, and progression, for a total of over 300 parameters to compare differences in histological features between ASH and NASH.

Results: The 36 patients with ALD and 17 patients with NASH did not differ in terms of age, BMI, MELD score, or serum hyaluronic acid level. There were significantly more males in the ALD group. Analysis using FibroNest showed no significant differences in collagen amount, structure, and architecture of fibrosis between the two groups. However, morphometric traits of the collagen fibres were significantly different between the two groups. As for morphological traits, the NASH group was characterized by assembled collagen, which defined a complex skeleton with a high number of nodes and branches, were short in length, thin, and small in area. On the other hand, the ALD group had significantly more fine collagen than the NASH group. Using the Phenotypic Fibrosis Composite score (Ph-FCS) created from 350 quantitative fibrosis traits normalized to their maximum value in the group and then averaged, a diagnosis of ALD/NASH was possible with a sensitivity of 86% and specificity of 94% when the cut-off value was set at 4.35 (Figure).

Conclusion: The analysis of fibrosis patterns by digital pathology suggested the possibility of discriminating the histological diagnosis of ALD/NASH by differences in fibrosis morphology.

FRI-459
Radiomic data can define phenotypes of acute alcoholic hepatitis
Nawaz Safdar1, Amy Hicks2, Yun Chew2, Craig Roe3, Sabina Choudhry4, Ashwani Singal5, Richard Parker2, 1University of Leeds, School of Medicine, Leeds, United Kingdom; 2Leeds Teaching Hospital Trust, Leeds Liver Unit, Leeds, United Kingdom; 3Leeds Teaching Hospital Trust, Radiology, Leeds, United Kingdom; 4Avera Medical Group, Radiology, Sioux Falls, United States; 5University of South Dakota, Sioux Falls, United States
Email: richardparker@nhs.net

Background and aims: Alcohol associated-hepatitis (AAH) is an acute manifestation of alcohol-related liver disease with a 90-day mortality of ~30%. This study aimed to identify phenotypes of AAH based on radiological measures of hepatic volume and steatosis.

Method: Consecutive patients with a clinical diagnosis of AAH based on the NIAAA definition who had undergone computed tomography (CT) imaging of the abdomen within 10 days of admission were included. AAH phenotypes were defined using hepatic steatosis (HS), calculated using a liver/spleen attenuation ratio, and adjusted liver volume (aLV) calculated as a ratio of observed: predicted liver volume using the formula published by Vauthey et al (2002). Radiological anthropometric data were collected using Hepatic VCAR (GE HealthCare, UK) and Vitrea (Canon, USA), and biochemical data were collected from electronic health records. Patients were assigned to three distinct phenotypes: small non-fatty (SNF), intermediate, and large fatty (LF) based on tertiles for HS and aLV (Figure 1). No specific study procedures were performed, and individual patient consent was not sought. All analyses were performed using R.

Figure:

Conclusion: The analysis of fibrosis patterns by digital pathology suggested the possibility of discriminating the histological diagnosis of ALD/NASH by differences in fibrosis morphology.
Background and aims: New patient referrals to specialist hepatology clinics are increasing. Alcohol remains a common problem for Irish healthcare. Concentrated efforts are required to establish which patients referred can be managed in primary care, thus improving specialist access for more complex cases. The aims of this prospective study were to evaluate new referrals to hepatology clinic in MMUH and to assess the impact of a hepatology nurse specialist. We also aimed to evaluate patterns of alcohol consumption in these new referrals and the correlation with phosphatidylethanol levels (PEth) testing.

Method: New patients to clinic were reviewed by a hepatology nurse specialist. A questionnaire was completed including referral details, basic demographics and alcohol consumption data. Bloods including Pebth and transient elastography (TE) were performed. Following review by a consultant hepatologist, patients with alcohol or non-alcohol related steatosis with low TE scores (<6Kpa) were discharged to their GP with lifestyle advice.

Results: 380 new patients were reviewed over 7 months, 53.75% male with a mean age 50.69 years (±15.29). Mean BMI was 28.98 kg/m²

Figure:

Conclusion: Our study shows that the initial nurse led clinic is a useful adjunct in identifying which patients can be managed in a primary care setting after appropriate screening investigations, thus freeing up space in the doctor clinic to manage more advanced patients. Two thirds of our patients consume alcohol, with one third at hazardous levels with Peth testing being a useful tool in identifying these patients. Equally, in patients who report alcohol abstinence, their history is generally very reliable without the need for further confirmatory PEth testing.

FRI-461
Carbohydrate-deficient transferrin is a suitable drinking marker for patients with metabolic dysfunction-associated fatty liver disease
Kazuyoshi Kon1, Maki Morinaga1, Akira Uchiyama1, Hiroo Fukada1, Toshifumi Sato1, Shunheii Yamashina1, Kenichi Ikejima1, Juntendo University School of Medicine, Department of Gastroenterology, Japan
Email: kazukon@juntendo.ac.jp

Background and aims: In 2020, an international expert group newly proposed the definition of metabolic dysfunction-associated fatty liver disease (MAFLD). MAFLD focuses on obesity and metabolic syndrome-related diseases, not exclude alcohol-related steatohepatitis; it is essential to objectively evaluate alcohol consumption as well as glycolipid metabolism in clinical practice. In this study, we examined the usefulness of measurement of carbohydrate-deficient transferrin/total transferrin ratio (%CDT) in patients with MAFLD.

Method: A total 121 patients who visited our hospital from September 2018 to November 2021 and were diagnosed with fatty-related liver disease, including alcohol-related liver disease and non-alcoholic fatty liver disease, were evaluated according to MAFLD diagnostic criteria of the International Consensus Panel. They were classified into a MAFLD group (n = 95) and a non-MAFLD group (n = 26). Controlled attenuation parameter (CAP) value of ≥220 dB/m was defined as fatty liver. ROC analysis was performed to evaluate the diagnostic usefulness of %CDT, mean corpuscular volume (MCV), and gamma-glutamyl transpeptidase (γGT) as drinking markers for non-to light-drinkers (<210 g/week for men, <140 g/week for women) and heavy drinking (≥420 g/week). In addition, we analyzed the effects of alcohol consumption, age, gender, hepatic enzymes, lipids, blood glucose levels, CAP levels, and liver stiffness on each marker by multiple regression analysis.

Results: In the MAFLD group, the diagnostic power of non- to light-drinking by %CDT was higher than AUROC 0.78 (cut-off 1.78%; sensitivity 73%, specificity 76%), which was higher than AUROC 0.71 in MCV and AUROC 0.69 in γGT. AUROC for %CDT was 0.78 (cut-off 2.08%; sensitivity 55%, specificity 88%), which was higher than 0.69 in AUROC for MCV or AUROC 0.66 in AUROC for γGT. Even in the non-MAFLD group, the %CDT value remained high AUROC values, 0.88 for non-to light-drinking detection and AUROC 0.83 for heavy drinking, whereas other markers tended to increase in the non-MAFLD group more markedly than in the MAFLD group. (MCV: non-to light-drinker 0.90, heavy drinker 0.81, γGT: non-to light-drinker 0.78, heavy drinker 0.74). In the multiple regression analysis, only alcohol consumption was an independent factor for %CDT in both the MAFLD and non-MAFLD groups. In contrast in γGT, alcohol consumption was not a significant factor in either the MAFLD group or the non-MAFLD group, and AST and triglycerides levels were detected as significant factors in the MAFLD group.

Conclusion: Measurement of %CDT showed high AUROC values in the detection of non-to light-drinkers and heavy drinkers regardless of MAFLD or non-MAFLD. MCV and γGT values were affected by dyslipidemia and liver damage, and rather favorable AUROC values were shown in the non-MAFLD group. %CDT was shown to be a very useful marker for the objective evaluation of alcohol consumption in the diagnosis and treatment of MAFLD.

FRI-462
Early liver transplantation for acute alcoholic hepatitis in a Spanish liver transplant center
Victoria Aguilea Sanchez1,2,3, Sonia García-García1, Sarai Romero Moreno2, María García Eliz1,4, Isabel Conde1,5, Javier del Hoyo6, Carmen Castillo6, Sagrario Gutierrez6,

Email: aoifemoriarty@eril.ie
Background and aims: Liver Transplantation (LT) for acute alcoholic hepatitis (AAH) has become an accepted treatment for selected patients. However, the inclusion in the waiting list and access to LT remains limited in our country.

Aims: (i) To describe the number of patients admitted due to AAH during 2015–2021 divided in 3 temporal cohorts and (ii) to evaluate access to LT and reasons for not being included were recorded.

Method: Patients admitted due to AAH during 2015–2021 were recorded and divided in 3 temporal cohorts (1:2015–2017, 2:2018–2019, 3:2020–2021). The demographics, social features, NIAAA criteria and severity of AAH assessed by Maldreyy and MELD were recorded. Access to LT and reasons for not being included were recorded.

Results: 61 patients were admitted during these years (NIAAA probable criteria in 87%). There was a trend towards higher admissions in last cohort (1:33%, 2:16% and 3:51%). Mean age was 55 years, 75% were men, 73% were from Spain and rest were from foreign countries. Only 25% were married. Social risk was moderate-high in 77% of patients. 61% had cirrhosis at admission, median MELD was 21 and Maldreyy 43. Treatment with corticoids was indicated in 38 (62%) but only 31 received treatment and 17 patients were considered non-responders at 7 day (Lille score). 24 patients (non-responders to corticoids (n = 17) and those who did not received them (n = 7)), were evaluated as potential early LT candidates for AAH. Reasons for not included in the waiting list were: addiction risk (n = 8), high social risk (n = 4), improvement in liver function (n = 4), contraindication due to medical condition (n = 5). Only 1 patient (1.6%) was included on the waiting list due to AAH but died before LT and 2 patients were included after 6 months of abstinence. 1, 3 and 5 year survival was 69, 44 and 41%. High social risk and non-maintained abstinence were associated with mortality.

Conclusion: Admissions due to AAH has increased during the last years, potentially related to COVID pandemia. Access to LT is very limited (<2%) at our center, mainly due contraindiations related to social or addiction comorbidities. Both aspects should be managed intensively in order to improve the prognosis of those patients.

FRI-463
Identification of risk factors for alcohol relapse in liver transplant patients with alcohol-related liver disease
Dilara Turan1, Fulya Güneş2, Murat Harputluoglu3,
Gökhan KaBaça4, Hale Gokcan5, Murat Akylidiz6, Mesut Akarsu7,
Gupse Adali8, Derya Ari1, Ilker Turan2, Nilay Danis7, Ulus Akcar2,
Esra Durmaz2, Genco Gencda2, Murat Aladag3,
Murat Taner Gulsen4, Ozan Sarikaya2, Volkam Yilmaz2, Zeki Karasu2,
Ramazan Idilman2, Meral Akdogan Kayhan1.

Background and aims: Alcohol-related liver disease (ALD) is one of the most common causes of liver transplantation (LT). Although alcohol relapse after LT negatively impacts the graft and patient survival rates, predictors for alcohol relapse are not yet well defined. This study aimed to determine risk factors for alcohol relapse after LT.

Method: Patients with ALD who underwent LT from 9 different transplantation centres were assessed. Demographic and clinical features such as family support, alcohol consumption habits, educational level, whom the patient resided with, length of abstinence of alcohol before LT, marital status, age at transplantation, and smoking habits were evaluated and statistically analyzed. The chi-square test was used to evaluate categorical variables.

Results: A total of 124 patients with ALD, consisting of all males (100%) with and mean age of 52.9 ± 9.6 years, were recruited for evaluation of the alcohol relapse. The mean follow-up time was 65 ± 54.2 months (range: 6 months–238 months). The mean MELD-Na score before LT was 21.6 ± 5.7. Twenty and eight patients reported consumption of alcohol following LT: all patients began drinking alcohol within the first 5 years of the posttransplant period (mean relapse time: 18.5 ± 3.2 months). Most patients had heavy alcohol consumption (53%, >210 g/day), there was no relationship between alcohol relapse and being a heavy drinker (p = 0.254). While fifty patients (40%) did not adhere to the “6-month rule” of alcohol abstinence before LT, it was found that their rate of alcohol relapse did not statistically increase after LT (p = 0.405). Approximately 30% of the patients reported strict adherence to alcohol abstinence during Ramadan time. Remarkably, marital status was related to higher rates of posttransplant alcohol abstinence success (p = 0.010).

Table 1: Risk factors of alcohol relapse after LT evaluated in patients (n = 124)

<table>
<thead>
<tr>
<th>n (%)</th>
<th>Relapse (n = 28)</th>
<th>No Relapse (n = 96)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &lt;50 years at Tx</td>
<td>11 (39.2)</td>
<td>29 (30.2)</td>
<td>0.248</td>
</tr>
<tr>
<td>Married</td>
<td>16 (57.1)</td>
<td>77 (80.2)</td>
<td>0.010</td>
</tr>
<tr>
<td>Social support</td>
<td>19 (67.8)</td>
<td>78 (81.2)</td>
<td>0.060</td>
</tr>
<tr>
<td>Family history of alcohol use</td>
<td>15 (53.5)</td>
<td>51 (53.1)</td>
<td>0.340</td>
</tr>
<tr>
<td>Smoker</td>
<td>20 (71.4)</td>
<td>53 (55.2)</td>
<td>0.110</td>
</tr>
<tr>
<td>Pre-LT abstinence &lt;6 months</td>
<td>10 (35.7)</td>
<td>39 (40.6)</td>
<td>0.405</td>
</tr>
<tr>
<td>Alcohol consumption during Ramadan (Yes)</td>
<td>5 (17.8)</td>
<td>32 (33.3)</td>
<td>0.102</td>
</tr>
<tr>
<td>Donor (Living Liver)</td>
<td>19 (67.8)</td>
<td>54 (66.6)</td>
<td>0.550</td>
</tr>
</tbody>
</table>

Conclusion: In our study, being married was linked to a lower rate of relapsing back to drinking. There was no increase in the rate of relapsing back to drinking among patients who had transplants without following the 6-month rule. The results of this study indicated that multifactorial predictors strongly influenced post-transplantation alcohol consumption among patients. All patients
should be comprehensively assessed in regard to multiple factors to determine whether or not the patient is eligible for LT.

FRI-464
Costs of hospital management of acute alcoholic hepatitis
Lucy Turner1, Richard Parker1, Kath Chapman2. 1Leeds Teaching Hospital Trust, Leeds Liver Unit, Leeds, United Kingdom; 2Leeds Teaching Hospital Trust, Finance, Leeds, United Kingdom
Email: richardparker@nhs.net

Background and aims: Alcoholic hepatitis is an acute manifestation of alcohol related liver disease (ARLD) with a high short-term mortality. Patients with AH are often very unwell and require significant healthcare resources.

Method: We used the ALLHEAL observational study of patients with ARLD to derive the cost of admissions to hospital with AH or other types of liver disease for individual patients. The cause of admission was recorded as per hospital discharge coding using ICD-10 codes. Validation of coded diagnoses was done by reviewing hospital records and laboratory values. Costs are reported in pounds sterling (£) with Euro (€, 1 GBP = 1.12 EUR) and US dollar ($, 1 GBP = 1.22 USD) equivalent values. Hospital episode statistic (HES) reports for the NHS in England were used to estimate the costs of alcoholic hepatitis to the health service in England.

Results: Two hundred and sixteen patients recruited into ALLHEAL had a total of 2,947 hospital admissions over a five year period including 124 (4%) due to primary diagnosis of AH, and a further 183 admissions (6%) had AH as a secondary diagnosis. The average cost of a primary admission with alcoholic hepatitis was £3,880 (SD 3,369) (£4,377, $4,745). Secondary admissions with AH cost an average of £3,461 (SD 2,901), (£3,904, $4,232). The average costs of non-AH admissions with ARLD was £1,004. HES data showed that in 2021–22 there were 2,749 primary admissions to hospital in England with AH and 10,022 secondary admissions, with a clear increase in both types of admission over the past decade. Scaling up ALLHEAL costs based on HES data showed that costs to the health service in England in 2021–22 were £10,666,120 for primary admissions and £34,686,142 for secondary admissions.

Conclusion: Hospital admissions with AH are expensive, costing on average three times as much as admissions with other diagnoses. The cost to the health service is considerable: based on the admissions in this series, we estimate that the NHS in England spent a total of nearly £45 million on caring for patients with AH in the last financial year. Better treatments are urgently required to address this significant burden to the healthcare system.

FRI-465
Adverse childhood experiences as a background for alcoholic liver disease-cohort analysis of risk score in ALD and non-ALD cirrhosis patients in comparison with the control group
Karolina Sulejova1. 1University Hospital F.D. Roosevelt Banska Bystrica, Department of Internal Medicine Div Hepatology, Gastroenterology and Liver Transplantation, Banska Bystrica, Slovakia
Email: sulejovakarolina@gmail.com

Background and aims: The alcoholic liver disease represents the main cause of liver cirrhosis in the Slovak republic. An important position in the development of addiction has childhood trauma. Child abuse, neglect, and other traumatic experiences contribute to the development of risky patterns of behavior leading to the evolution of cirrhosis. The Adverse Childhood Experience Questionnaire is a rating scale evaluating the main risky domains for the development of addiction, and it could play as an indicator for cirrhosis development.

Method: In the following period, we evaluated adverse childhood experiences by the 10-item questionnaire in all patients enrolled in the local register of cirrhosis. The end point of this study was to assess the risk score for ALD and non-ALD groups in contrast with the cut-off value for the peril of addiction. According to the questionnaire, we tried to analyze the high-risk domain for the development of alcoholic liver disease. Finally, we compared the ACE risk score in ALD, non-ALD, and control groups, which were represented by university students.

Results: ACE score in a cohort of patients with alcohol cirrhosis reached 3.21 points (2.88-3.54 points). In comparison, the ACE score in non-ALD cirrhosis was 1.26 points, and in the cohort of university students 1.32 points. The main domains of ACE for ALD were sexual and physical abuse, alcohol addiction, and depression in the family.

Figure:

Conclusion: The higher score in ACE-Q reflects grave childhood trauma which represents the risk for addiction and correlates with the prevalence of ALD-cirrhosis in our local register. We assume that a higher number of points from ACE-Q could predict the development of alcoholic hepatitis and alcoholic cirrhosis and simultaneously could be a useful predictive tool for recurrence of thy abuse after liver transplantation.

Cirrhosis and its complications ACLF and Critical illness

WEDNESDAY 21 TO SATURDAY 24 JUNE

TOP-040
Evaluation of albumin and midodrine versus albumin alone in the outcome of refractory ascites in patients with decompensated cirrhosis: a randomized controlled trial (NCT04816240)
Rakhi Maitiwal1, Priti Jain1, Shiv Kumar Sarin1, Manoj Kumar1, Deepak Tempe1, Shalini Thapar1, Anupam Kumar1, Vijayraghavan Rajan1, Prashant Agrawal1. 1Institute of Liver and Biliary Sciences, New Delhi, India
Email: rakhi_2011@yahoo.co.in

Background and aims: Long term albumin has been recently shown to improve outcomes of uncomplicated ascites. Refractory ascites (RA) is a severe form of ascites wherein the hemodynamic alterations are further impaired and patients have marked vasodilatation and impaired renal perfusion. Midodrine acts on the alpha-adrenergic receptors, producing an increase in vascular tone and elevation of blood pressure. There are no studies on using combination of midodrine and albumin compared to albumin alone in improving liver related outcomes in RA. We studied efficacy of combining
midodrine with intravenous albumin (A-MIDO) versus albumin alone (A-PLAC) in 6-month mortality in RA.

**Method:** We conducted an open-label randomized controlled trial of 112 patients. A-MIDO group (55 patients) received albumin started at 80 gm/week for 2 weeks followed by 40 gm/week and midodrine started at 15 mg and increased up to 45 mg a day with target mean arterial pressure (MAP) of >75 and <90 mm Hg, while Group 2 (57 patients) received albumin and placebo. Competing risk survival analysis was performed with liver transplant (LT) and transjugular intrahepatic portosystemic shunt (TIPS) placement as competing events. Primary end point was survival free of LT and TIPS at 6 months and secondary end points were liver-related complications, impact on frailty and renal hemodynamics.

**Results:** Cirrhosis patients with RA [54 years age, 86.6% males, 48.2% alcohol] in both the groups were comparable at baseline; MELD Na [24.25 ± 5.85 vs. 25.95 ± 5.86; p = 0.13], MAP (mmHg) [72.18 ± 4.91 vs. 73.26 ± 5.51; p = 0.23], serum albumin (g/dL) [2.66 ± 0.39 vs. 2.69 ± 0.36; p = 0.53] and eGFR [79.68 ± 25.29 vs. 81.63 ± 56.21; p > 0.05]. Mean dosage of midodrine was 22.30 ± 5.15 mg at 6 months in A-MIDO. LT and TIPS free survival were significantly better in A-MIDO [74.5% vs 54.4%; p = 0.01]. On competing risk survival analysis, hazard ratio [2.29 (95% CI 1.09-4.48)]. Cumulative incidence of paracentesis induced circulatory dysfunction and therapeutic paracentesis were high in A-PLAC [20% vs 35.1%; p = 0.07, 3.69 ± 2.18; p = 0.00]. Liver related events were high in A-PLAC, hepatic encephalopathy [p = 0.01], acute variceal bleed [p = 0.04]. A significant decline in renal functions was seen in A-PLAC; hepatorenal syndrome (HRS)-acute kidney disease [18.2% vs. 7%; p = 0.07] while HRS-chronic kidney disease [10.9% vs. 26.3%; p = 0.03]. Similar results were observed in the per-protocol analysis.

### Events in 6 months

<table>
<thead>
<tr>
<th></th>
<th>A-MIDO</th>
<th>A-PLAC</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of hospitalizations (%)</td>
<td>35.1%</td>
<td>60%</td>
<td>0.03</td>
</tr>
<tr>
<td>MELD Na (mean ± SD)</td>
<td>20.20 ± 9.89</td>
<td>20.30 ± 10.09</td>
<td>0.00</td>
</tr>
<tr>
<td>Frailty index</td>
<td>1.91 ± 0.78</td>
<td>2.53 ± 0.57</td>
<td>0.00</td>
</tr>
<tr>
<td>Reintroduction of beta-blockers (%)</td>
<td>54.54</td>
<td>17.5</td>
<td>0.00</td>
</tr>
<tr>
<td>MAP at 6 months (mmHg)</td>
<td>77.47 ± 4.43</td>
<td>73.16 ± 5.18</td>
<td>0.00</td>
</tr>
</tbody>
</table>

**Conclusion:** The combination of Midodrine and albumin is better for LT and TIPS free survival and lesser liver related complications by improving hemodynamics and renal functions in RA.

**TOP-049 Increased level of presepsin in patients with acutely decompensated cirrhosis predicts development of acute-on-chronic liver failure**

Alberto Zanetto1, Monica Mion2, Alberto Ferrarese3, Sarah Shalaby1, Giacomo Germani1, Martina Gambato1, Francesco Paolo Russo1, Fabio Farinati1, Daniela Basso2, Patrizia Burra1, Marco Senzolo3, 1Gastroenterology and Multivisceral Transplant Unit, Surgery, Oncology, and Gastroenterology, Padova University Hospital, Padova, Italy; 2Unit of Gastroenterology, Borgo Trento University Hospital of Verona, Italy Email: alberto.zanetto@yahoo.it

**Background and aims:** The clinical course of acutely decompensated cirrhosis (AD) is heterogeneous. Presepsin (PSP) is a soluble CD14-subtype biomarker that reflects Toll-like receptor activity as the immune response to endotoxemia and bacterial infections, and it has regulatory properties of the adaptive immune system. We conducted a prospective study to assess whether, in hospitalized patients with AD, plasmatic level of PSP could predict development of ACLF.

**Method:** Hospitalized patients with AD were prospectively recruited at admission and underwent determination of PSP (chemiluminescent immunoassay). All patients were then followed for 1 year, and predictors of ACLF were assessed by Cox regression analysis.

**Results:** 99 patients with AD were included (male; 66%; median age: 61 years; 65% had alcohol-related cirrhosis). The main reasons for AD were bacterial infections and alcoholic hepatitis (52% and 22%, respectively). Median MELD and CLIF-C AD scores were 18 and 54, respectively. Median PCP was 674 U/L (308–1700). Thirty-six patients developed ACLF (median time from inclusion to development of ACLF was 88 days). Baseline level of PSP was significantly higher in patients who experienced ACLF vs those who did not (1253 [670–2562] vs 375 [245–722], respectively; p < 0.0001). Among patients who didn’t develop ACLF, PSP was comparable between those who were re-hospitalized due to cirrhosis complications and those who were not re-hospitalized (432 vs 355, respectively). Cox regression analysis demonstrated that PSP was independently associated with development of ACLF (Table). AUROC of PSP was good and comparable to that of CLIF-C AD score (0.78 vs 0.79, respectively). A PSP value >660 U/L had 77% sensitivity and 70% specificity for the development of ACLF. In a sub-analysis including patients at lower risk of ACLF (i.e. CLIF-C AD score ≤50 and Child B), PSP was significantly higher in those who developed ACLF than in those who did not (1054 vs 250, respectively).

**Figure:**

**Conclusion:** PSP can be a useful, single and independent biomarker to identify trajectories of AD, even in patients who would be considered at lower risk of ACLF, if this is confirmed in larger cohorts.

**FRIDAY 23 JUNE**

**FRI-339 Disparities in hospital outcomes among patients with end-stage liver disease with palliative care collaboration: a nationwide cohort analysis (2016–2020)**

Sheza Malik1, Mohammed Faisaluddin1, Jay Bapaye1, Ali Jaan1, Yasir Rajwana2. 1Rochester General Hospital, United States; 2Stanford Medicine, United States Email: sheza.malik@rochesterregional.org

**Background and aims:** Despite the very high symptom burden, palliative care (PC) services are underutilized in patients with end-stage liver disease (ESLD). In addition, previous studies have shown that there are significant racial disparities in PC utilization for these ESLD patients in the United States. Herein, we investigated the
**POSTER PRESENTATIONS**

disparities in the utilization of PC services among patients with ESLD hospitalized in the United States.

**Method:** We conducted a retrospective cohort analysis by utilizing Nationwide Inpatient Sample from 2016 to 2020. All patients greater than 18 years old admitted with ESLD, defined as having at least two hepatic decompensation events, were included in the analysis. A multivariate logistic regression model predicting referral to PC was created.

**Results:** The mean age of ESLD patients at the time seeking palliative care services was 62.25. PC consultation was performed in only 17% of ESLD patients. Hispanic patients were significantly less likely than White and Black patients to receive palliative care services (15.83% compared to 17.26% and 17.23% for White and Black patients respectively (p < 0.01). Our analysis also revealed that compared to Whites, Blacks, and other ethnicities, Hispanics are also less likely to be referred to other hospitals or skilled nursing facilities. This patient population also had significantly higher lengths of stay in the hospital (22 days in Hispanics versus 20 days in the White population, p < 0.01). Total hospitalization cost was also statistically significantly higher (p < 0.01) in Hispanics (76104 United States Dollars) compared to the White (66737 United States Dollars) and Black population (67209 United States Dollars). Furthermore, the mortality rate was significantly higher in the PC group than no-PC group among all racial groups (52.76% vs 13.95%, p < 0.01 for Whites, 55.45% vs 19.95%, p < 0.01 for Black and 55.19% vs 19.03%, p < 0.01 for Hispanics).

**Conclusion:** There are significant racial disparities in the use of palliative care services. Further research on the causes of racial disparities is needed to improve access to palliative care services for the vulnerable ESLD population.

**FRI-340**

ACLF grade is not independently associated with 1-year mortality after hospital discharge in cirrhotic patients admitted to ICUs in the Netherlands

Jubi de Haan 1, Fabian Termorshuizen 2,3, Nicolette de Keizer 2,3, Diederik Gommers 1, den Hoed Caroline 4, Erasmus University Medical Center, Department of Adult Intensive Care, Rotterdam, Netherlands; National Intensive Care Evaluation (NICE) foundation, Amsterdam, Netherlands; Amsterdam Public Health Institute, Amsterdam UMC, University of Amsterdam, Department of Medical Informatics, Amsterdam, Netherlands; Erasmus MC Transplant Institute, Erasmus University Medical Center, Department of Gastroenterology and Hepatology, Rotterdam, Netherlands Email: j.dehaan@erasmusmc.nl

**Background and aims:** Patients with acute decompensated liver cirrhosis or Acute-on-chronic liver failure (ACLF) often require intensive care unit (ICU) admission for organ support. Nonetheless data addressing the outcomes of these patients remains scarce, is mainly limited to studies conducted in specialized liver transplant centres and has predominantly focused on short-term outcomes, such as ICU and hospital mortality. The aim of this study was to evaluate the influence of ACLF grade on the outcomes of cirrhotic patients admitted to all ICUs in the Netherlands.

**Method:** We conducted a nationwide observational cohort study using data from the Dutch ICU quality registry, the National Intensive Care Evaluation (NICE). Adult patients with an history of cirrhosis or first complications of cirrhotic portal hypertension admitted to all 82 ICUs in the Netherlands between 2012 and 2020 were included. Admission for elective or cardio-thoracic surgery or primary neurologic events were excluded. We identified 7779 cirrhotic patients; complete data to classify ACLF grade according to EASL-CLIF criteria was available in 2917 patients. The influence of ACLF grade on in-hospital mortality was evaluated using multivariate logistic regression (LR) to adjust for factors including demographics, GI bleeding, infection, APACHE IV probability and MELD score. Subsequently the influence of ACLF grade on 1-year mortality after hospital discharge among survivors of hospital admission was evaluated using unadjusted Kaplan-Meier (KM) survival curve and adjusted Cox proportional hazard model.

**Results:** In-hospital mortality rate according to ACLF grade is shown in figure 1A. The adjusted OR of in-hospital death among those with ACLF-1 vs no ACLF was 1.18 [95% CI 0.65–2.16], ACLF-2 vs no ACLF 1.92 [95% CI 1.16–3.16] and ACLF-3 vs no ACLF 1.99 [95% CI 1.2–3.3] (p = 0.008). In KM analysis among hospital survivors, a higher ACLF grade appeared to be associated with a lower survival following discharge (N = 1318) (Figure 1B; Logrank p < 0.0001). However, this association vanished after adjustment for factors including age, comorbidities, malignancy status, APACHE IV probability and MELD score (p = 0.1715), factors that appeared to have a more important influence on 1-year mortality than ACLF grade.

**Figure:** (abstract: FRI-339): Disparities in Hospital Outcomes of End Stage Liver Failure Patients with Palliative Care Collaboration: A Nationwide Cohort Analysis (2016–2020).

<table>
<thead>
<tr>
<th></th>
<th>Whites (176950, 61.81%)</th>
<th>Blacks (47975, 16.76%)</th>
<th>Hispanics (38670, 13.51%)</th>
<th>Others (16610, 5.71%)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (Median, IQR)</td>
<td>64 (55–72)</td>
<td>62 (53–70)</td>
<td>61 (50–70)</td>
<td>62 (52–72)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Female</td>
<td>41.43%</td>
<td>43.10%</td>
<td>37.34%</td>
<td>40.11%</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Palliative Care Consult</td>
<td>17.26%</td>
<td>17.23%</td>
<td>15.83%</td>
<td>17.86%</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Do Not Resuscitate Status</td>
<td>61.97%</td>
<td>61.45%</td>
<td>61.79%</td>
<td>61.87%</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>In Hospital Mortality with Palliative Care Consult</td>
<td>52.76%</td>
<td>55.45%</td>
<td>55.19%</td>
<td>57.78%</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>In Hospital Mortality without Palliative Care Consult</td>
<td>13.95%</td>
<td>19.95%</td>
<td>19.03%</td>
<td>21.11%</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Disposition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Routine</td>
<td>3.52%</td>
<td>3.93%</td>
<td>5.40%</td>
<td>3.43%</td>
<td></td>
</tr>
<tr>
<td>Transferred To Other Hospital</td>
<td>30.84%</td>
<td>30.09%</td>
<td>23.63%</td>
<td>25.86%</td>
<td></td>
</tr>
<tr>
<td>SNF/ICF Transfer</td>
<td>29.48%</td>
<td>28.33%</td>
<td>22.49%</td>
<td>24.80%</td>
<td></td>
</tr>
<tr>
<td>Home Health Care</td>
<td>12.61%</td>
<td>10.47%</td>
<td>15.54%</td>
<td>12.40%</td>
<td></td>
</tr>
<tr>
<td>LOS (Median, IQR)</td>
<td>20 (17–28)</td>
<td>21 (17–29)</td>
<td>22 (17–30)</td>
<td>21 (17–31)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Total Hospitalization Cost (Median, IQR)</td>
<td>66737.85</td>
<td>67209 (43297.78–111002.50)</td>
<td>11589.58 (47223.90–131422.13)</td>
<td>78526.08 (48193.83–145696.15)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>
Conclusion: In this nationwide cohort study ACLF grade was associated with in-hospital mortality of cirrhotic patients admitted to ICUs in the Netherlands. In those surviving hospital admission, ACLF grade was not an independent risk factor for 1-year mortality after hospital discharge.

Outcomes, clinical trajectories and risk factors of acute kidney injury (AKI) in critically-ill patients with liver cirrhosis

Martin Schulz1, Georg Guttenberg2, Wenyi Gu1, Jan Mengers2, Nora Ackermann2, Frank Erhard Uschner1, Maximilian Joseph Bro11, Philip Ferstl2, Michael Tischendorf2, Christiana Graf3, Salvatore Piano4, Paolo Angeli5, Stefan Zeuzem6, Michael Praktiknjo1, Alexander Zarbock4, Christoph Welsch4, Hermann Pavenstaedt5, Kai-Henrik Peiffer1, Jonel Trebicka6,6. Münster, Department of Internal Medicine B, Münster, Germany; 2Frankfurt, Department of Internal Medicine I, Frankfurt am Main, Germany; 3University of Padova, Unit of Internal Medicine and Hepatology, Dept. of Medicine, DIMED, Padova, Italy; 4University of Münster, Department of Anesthesiology, Intensive Care and Pain Medicine, Münster, Germany; 5University of Münster, Department of Internal Medicine D, Münster, Germany; 6European Foundation for Study of Chronic Liver Failure, EF-Clif, Barcelona, Spain. Email: jonel.trebicka@ukmuenster.de

Background and aims: In critically-ill patients with cirrhosis (CIC), AKI is a frequent and severe complication, associated with high mortality rates. This study aimed to assess the detailed impact of AKI in patients’ clinical trajectory and identify risk factors for AKI development.

Method: In this observational study, data from 498 patients with liver cirrhosis and admission to IMC or ICU were retrospectively analysed. Risk factors for increased short-term mortality and AKI development were analysed by multivariable Cox regression. Decision tree analysis was performed to derive a risk stratification for AKI development. Clinical trajectories were visualized by Sankey plots dependent on AKI subtypes.

Results: At index IMC/ICU admission, AKI was observed in 208/498 CIC patients. Median age was 60 years, 71.5% of patients were male, 176/498 patients presented ACLF. AKI at index ICU admission was associated with a 28-day mortality of 43.3%. After IMC/ICU discharge, 21.4% of patients developed an AKI within a median of 30 days (IQR 13.8–93.3). Patients without full AKI resolution were observed as a highly vulnerable subgroup in case of AKI recurrence. In these patients, recurrent AKI was associated with a massive mortality increase compared to patients with regular AKI at readmission (90d-mortality 75.0% vs. 39.7%, p < 0.05). Multivariable Cox regression showed bilirubin (HR 1.06, 95%CI 1.01–1.10, p < 0.05) and tense ascites requiring paracentesis at ICU/IMC admission (HR 1.84, 95%CI 1.07–3.17, p < 0.05) are risk factors for AKI development. In decision tree analysis, bilirubin ≥6 mg/dl and tense ascites allowed a risk stratification into three distinct groups: Patients with none of these clinical features (n = 65) showed a relatively low risk of AKI development (26.2%), while patients meeting one criterion (intermediate risk, n = 83) or both criteria (high risk, n = 19) developed AKI in 51.2% and 73.7%, respectively. Intermediate and high risk patients showed significantly higher mortality rates (90d-mortality 47.6% vs 12.9%, p < 0.001) and higher rate of renal replacement therapy (21.4% vs 9.7%, p < 0.05). High-risk patients also developed AKI significantly faster with a median time to AKI of 15 days (p < 0.05).

Conclusion: Patients without full AKI resolution and persisting renal dysfunction emerge as a novel and profoundly vulnerable subgroup.
in case of AKI recurrence as a second hit. Thus, full restoration of renal function should be closely monitored to identify recurrent AKI and initiate rapid treatment. Consequently, this data underscores the urgent clinical need for further evaluation of secondary prophylaxis for selected patients at risk.

FRI-342
VSIG4 as a biomarker for the diagnosis and prognosis of HBV-ACLF
Xi Liang1, Peng Li2, Jing Jiang3, Jiaojiao Xin2, Xin Chen2, Dongyan Shi2, Jun Li2, 1Taizhou Central Hospital (Taizhou University Hospital), Precision Medicine Center, Taizhou, China; 2The First Affiliated Hospital, Zhejiang University School of Medicine, State Key Laboratory for Diagnosis and Treatment of Infectious Diseases, National Clinical Research Center for Infectious Diseases, National Medical Center for Infectious Diseases, Hangzhou, China; 3Zhejiang University School of Medicine, Institute of Pharmaceutical Biotechnology and the First Affiliated Hospital, Department of Radiation Oncology, Hangzhou, China

Email: lijun2009@zju.edu.cn

Background and aims: Hepatitis B virus-related acute-on-chronic liver failure (HBV-ACLF) is a complex syndrome with high short-term mortality. This study aims to reveal the molecular basis and identify novel HBV-ACFL biomarkers.

Method: Transcriptome sequencing was performed using peripheral blood mononuclear cells (PBMCs) of HBV-ACFL patients in the derivation (n = 20) and validation cohorts (n = 50). Candidate biomarkers were confirmed in two external cohorts using enzyme-linked immunosorbent assay.

Results: Cellular composition analysis with PBMC transcriptomics from the derivation cohort showed that the proportions of monocytes, T cells and NK cells were significantly correlated with ACLF 28-day mortality. A significant upregulation of myeloid lineage modules and inflammatory response. Plasma VSIG4 analysis externally validated its diagnostic value for ACLF patients (compared with other clinical presentation). Each organ failure was a risk factor for adverse outcome in total or subgroup of AD patients if it were analyzed with multivariate cox regression analysis, MELD was most important risk factor for adverse outcomes.

Conclusion: This study reveals immune-metabolism disorder underlying poor ACLF outcomes. VSIG4, as a biomarker for the diagnosis and prognosis of HBV-ACFL, may be helpful in clinical practice.

FRI-343
The prognostic impact of each organ failure is different than that of acute-on-chronic liver failure according to the major clinical presentation in acutely decompensated cirrhosis
Jung Hee Kim1, Sung-Eun Kim1, Do Seon Song2, Jang Han Jung1, Hyoungh Su Kim1, Eileen Yoon2, Tae Hyung Kim4, Jung Hyun Kwong2, Young Kul Jung4, Ki Tae Suk1, Moon Young Kim2, sang gyun kim6, Yoon Jun Kim7, Won Kim8, Jin Mo Yang2, Jae Young Jiang9, Dong Joon Kim1.

1Hallym University College of Medicine, Korea, Rep. of South; 2College of Medicine, The Catholic University of Korea, Korea, Rep. of South; 3Hanyang University College of Medicine, Korea, Rep. of South; 4Korea University Ansan Hospital, Korea, Rep. of South; 5Yonsei University Wonju College of Medicine, Korea, Rep. of South; 6Seoul National University College of Medicine, Korea, Rep. of South; 7Seoul Metropolitan Government Seoul National University Boramae Medical Center, Korea, Rep. of South; 8Seoul National University Boramae Medical Center, Korea, Rep. of South; 9Soonchunhyang University College of Medicine, Korea, Rep. of South

Email: sekim@hallym.or.kr

Background and aims: The acute-on-chronic liver failure (ACLF) is major poor prognosis factor in acute decompensation (AD) of chronic liver disease (CLD) or liver cirrhosis (LC). Main pathogenic mechanism of AD has been speculated systemic inflammation and portal hypertension. The effects of not only ACLF but also each organ failure may be different depending on the major pathogenesis in AD patients, but studies for this have not yet been investigated. Therefore, we aimed to investigate whether significant differences of adverse outcomes (death or LT) show or not according to main clinical presentation in AD cirrhotic patients in prospective Korean Acute-On-Chronic Liver Failure (KACLFi) cohort. Also, we intend to reveal risk factor including ACLF and each organ failure for adverse outcomes.

Method: The prospective KACLFi cohort consisted of 1,773 patients who were hospitalized with AD of CLD, from July 2015 to August 2018. We enrolled a total of 1,416 patients with AD after excluding non-LC patients. Patients were then regularly evaluated for 3 months outcomes (liver transplantation and death) at 1 year were also recorded.

Results: According to clinical presentation, patients were analyzed: gastrointestinal bleeding (GIB) (n = 490), ascites (n = 355), bacterial infection (n = 103), hepatic encephalopathy (HEP) (n = 178), and jaundice (n = 290). The adverse outcomes rate for subgroups of AD were differed as followed: 28-day adverse outcome (total = 8.1%, GIB = 4.9%, ascites = 9.6%, bacterial infection = 13.6%, HEP = 10.1%, and jaundice = 8.3%; p = 0.011), 90-day adverse outcome (total = 13.5%, GIB = 8.4%, ascites = 15.2%, bacterial infection = 19.4%, HEP = 17.4%, and jaundice = 15.5%; p = 0.001), and 1-year adverse outcome (total 21.9%, GIB = 14.7%, ascites = 25.1%, bacterial infection = 31.1%, HEP = 27%, and jaundice = 23.8%; p < 0.001). After multivariate cox regression analysis, MELD was most important risk factor for adverse outcome in total or subgroup of AD patients if it were analyzed with ACLF. As a result of analysis with each organ failure as a variable other than ACLF, cardiac failure in GIB patients, coagulation failure in ascites patients, coagulation failure and brain failure in BI patients, liver failure in HEP patients, and MELD and DM in jaundice patients were the main factors.

Conclusion: According main clinical presentation, cirrhotic patients with AD showed different 28-days, 90-days, and 1-year adverse outcomes. Although ACLF is a factor influencing the patient’s adverse outcomes, the relevant organ failure may differ depending on the patient’s major clinical presentation upon admission. Especially, AD patients with bacterial infection showed poorer adverse outcomes compared to patients with other clinical presentation. Each organ failure rather than ACLF tends to have a direct impact on the
prognosis of cirrhotic patient with AD according to the main clinical presentation.

FRI-533
Incidence, risk factors and outcomes of acute kidney disease in cirrhosis patients with sepsis-related acute kidney injury
Rakhi Maiwall1, Ashini Hidam1, Neha Chauchan1, Shiv Kumar Sarin1.
1Institute of Liver and Biliary Sciences, Department of Hepatology, New Delhi, India
Email: shivsarin@gmail.com

Background and aims: Cirrhosis patients frequently have sepsis related acute kidney injury (S-AKI). Persistence of kidney dysfunction in S-AKI is reported to have sustained inflammatory and procoagulant responses. Patients with acute kidney disease (AKD) in the context of sepsis may have worse outcomes compared to those with recovery. We aimed to investigate in a prospective cohort of patients with S-AKI the incidence, spectrum, risk factors, and outcomes of AKD.

Method: Prospective cohort of cirrhosis patients admitted to the liver intensive care unit with S-AKI (n = 254) were enrolled. AKD was defined as acute or subacute damage and/or loss of kidney function for a duration between 7 and 90 days after AKI. A detailed biochemistry, urine sediment and neutrophil gelatinase-associated lipocalin (NGAL) was performed for all patients at enrolment and day 7. A urine microscopy score (UMS) was derived based on the observed quantification of renal tubular cells (RTC) and casts in the sediment. Our primary outcome was development of AKD. Secondary outcomes included need of dialysis, recovery from AKD and death. The stages of AKD at day 90 or last follow-up were defined in accordance with Levey et. al (Nephron 2022).

Results: Patients with S-AKI, mean age 45.6 ± 9.6 years, 91% males, mean MELD 27.3 ± 11.3, and CTP score 12.3 ± 1.6, 43% alcoholics, 44% obese, 29% diabetics, and 19% with grade 3 ascites were enrolled. The median urine NGAL was 1865.5 (1276.7–2863.5) ng/ml. Pneumonia was the most common infection in 67% and septic shock was seen in 58%. AKI stage at enrolment (KDIGO Stage 1:2:3 26%vs 33%.vs 41%). The cause of AKI was acute tubular necrosis in 60% followed by hepatorenal syndrome in 24% and remaining had prerenal volume-responsive AKI. A total of 115 (45%) developed AKD at day 90. Patients...
who developed AKD had significantly higher urine spot sodium (mxEng/L) (27.6 ± 15.9 vs. 18.2 ± 8.7; p < 0.001), urine protein-to-creatinine ratio (2.0 ± 1.3 vs. 1.18 ± 0.89; p < 0.001), and NGAL at enrolment and day 7 (Figure). These patients also had higher UMS for granular casts and RTCs. On multivariate analysis, higher NGAL at enrolment (log transformed) (OR 2.9, 1.8–4.7), UMS (OR 3.2, 1.6–6.3), presence of metabolic syndrome (OR 1.9, 1.2–3.4) were risk factors for AKD. At last follow-up, 9% had stage 0, 4% had stage 1, 16% had stage 2, 18% had stage 3 AKD and 54% were on dialysis. In the proportion of patients with recovery (n = 9), 44% had stage C, 22% stage B and 33% stage A AKD. Development of AKD was an independent predictor of 90-day mortality (OR 6.4, 3.7–11.1).

Conclusion: Almost 60% of patients with S-AKI have acute tubular necrosis and one in two develops AKD. AKD after S-AKI is associated with worse outcomes, recovers in only 9%, and progresses to dialysis in one-half. Of patients with recovery only 33% have return to normal renal functions. Higher NGAL, urine sediment score and presence of metabolic syndrome predict risk of AKD in patients with S-AKI. Novel therapeutic modalities are an unmet need for preventing AKD in S-AKI.

FRI-534
Machine learning-based model is superior to CLIF-C ACLF score for predicting ICU mortality in critically ill patients with acute-on-chronic liver failure
Maike Rebecca Pollmanns1, Bastian Kister1, Samira Abu Jhaisha1, Jonathan Frederik Brozat1, Philipp Hohlstein1, Tony Bruns1, Lars Küpfer2, Christian Trautwein1, Alexander Koch1, Theresa Hildegard Wirtz1, 1University Hospital RWTH Aachen, Medical Department III, Aachen, Germany; 2Institute for Systems Medicine with Focus on Organ Interaction, Aachen, Germany
Email: mpollmanns@ukaachen.de

Background and aims: Acute-on-chronic liver failure (ACLF) is a highly heterogeneous syndrome characterized by acute decompensation in patients with pre-existing liver disease accompanied by multiple organ failure. Available prognostic scores predict overall mortality. The aim of the presented study was to establish a simply applicable scoring system that could reliably predict mortality of ACLF patients during intensive care unit (ICU) treatment.

Method: A retrospective analysis of 206 patients with ACLF who were admitted to the medical ICU at the University Hospital RWTH Aachen between 2015 and 2021 was conducted. To develop a machine-learning model for predicting ICU mortality a training and validation dataset were defined and model development was performed by logistic regression. Various metrics were assessed to evaluate the calculated model and compare its predictive performance to existing scoring systems, including the chronic liver failure consortium (CLIF- C) ACLF score, the ACLF grade as well as CLIF-C OF, SOFA, MELD, APACHE-II, and SAPS score.

Results: The ICU mortality in this cohort was 62.0%. All evaluated scoring systems were able to distinguish between ICU survivors and non-survivors. The CLIF-C ACLF scoring system had the highest area under the receiver operating characteristics curve (AUROC) at 0.79 (95% CI) in the cohort. Machine learning resulted in seven different models using five up to thirteen features. The prognostic accuracy of CLIF-C ACLF score could be significantly improved by adding the number of organ failures, Horowitz quotient (FiO₂/PaO₂), FiO₂ and lactate (validation cohort AUROC 0.96, “model” in Fig. 1). Moreover, this model was superior to the existing ‘gold-standard’ CLIF-C ACLF score in predicting ICU mortality as well as 90-days transplant-free mortality.

Conclusion: Our findings indicate that this novel model can effectively predict ICU mortality in critically ill patients with ACLF, highlighting its potential for practical use in clinical settings.

FRI-535
Albumin use in acute-on-chronic liver failure in a large national cohort
Nadim Mahmud1, Tamar Taddei2, David Kaplan1, Elisabet Viayna2, Thomas Ardiles4, Marina Serper1.

Background and aims: Acute-on-chronic liver failure (ACLF) is associated with high short-term mortality. Common ACLF triggers include hepatorenal syndrome (HRS) acute kidney injury (AKI) and spontaneous bacterial peritonitis (SBP); conditions where albumin is indicated for treatment. Albumin use in ACLF hospitalizations has not been studied in detail in large cohorts. We aimed to investigate use of albumin in ACLF by severity and identify factors associated with its use in a large national cohort of patients with cirrhosis in the U.S. Veterans Health Administration Affairs (VHA).

Method: We identified all hospitalizations of patients with cirrhosis between 2008 and 2021 and classified them based on the EASL criteria from ACLF 0 (no ACLF) to 3 (severe ACLF) using validated methods. All inpatient albumin use was captured via inpatient pharmacy files; we also obtained demographic, comorbidity, and admission laboratory data. Average days of albumin administration were presented by length of hospital stay (LOS), stratified by ACLF grade. We subsequently fit multivariable logistic regression models for albumin use adjusting for characteristics at hospital admission: patient demographics, liver disease etiology, Child Pugh score, MELD...
Results: Among 47,290 hospitalizations; 4.3% were ACLF-3, 6.6% ACLF-2, 12.1% ACLF-1, and 77.0% ACLF-0. Any albumin use was significantly associated with ACLF grade, for example 78.9% of ACLF-3 hospitalizations versus 22.8% of ACLF-0 (p < 0.001); these associations were also apparent when visualized as cumulative days of albumin use for hospitalizations of different LOS (Figure 1). In adjusted models, factors independently associated with lower odds of albumin use were: Black race (OR 0.78, 95% CI 0.72–0.84) and Hispanic ethnicity (OR 0.80, 95% CI 0.72–0.90) (relative to White race): congestive heart failure (OR 0.77, 95% CI 0.72–0.82), atrial fibrillation (OR 0.72, 95% CI 0.66–0.78); and diabetes (OR 0.72, 95% CI 0.67–0.76). Factors associated with higher use were: HRS-AKI (OR 2.48, 95% CI 2.16–2.85), SBP (OR 2.89, 95% CI 2.57–3.25), and ACLF grade (relative to ACLF-0): (ACLF-1: OR 1.72, 95% CI 1.59–1.85; ACLF-2: OR 1.95 95% CI 1.78–2.15, ACLF-3: OR 4.25, 95% CI 3.73–4.84). Among liver disease etiologies, hepatocellular carcinoma was associated with higher albumin use (OR 1.22, 95% CI 1.13–1.32).

Results: In this national cohort study, we show that inpatient albumin utilization is substantial in high-grade ACLF and in the setting of SBP and HRS-AKI. After adjusting for medical factors, we found variation in use by race/ethnicity suggesting practice variation and health inequity. These findings highlight the need to identify causes of practice variation to improve use of guideline recommended therapies; this is particularly important in ACLF, which carries very high mortality risk.

Method: Decompensated cirrhosis patients with ascites were prospectively recruited at 5 teaching hospitals between 2019 and 2020 (NCT04125654). Patients were underwent microbial mNGS detection of ascites and clinical characteristics as well as outcomes were recorded accordingly. The association between the microorganisms detected by mNGS and clinical outcomes was assessed.

Results: In this study, 165 decompensated cirrhosis patients with ascites were included. Twenty patients were diagnosed with SBP and 14 patients had positive ascites culture. By microbial mNGS of ascites testing, 149 microorganisms were detected in 52 (31.5%) patients, including bacteria (65.8%), fungi (4.0%), virus (30.2%). Fever was more frequent in patients with positive ascites mNGS detection than those without (30.8% vs.15.0% p = 0.019). The prevalence of new-onset SBP and acute kidney injury were much higher in the positive ascites mNGS group than the negative group (25.6% vs. 3.9%, p = 0.001; 30.8% vs. 14.2%, p = 0.012).

Conclusion: Microbial mNGS detection may improve the pathogen diagnosis of infected ascites in acutely decompenated cirrhosis. The positive detection by ascites mNGS was correlated with the progression of SBP and future studies need to be further validated.

FRI-536 Microbial cell-free DNA next-generation sequencing of ascites in acutely decompenated cirrhosis patients: a proof-of-concept study
Beling Li1, Yanhang Gao2, Yan Huang3, wei yuan4, Zuxiong Huang5, Qin Tao Lai1, Qinjun He 1, Ling Zhou1, Miaoxia Liu1, Jinjun Chen1,6
1Hepatology Unit, Department of Infectious Diseases, Nanfang Hospital, Southern Medical University, Guangzhou, China, China; 2Department of Hepatology, The First Hospital of Jilin University, Jilin University, Changchun, China, China; 3Department of Infectious Diseases, Xiangya Hospital, Central South University, Changsha, China, China; 4Department of Liver Intensive Care Unit, Shanghai Public Health Clinical Centre, Fudan University, Shanghai, China, China; 5Department of Hepatology, Menghao Hepatobiliary Hospital of Fujian Medical University, Fuzhou, China, China; 6Hepatology Unit, Zengcheng Branch, Nanfang Hospital, Southern Medical University, Guangzhou, China, China
Email: chjj@smu.edu.cn

Background and aims: Targeted anti-microbial treatment therapy in patients with spontaneous bacterial peritonitis (SBP) is currently not possible as pathogens are identified in only 5%-20% patients. Metagenome next-generation sequencing (mNGS) test can provide rapid diagnosis of a comprehensive spectrum of pathogens. The aim is to evaluate the performance of microbial mNGS of ascites and its clinical effect in the decompenated cirrhosis patients.

Method: Decompensated cirrhosis patients with ascites were prospectively recruited at 5 teaching hospitals between 2019 and 2020 (NCT04125654). Patients were underwent microbial mNGS detection of ascites and clinical characteristics as well as outcomes were recorded accordingly. The association between the microorganisms detected by mNGS and clinical outcomes was assessed.

Results: In this study, 165 decompensated cirrhosis patients with ascites were included. Twenty patients were diagnosed with SBP and 14 patients had positive ascites culture. By microbial mNGS of ascites testing, 149 microorganisms were detected in 52 (31.5%) patients, including bacteria (65.8%), fungi (4.0%), virus (30.2%). Fever was more frequent in patients with positive ascites mNGS detection than those without (30.8% vs.15.0% p = 0.019). The prevalence of new-onset SBP and acute kidney injury were much higher in the positive ascites mNGS group than the negative group (25.6% vs. 3.9%, p = 0.001; 30.8% vs. 14.2%, p = 0.012).

Conclusion: Microbial mNGS detection may improve the pathogen diagnosis of infected ascites in acutely decompenated cirrhosis. The positive detection by ascites mNGS was correlated with the progression of SBP and future studies need to be further validated.

FRI-537 Performances of the CLIF-consortium acute-on-chronic liver failure (ACLF) score are gender specific
Sophie-Caroline Sacleux1, Thomas Mangana Del Rio 2, Philippe Ichai 1, Sophie Mangina del Rio2, Constantine Karvellas3, Florent Artru 2,4
1Liver Unit, King’s College Hospital, London, United Kingdom; 2Department of Hepatology, King’s College Hospital, London, United Kingdom; 3Hepatology Unit, Zengcheng Branch, Nanfang Hospital, Southern Medical University, Guangzhou, China, China

Background and aims: CLIF consortium acute-on-chronic liver failure (CLIF-C ACLF) score is the current gold standard for the
prediction of outcomes in ACLF. This score was derived from cohorts comprising mainly male participants, as women are underrepresented in studies on critically ill patients with ACLF. Our aim was to investigate whether the performance of CLIF-C ACLF is gender-specific in a large multicentric and international cohort of critically ill patients with ACLF.

**Method:** Three cohorts of consecutive patients with ACLF hospitalised in intensive care units (ICU) were included in the present study: Lausanne-Switzerland (2010 to 2020, n = 428), Paul Brousse-France (2017 to 2019, n = 200) and Edmonton-Canada (2001–2015, n = 308) cohorts. CLIF-C ACLF score was calculated using its original formula. Performances were evaluated by discrimination ability estimated by the area under the receiver operating characteristics (AUROC) curve and calibration.

**Results:** A total of 936 patients fulfilled the inclusion criteria: median age was 59 years (IQR 50–66 years), 268 (29%) were women, and 568 (61%) had alcohol-related cirrhosis. The main causes of admission were sepsis (n = 359, 33%) and bleeding (n = 243, 26%). On day 1, the median MELD score was 24, the median ACLF grade was 3, and the median CLIF-C ACLF score was 63. Forty-five patients (5%) underwent LT within the first 28 days of ICU admission. The 28-day transplant-free survival (TFS) was 56% and was not different between women (57%) and men (55%) (p = 0.71). The distribution of ACLF grades on day 1 between women and men was not different (p = 0.31), but there was a trend to an increased prevalence of ACLF grade 3 with 4 or more OFs in women vs. men (48.6% vs. 37.4%, p = 0.09). The AUROC of CLIF-C ACLF score on days 1 and 3 was greater in women (0.74 and 0.83) than in men (0.61 and 0.72) (p = 0.002 and p = 0.006, respectively). In sensitivity analyses, the AUROC of CLIF-C ACLF on days 1 and 3 remained greater in women at each of the three centers. Calibration according to the quintile of the population on days 1 and 3 had a maximum delta of 3% in women and 8% in men between observed and predicted 28-day TFS. We then explored whether variables included in the CLIF-C ACLF score had a different association with 28-day TFS in women vs. men. All the variables included in the CLIF-C ACLF score apart from leukocyte count and cerebral failure were associated with 28-day TFS in multivariable analyses in women. In men, leukocytes count, cerebral failure, and age were not associated with 28-day TFS in women. The acute on chronic liver failure (ACLF) is well known poor prognosis in acute decompensation (AD) of chronic liver disease or liver cirrhosis. Recently the European Foundation for the Study of Chronic Liver Failure (EF-CLIF) consortium suggested that four clinical course within 3 months after first AD stratified the long term prognosis: stable decompensate cirrhosis (SDC), unstable decompensated cirrhosis (UDC) and pre-ACLF and ACLF. We verify the outcomes of these subgroups and analysis the initial factors for affecting these clinical course in Korean prospective cohort of AD.

**Conclusion:** CLIF-C ACLF score better predicts 28-day TFS of critically ill women with ACLF, likely due to a lower discriminant ability of age in men as well as a lower chance of recovery in women where ACLF is less dynamic. In women, based on its excellent performance, especially on day 3, CLIF-C ACLF allows identifying patients with the lowest chance of survival to adapt critical care management toward LT or withdrawal of intensive care. CLIF-C ACLF score should be optimised in men.

**FRI-538 The risk factors for poor prognosis according to the clinical course after first acute decompensation in cirrhotic patients**

Jung Hee Kim1,2, Sung-Eun Kim1,2, Do Seon Song3, Eileen Yoon4, Hyoun Su Kim1,2, Jong Han Jung1,2, Tae Hyung Kim5, Young Kil Jung6, Ki Tae Suk1,2, Won Kim6, Jae Young Jang7, Dong Joon Kim1,2, Hallym University College of Medicine, Internal Medicine, Korea, Rep. of South; 2Institute for Liver and Digestive Diseases, Hallym University, Korea, Rep. of South; 3College of Medicine, The Catholic University of Korea, Korea, Rep. of South; 4Hanyang University College of Medicine, Korea, Rep. of South; 5Korea University Ansan Hospital, Korea, Rep. of South; 6Seoul Metropolitan Government Seoul National University Boramae Medical Center, Korea, Rep. of South; 7Soonchunhyang University College of Medicine, Korea, Rep. of South

Email: sekim@hallym.or.kr

**Background and aims:** The acute on chronic liver failure (ACLF) is well known poor prognosis in acute decompensation (AD) of chronic liver disease or liver cirrhosis. Recently the European Foundation for the Study of Chronic Liver Failure (EF-CLIF) consortium suggested that four clinical course within 3 months after first AD stratified the long term prognosis: stable decompensate cirrhosis (SDC), unstable decompensated cirrhosis (UDC) and pre-ACLF and ACLF. We verify the outcomes of these subgroups and analysis the initial factors for affecting these clinical course in Korean prospective cohort of AD.

**Method:** The prospective Korean Acute-On-Chronic Liver Failure (KACLIF) cohort consisted of 1773 patients who were hospitalized with AD of CLD, including either LC or non-cirrhotic CLD, from July 2015 to August 2018. We enrolled the first AD patient on LC after excluding as followed: previous history of decomposition (n = 902), previous diagnosis of HCC (n = 26) and non LC (n = 133). After exclusion, a total of 746 patients with AD were enrolled. Patients were then closely followed up and evaluated for 3 months outcomes (liver transplantation and death) at 1 year were also recorded.

**Results:** The subgroups consisted with SDC (n = 565), UDC (n = 29), Pre ACLF (n = 28) and ACLF (n = 124). The subgroups of AD stratified the 90 days and 1-year mortality as followed: (90 days’ mortality: SDC = 5.3%, UDC = 10.3% and pre ACLF = 42.9%, 1-year mortality: SDC = 13.5%, UDC = 34.5% and pre ACLF = 57.1%). And ACLF group showed favorable 90 days and 1-year mortality (29.0% and 33.9%) compared with pre AD group. The initial factors that affected to occurrence of UDC or pre ACLF within 3 months were age [Odd ratio (OR) = 1.027, p = 0.042], non-varical GI bleeding (OR = 3.031, p = 0.008), hepatic encephalopathy (HEP) (OR = 2.457, p = 0.033) and MELD (OR = 1.106, p < 0.001).

**Figure 1:** Flow chart of the study
Table 1. Baseline characteristics of enrolled patients according to clinical course

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>EDC (N=565)</th>
<th>UDC (N=59)</th>
<th>PreAACLIF (N=28)</th>
<th>P value</th>
<th>AACLIF (n=124)</th>
</tr>
</thead>
<tbody>
<tr>
<td>54.7 ± 11.3</td>
<td>56.9 ± 14.0</td>
<td>54.7 ± 13.0</td>
<td>0.256</td>
<td>53.6 ± 10.2</td>
<td></td>
</tr>
<tr>
<td>Male (%)</td>
<td>61.2 (72.9)</td>
<td>19.6 (59)</td>
<td>18.8 (32)</td>
<td>0.436</td>
<td>102.8 (31)</td>
</tr>
<tr>
<td>Ethiology</td>
<td>26 (28.0)</td>
<td>3 (5)</td>
<td>4 (14.3)</td>
<td>0.424</td>
<td>5 (8)</td>
</tr>
<tr>
<td>Virus</td>
<td>38.8 (40)</td>
<td>22.7 (51)</td>
<td>20.7 (38.9)</td>
<td>0.407</td>
<td>31.9 (47.5)</td>
</tr>
<tr>
<td>Alcohol</td>
<td>61 (10.9)</td>
<td>2 (6.9)</td>
<td>3 (10.7)</td>
<td>0.634</td>
<td>13 (15)</td>
</tr>
<tr>
<td>Virus+Alcohol</td>
<td>16 (2.8)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0.8</td>
<td>0 (0)</td>
</tr>
<tr>
<td>AIN-PV</td>
<td>287.5 (0.8)</td>
<td>13 (4)</td>
<td>13 (4)</td>
<td>0.632</td>
<td>6 (8.4)</td>
</tr>
<tr>
<td>AD</td>
<td>185 (32.7)</td>
<td>9 (13.9)</td>
<td>9 (13.9)</td>
<td>0.12</td>
<td>32 (47.5)</td>
</tr>
<tr>
<td>Acute</td>
<td>9 (15.1)</td>
<td>3 (13.9)</td>
<td>3 (13.9)</td>
<td>0.12</td>
<td>14 (17.8)</td>
</tr>
<tr>
<td>Bleeding</td>
<td>36 (6.5)</td>
<td>9 (13.9)</td>
<td>9 (13.9)</td>
<td>0.12</td>
<td>12 (15.5)</td>
</tr>
<tr>
<td>Necrosar</td>
<td>36 (6.5)</td>
<td>9 (13.9)</td>
<td>9 (13.9)</td>
<td>0.12</td>
<td>12 (15.5)</td>
</tr>
<tr>
<td>Bacterial</td>
<td>36 (6.5)</td>
<td>9 (13.9)</td>
<td>9 (13.9)</td>
<td>0.12</td>
<td>12 (15.5)</td>
</tr>
<tr>
<td>Infection</td>
<td>36 (6.5)</td>
<td>9 (13.9)</td>
<td>9 (13.9)</td>
<td>0.12</td>
<td>12 (15.5)</td>
</tr>
<tr>
<td>Varix</td>
<td>17 (30.4)</td>
<td>5 (8.6)</td>
<td>5 (8.6)</td>
<td>0.12</td>
<td>22 (26.2)</td>
</tr>
<tr>
<td>Heart rate</td>
<td>36 (6.5)</td>
<td>9 (13.9)</td>
<td>9 (13.9)</td>
<td>0.12</td>
<td>12 (15.5)</td>
</tr>
<tr>
<td>Systolic</td>
<td>36 (6.5)</td>
<td>9 (13.9)</td>
<td>9 (13.9)</td>
<td>0.12</td>
<td>12 (15.5)</td>
</tr>
<tr>
<td>Diastolic</td>
<td>36 (6.5)</td>
<td>9 (13.9)</td>
<td>9 (13.9)</td>
<td>0.12</td>
<td>12 (15.5)</td>
</tr>
<tr>
<td>AARC score</td>
<td>36 (6.5)</td>
<td>9 (13.9)</td>
<td>9 (13.9)</td>
<td>0.12</td>
<td>12 (15.5)</td>
</tr>
</tbody>
</table>

Conclusion: The prognostic groups of EF-CLIF are also verified in Asian cohort of cirrhosis. The accumulation of hepatic injury caused by recurrent symptom and progression to ACLF after first AD cause the dismal prognosis. Specially, the symptoms of first AD which were difficult to control and easily reproducible such as non-variceal bleeding and HEP are the sign of recurrent hepatic insult and should be care for prevention from the occurrence.

FRI-539
Prediction of sepsis in patient of acute on chronic liver failure (ACLF)-a machine learning approach
Ashok Choudhury1, Vinod Arora1, Shiv Kumar Sarin1, Vikash Dubey1 and APASL ACLF Research Consortium Aarc

Background and aims: ACLF is syndrome rapid worsening liver failure with poor outcome. The survival is confounded by organ failure often with or without sepsis. Early sepsis identification is crucial. The machine learning using big data is could precisely and accurately predict the development of sepsis. Aim is to develop a machine learning based prediction model for development of sepsis among hospitalized patients of ACLF who had no sepsis at presentation.

Method: We analysed the prospective collected data from AARC registry. Clinical data, laboratory parameters and sepsis were serially noted. AI-modelling was done after appropriate mining, feature engineering, splitted randomly into train and test-sets (70:30). The models created on the train-set were (XGB), Random Forest, K-Nearest Neighbours Classifier, Decision Trees (DT), Logistic Regression (LR), Adaptive Boosting (adaBoost) Model. We evaluated area under the curve (AUC), accuracy, sensitivity, specificity, and precision of models for predicting the outcomes in the test-set for any definite sepsis within first 7days of hospitalization who had none at baseline. ALIC was the primary selection criteria; confusion matrix was used to compare AUCs between AI-models and calibration plot created to evaluate the observed and predicted risk.

Results: Of 4990 ACLF patients [mean age 44.8 ± 11.6 years, 86% male], sepsis at presentation was detected in 1180 (23.6%) patients. New onset sepsis developed in 9.4% (358) within first week and is considered as the event. Initial 54 features reduced to 45 after data cleaning and preparation and followed by selection of the top 14 features to prepare the basic model representing the sepsis development. The XGB-CV model had the best accuracy among other tested models for prediction in train-set: 0.94 ± 5%, validation-set: 0.90 ± 5% and overall-dataset 0.86 with an AUROC of 0.954. The top five features critical for the XGB-CV model were baseline GGT, and day 4 parameters i.e., Heart rate, systolic and diastolic blood pressure and AARC score. New onset sepsis was associated with significantly higher 30-day mortality [56.4% versus 38.1%, OR = 2.07 (95 CI 1.77-3.61), p = 0.01].

Conclusion: New onset definite sepsis developed in one tenth of hospitalized ACLF patients within first week. The baseline GGT and day 4 AARC score along with simple heart rate and blood pressure dynamicity can predict sepsis. This may be a simple guide for decision regarding early prevention of sepsis and may improve survival.

FRI-540
Predictors of clinical courses in patients with acutely decompened cirrhosis. An external validation of the PREDICT study
Enrico Pompili1,2, Maurizio Baldassarre1,3, Giorgio Bedogni1,4, Giacomo Zaccherini1, Giulia Iannone1,2, Clara De Venuto1,2, Francesco Palmese1,4, Manuel Tufoni2, Marco Domenicali1,4, Paolo Caraceni1,2,1 Alma Mater Studiorum-University of Bologna, Department of Medical and Surgical Sciences, Bologna, Italy; 2IRCCS Azienda Ospedaliero-Universitaria di Bologna, Unit of Semeiotics, Liver and Alcohol-related diseases, Bologna, Italy; 3Alma Mater Studiorum-University of Bologna, Centre for Applied Biomedical Research (CRBA), Bologna, Italy; 4AUSL Romagna, Department of Primary Health Care, Internal Medicine, Frailty and Aging, Ravenna, Italy

Background and aims: The PREDICT study recently showed that acutely decompened (AD) cirrhotic patients without acute-on-chronic liver failure (ACLF) at admission present three different clinical trajectories and mortality rates: pre-ACLF, developing ACLF, Regression (LR), Adaptive Boosting (adaBoost) Model. We evaluated area under the curve (AUC), accuracy, sensitivity, specificity, and precision of models for predicting the outcomes in the test-set for any definite sepsis within first 7days of hospitalization who had none at baseline. ALIC was the primary selection criteria; confusion matrix was used to compare AUCs between AI-models and calibration plot created to evaluate the observed and predicted risk.

Results: Of 4990 ACLF patients [mean age 44.8 ± 11.6 years, 86% male], sepsis at presentation was detected in 1180 (23.6%) patients. New onset sepsis developed in 9.4% (358) within first week and is considered as the event. Initial 54 features reduced to 45 after data cleaning and preparation and followed by selection of the top 14 features to prepare the basic model representing the sepsis development. The XGB-CV model had the best accuracy among other tested models for prediction in train-set: 0.94 ± 5%, validation-set: 0.90 ± 5% and overall-dataset 0.86 with an AUROC of 0.954. The top five features critical for the XGB-CV model were baseline GGT, and day 4 parameters i.e., Heart rate, systolic and diastolic blood pressure and AARC score. New onset sepsis was associated with significantly higher 30-day mortality [56.4% versus 38.1%, OR = 2.07 (95 CI 1.77-3.61), p = 0.01].

Conclusion: New onset definite sepsis developed in one tenth of hospitalized ACLF patients within first week. The baseline GGT and day 4 AARC score along with simple heart rate and blood pressure dynamicity can predict sepsis. This may be a simple guide for decision regarding early prevention of sepsis and may improve survival.
within 90 days; Unstable Decompensated Cirrhosis (UDC), who were readmitted within 90-days or die without prior ACLF; and Stable Decompensated Cirrhosis (SDC), without ACLF or readmissions. This study aimed to i) validate the existence of three distinct trajectories in AD patients and compare their 1-year mortality rate; and ii) identify predictors for the occurrence of each trajectory.

Method: We performed a secondary analysis in a prospectively cohort of patients admitted to hospital for AD. Laboratory and clinical data at admission, development of ACLF and readmission up to 3 months and 1-year mortality were recorded. Patients were classified as pre-ACLF, UDC or SDC according to the PREDICT criteria. A pre-specified multinomial multivariable model (MNM) was used to evaluate the association between baseline features and the occurrence of pre-ACLF, SDC or UDC. Marginal estimates of the probability of pre-ACLF, SDC or UDC made by the MNM were calculated for one interquartile interval (IQR) increase for continuous predictors and for presence vs absence for binary predictors.

Results: Of the 311 patients included, 169 (55%) met the criteria for SDC, 57 (18%) for UDC, and 85 (27%) for pre-ACLF. The 1-year mortality was significantly different between the three groups: pre-ACLF 65%, UDC 46% and SDC 21% (p < 0.001). Marginal changes of the probability of pre-ACLF, SDC and UDC attributable to the predictors are reported in Figure 1. Among clinical parameters, the presence of hepatic encephalopathy was associated to UDC (p = 0.043), while the absence of ascites to SDC (p = 0.017). Among laboratory parameters, the increase in MELD-Na (p = 0.000) and C-Reactive Protein (p = 0.009) and the decrease in hemoglobin (p = 0.004) and albumin (p = 0.008) levels were associated to pre-ACLF.

Figure:

Conclusion: The present study confirms that patients with AD have 3 different clinical trajectories associated to different mortality rates. Besides severity of cirrhosis, the association with CRP supports the predominant role of systemic inflammation in ACLF development. Finally, HE is associated to the UDC trajectory highlighting the need of a better management of this complication after discharge.

FRI-541
Increased serum IL-6 and IL-8 are associated with echocardiographic signs of diastolic dysfunction in patients admitted for acutely decompenated cirrhosis
Andrei Voiosu1,2, Ioana Daha1,2, Victor Dragan1, Mihaela Birligea1, Paul Balanescu1,2, Theodor Voiosu1,2, Caterina Delcea1,2, Ana Alina Vizan2,3, Bogdan Mateescu2,3, Cristian Baicu2,3
1Colentina Clinical Hospital, Romania; 2Carol Davila University of Medicine and Pharmacy, Romania; 3Colentina Clinical Hospital, Cardiology, Romania
Email: andreivoiosu@gmail.com

Background and aims: We hypothesized that the inflammation underpinning many cases of acute decompensation (AD) in cirrhosis leads to impaired cardiac function increasing the risk of evolving towards Acute on Chronic Liver Failure (ACLF) or death. We aimed to explore the relationship between a panel of relevant inflammatory biomarkers and functional cardiac parameters in patients with AD of cirrhosis.

Method: This is a retrospective analysis of a prospective database of 70 patients with AD of cirrhosis who had echocardiography performed within 48 hours of admission and for whom follow-up was available. A single investigator examined all patients with according to a pre specified echocardiography protocol and measured parameters of systolic and diastolic function. Cardiac dysfunction was diagnosed by echocardiography according to current algorithms and cut-off values based on parameters available from the corresponding recorded examinations. We measured serum concentrations of inflammatory (IL-6, IL-8, TNF-α, CD206) and cardiac biomarkers (pro Brain Natriuretic Peptide -proBNP, Troponin T) from frozen samples stored in our biobank. Patients were divided into a low and a high-risk group by using a cut-off CLIF-C AD score of 50 [1]. We analyzed associations between the echocardiographic parameters of cardiac dysfunction, concentrations of biomarkers, CLIF-C AD score, and outcome.

Results: We included 70 patients (mean age 58 ± 10 years, 28 women) admitted for AD of cirrhosis and followed-up for 17 ± 7 months. 3 patients had ACLF at enrollment and the mean CLIF-C AD score was 47 ± 13. 13 patients fulfilled the echocardiographic criteria for systolic dysfunction and 29 patients those for diastolic dysfunction, but there were no significant correlations with the concentrations of serum IL-6, IL-8, TNF-α or CD206. Of the echocardiographic parameters, increased left atrial volume and mitral A wave, both indicators of left ventricular diastolic dysfunction, positively associated with markers of inflammation: IL-6 (r = 0.404, p < 0.001), and, respectively, IL-8 (r = 0.368, p = 0.002). In univariate analysis, patients with higher CLIF-C AD score had higher levels of IL-6 (r = 0.284, p = 0.02) and IL-8 (r = 0.307, p = 0.01), but were not more likely to have cardiac dysfunction. 18/70 patients died during follow-up. Patients with higher concentrations of proBNP (p = 0.01), IL-6 (p = 0.01), IL-8 (p = 0.008), and higher CLIF-C AD score (p = 0.02) were more likely to die.

Conclusion: We found associations between inflammatory biomarkers and echocardiographic indicators of diastolic dysfunction. Cardiac dysfunction was not more prevalent in patients with AD of cirrhosis at higher risk of developing ACLF or death during follow-up. This work was supported by a grant of the Ministry of Research, Innovation and Digitization, CNCS-UEFISCDI project number PN-III-P1-1.1-PD-2021-0180, within PNCDI III.

Reference
(NVB) is a major complication in patient with chronic liver disease, especially liver cirrhosis. Recent studies reported that there were no differences in clinical outcomes between VB and NVB. However, larger scale, multicenter, prospective studies were warranted to confirm these results because there was different pathogenic mechanism of development between VB and NVB. We aimed to investigate differences of clinical outcomes and risk factor in cirrhotic patients with GIB.

**Method:** The prospective Korean Acute-On-Chronic Liver Failure (KACLiF) cohort consisted of 1, 773 patients who were hospitalized with acute decompensation of chronic liver disease, from July 2015 to August 2018. We enrolled a total of 490 cirrhotic patient with GIB after excluding non-cirrhict patients. Patients were then regularly evaluated for adverse outcomes (liver transplantation and death) every 3 month during follow-up period.

**Results:** A total of 490 cirrhotic patient with GIB were included, 414 with VB and 76 with NVB. Patients with NVB had poorer underlying liver function than those with VB (bilirubin 4.49 ± 3.96 vs 2.86 ± 3.64 mg/dL, p < 0.001; Child-Pugh score 8 (5–14) vs 7 (5–15), p < 0.001; MELD 16.6 (7–41) vs 13.6 (7–54), p = 0.004; MELD-Na 19.2 (8–41) vs 15.3 (7–50), p < 0.001). Patients with VB and NVB had similar 28-day adverse outcome (death or liver transplantation) (4.6% vs 6.6%, p = 0.460), 90-day adverse outcome (7.5% vs 13.2%, p = 0.101), 1-year adverse outcome (18.4% vs 19.7%, p = 0.177). MELD was only one predictor for 28-day, 90-day, and 1-year adverse outcome in patients with VB if factors were analysed with ACLF. However, cardiac failure and/or respiratory failure were additional risk factors for 28-day, 90-day, and 1-year adverse outcomes in patients with VB if factors were analysed each statistically important organ failure. Compared to results in patients with VB, MELD was an important predictor for 28-day and 90-day adverse outcomes in patients with NVB.

**Conclusion:** Our results showed no statistically difference of adverse outcomes in cirrhotic patients with VB and NVB. However, there were differences of major predictor for short-term and long-term adverse outcomes between patients with VB and NVB.

**FRI-543**

**Trajectory of outcome from acute-on-chronic liver failure is determined beyond 48 hours of admission to intensive care**

Thomas Dixon1, Laura White1, Sherif Chabina1, Agnieszka Walecka1, Phyllis Keem1, Paul Bassett2, Rajiv Jalan1, Banwari Agarwal1, Gautam Mehta1,2,3, *Royal Free Hospital, United Kingdom; 2Statsconsultancy LTD, Amersham, United Kingdom; 3Roger Williams Institute of Hepatology, Foundation for Liver Research, London, United Kingdom*

**Email:** thomasdixon@nhs.net

**Background and aims:** Acute-on-chronic liver failure (ACLF) represents the most severe form of acute decompensation of cirrhosis, associated with multi-organ failure and high mortality. The CLIF-C ACLF score has been shown as a predictor of outcome in Intensive Care Unit (ICU) settings, and to determine futility of ICU care in certain cases (Engelmann et al., 2018). Change in ACLF grade over time (between 3 and 7 days) has been noted to correlate with certain cases (Engelmann et al., 2018). Change in ACLF grade over time (between 3 and 7 days) has been noted to correlate with certain cases (Engelmann et al., 2018).

**Method:** The prospective Korean Acute-On-Chronic Liver Failure (KACLiF) cohort consisted of 1, 773 patients who were hospitalized with acute decompensation of chronic liver disease, from July 2015 to August 2018. We enrolled a total of 490 cirrhotic patient with GIB after excluding non-cirrhict patients. Patients were then regularly evaluated for adverse outcomes (liver transplantation and death) every 3 month during follow-up period.

**Results:** A total of 490 cirrhotic patient with GIB were included, 414 with VB and 76 with NVB. Patients with NVB had poorer underlying liver function than those with VB (bilirubin 4.49 ± 3.96 vs 2.86 ± 3.64 mg/dL, p < 0.001; Child-Pugh score 8 (5–14) vs 7 (5–15), p < 0.001; MELD 16.6 (7–41) vs 13.6 (7–54), p = 0.004; MELD-Na 19.2 (8–41) vs 15.3 (7–50), p < 0.001). Patients with VB and NVB had similar 28-day adverse outcome (death or liver transplantation) (4.6% vs 6.6%, p = 0.460), 90-day adverse outcome (7.5% vs 13.2%, p = 0.101), 1-year adverse outcome (18.4% vs 19.7%, p = 0.177). MELD was only one predictor for 28-day, 90-day, and 1-year adverse outcome in patients with VB if factors were analysed with ACLF. However, cardiac failure and/or respiratory failure were additional risk factors for 28-day, 90-day, and 1-year adverse outcomes in patients with VB if factors were analysed each statistically important organ failure. Compared to results in patients with VB, MELD was an important predictor for 28-day and 90-day adverse outcomes in patients with NVB.

**Conclusion:** Our results showed no statistically difference of adverse outcomes in cirrhotic patients with VB and NVB. However, there were differences of major predictor for short-term and long-term adverse outcomes between patients with VB and NVB.

**FRI-544**

**Serum Cytokine and Chemokine profiles and disease prognosis in hepatitis B virus-related acute-on-chronic liver failure**

Bingbing Zhu1, Fangyuan Gao1, Yuxin Li1, Ke Shi1, Yixin Hou1, Jiali Chen1, Qin Zhang1, Xianbo Wang1, *Capital Medical University Affiliated Beijing Ditan Hospital, Center of Integrative Medicine, China*

**Email:** wangxb@ccmu.edu.cn

**Background and aims:** Hepatitis B virus-related acute-on-chronic liver failure (HBV-ACLF) has significant morbidity and mortality and is associated with the induction of cytokines/chemokines, which might contribute to the pathogenesis of liver injury. This study aims to explore the cytokines/chemokines profiles of HBV-ACLF patients and develop a composite clinical prognostic model.

**Method:** We prospectively collected blood samples and clinical data of 107 HBV-ACLF patients admitted to the Beijing Ditan Hospital. The concentration of 40-plex cytokines/chemokines were measured by the Luminex assay in 86 survivors and 21 non-survivors. Discrimination between cytokine/chemokines profiles in different prognosis groups were analyzed using the multivariate statistical technique of principal component analysis (PCA) and partial least square discriminant analysis (PLS-DA). The immune-clinical prognostic model was obtained using multivariate logistic regression analysis.

**Results:** The PCA and PLS-DA method indicated that the cytokine/chemokine profiling could distinguish patients with different prognosis clearly. 14 cytokines including IL-1β, IL-6, IL-8, IL-10, TGF-β, IFN-γ, CXCL1, CXCL2, CXCL9, CXCL13, CX3CL1, GM-CSF, CCL21 and CCL23 were significantly correlated with disease prognosis. Multivariate analysis identified CXCL2, IL-8, total bilirubin, and age as independent risk factors that constituted the immune-clinical prognostic model, which showed the strongest predictive value of 0.938 compared with the CLIF-C ACLFs (0.785), MELD (0.669), and MELD-Na (0.723) (p < 0.05 for all).

**Conclusion:** Serum cytokine/chemokine profiles correlated with 90-day prognosis of patients with HBV-ACLF. The composite immune-clinical prognostic model we proposed resulted in more accurate prognostic estimates than CLIF-C ACLFs, MELD, and MELD-Na.

**FRI-545**

**Impaired pituitary-thyroid signaling and low free triiodothyronine indicate increased risk for ACLF and mortality in cirrhosis**

Lukas Hartl1,2, Benedikt Simbrunner1,2,3, Mathias Jachs1,2,5, Peter Wolf5, David JM Bauer1,2, Bernhard Scheiner1,2, Lorenz Balcar1,2, Georg Semmler1,2, Michael Schwarz2, Rodrigo Marculescu5, Michael Trauner1, Mattias Mandorfer1,2, Thomas Reiberger1,2,3,

**Results:** The cohort comprised of 102 patients with complete data available at baseline: 64% were males and a median age 55. 63 patients (62%) survived to ICU discharge. Baseline CLIF-C ACLF score was a significant predictor of ICU mortality and survival at 3 months. Change in CLIF-C ACLF score from baseline to day 7, but not day 2, was a significant predictor of survival at ICU discharge and 3-months (Table 1). Logistic regression for survival at 3 months demonstrated an odds ratio of 3.61 (1.04–12.5, p = 0.04) for 3-month mortality for every 10-point increase in CLIF-C ACLF score between days 0 and 7; changes at day 2 were not significant.

**Conclusion:** Although preliminary, the data presented here suggests that re-assessment of clinical status at day 2 following ICU admission is an insufficient time to determine prognosis in ACLF patients. The optimal duration is likely between 3 and 7 days. These data have implications for resource allocation in ICU care of liver patients and merit validation in larger cohorts.

**POSTER PRESENTATIONS**
Background and aims: A low free triiodothyronine (fT3) phenotype has been described in patients with advanced chronic liver disease (ACLD). While conversion, transport and metabolism of thyroid hormones is dependent on hepatic function, thyroid hormones in turn affect hepatic metabolism. We aimed to characterize the pituitary-thyroid axis and the prognostic value of low fT3 in ACLD.

Method: Patients with ACLD, i.e. liver stiffness measurement (LSM) ≥10 kPa or HVPG ≥6 mmHg, undergoing hepatic venous pressure gradient (HVPG) measurement between 04/2007 and 09/2022 with available thyroid stimulating hormone (TSH) levels were considered. Patients with hepatocellular carcinoma (HCC), vascular liver disease, portal vein thrombosis, infections, liver transplantation (LT) or intake of thyroid hormones were excluded. Clinical stages were defined as: probable ACLD (pACLD): LSM ≥10 kPa and HVPG <6 mmHg, S0: mild portal hypertension (PH; i.e. HVPG 6–9 mmHg), S1: clinically significant PH (CSPH) without varices, S2: CSPH with varices, S3: previous variceal bleeding, S4: previous non-bleeding hepatic decompensation and S5: further decompensation.

Results: A total of 648 ACLD patients (median age: 54.7 years; 65.9% male; main etiologies: alcohol-related 50.2% and viral liver disease ≥ portal hypertension (PH; i.e. HVPG 6–9 mmHg), S1: clinically significant PH (CSPH) without varices, S2: CSPH with varices, S3: previous variceal bleeding, S4: previous non-bleeding hepatic decompensation and S5: further decompensation.

Analysis comparing CLIF-C ACLF scores between patients alive and dead at each timepoint. The difference in scores at the given timepoint and change between timepoints was calculated using unpaired t-test. Logistic regression used for further analysis demonstrating effect of CLIF-C ACLF score on survival, representing the relative change in the odds of death for every 10-unit increase in CLIF-C ACLF Score.

Levels with a higher prevalence among dACLD patients (cACLD: 7.0% vs. dACLD: 17.2%; p = 0.009) fT3 correlated with ACLD severity (Child score; rho = −0.52), portal hypertension (HVPG; rho = −0.30) endothelial dysfunction (von Willebrand factor antigen; rho = −0.36) and systemic inflammation (CRP; rho = −0.35). In multivariate linear regression analysis, CRP per mg/dL was associated with TSH (aB: 0.49; p < 0.001), as well as with fT3 (aB: −0.21; p = 0.016) after adjustment for HVPG, Child score and creatinine. Low fT3 was associated with a higher risk of acute-on-chronic liver failure (ACLF; aHR: 4.7; p = 0.004) and liver-related death (aHR: 5.5; p < 0.001), considering etiological cure, HCC, LT and non-liver-related death as competing risks.

Conclusion: The pituitary-thyroid axis is impacted by progressive severity of ACLD. Increasing TSH and declining fT3 levels in more advanced ACLD stages might be indicative of a low T3 (i.e. euthyroid sick) syndrome. In ACLD, low fT3 was associated with key disease driving mechanisms such as systemic inflammation. Importantly, low fT3 in patients with ACLD represents an independent risk factor for ACLF and liver-related death.
Inflammatory cytokine and chemokine profiles and disease prognosis in hepatitis B virus-related acute-on-chronic liver failure

Figure: (abstract: FRI-544).

FRI-546
Nosocomial infections in cirrhosis are unpredictable and vary based on region of the world: CLEARED study

Jasmohan S Bajaj 1, Florence Wong 2, Qing Xie 3, Patrick S. Kamath 4, Mark Topazian 5, Shiv Kumar Sarin 6, Shiva Kumar 7, Sebastián Marciano 8, Fiona Tudehope 9, Robert Gibson 10, Adam Doyle 11, Stephen Riordan 12, Alberto Queiroz Farias 13, Nabih Faisal 14, Puneeta Tandon 15, Marie Jeanne Lohoues 16, Carlos Benitez 17, Yongchao Xian 18, Chunwu Zhu 19, Minghua Su 20, Yongfang Jiang 21, Caiyan Zhao 22, Lei Wang 23, Mingxin Lu 24, Peng Hu 25, Belimi Hibat Allah 26, Henok Fisseha 27, Aloysious Aravinthan 28, Neil Rajoriya 29, Damien Leith 30, Danielle Adebayo 31, Diana Yung 32, Wai-Kay Seto 33, Godolfino Miranda Zazueta 34, Mauricio Castillo 35, René Malé Velazquez 36, Jose Antonio Velarde-Ruiz Velasco 37, Jacqueline Cordova 38, V欺骗eena Bhavani 39, Edith Okeke 40, Ruveena Bhavani 41, Dalia Allam 42, Hiang Keat Tan 43, Sombat Treeprasertsuk 44, Busra Haktanian 45, Feyza Gunduz 46, Abdullah Emre Yıldırım 47, Zeki Karasu 48, Enver Ucbilek 49, Haydar Adanir 50, Somaya Alblahi 51, Sumeet Asrani 52, K. Rajender Reddy 53, Andrew Keaveny 54, Paul J. Thuluvath 55, Scott Biggins 56, Peng Hu 57, Rahul Bhatnagar 58, Sotiris Economou 59, Ashok Choudhury 60, Virginia Commonwealth University and Central Virginia Veterans Healthcare System, Richmond, USA, United States; 2University of Toronto, Toronto, Canada, Canada; 3Ruijin Hospital, Shanghai Jiao Tong University School of Medicine, Shanghai, China, China; 4Mayo Clinic School of Medicine, Rochester, USA, United States; 5St Paul’s Hospital, Millennium Medical College, Addis Ababa, Ethiopia, Ethiopia; 6Institute of liver and biliary sciences New Delhi, India; 7Cleveland Clinic Abu Dhabi, United Arab Emirates; 8Hospital Italiano de Buenos Aires, Argentina, Argentina; 9Westmead Hospital, Sydney, Australia; 10John Hunter Hospital, Newcastle, Australia; 11Royal Perth Hospital, Perth, Australia; 12Prince of Wales Hospital, Sydney, Australia; 13Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo, Brazil; 14University of Manitoba, Winnipeg, Canada; 15University of Alberta, Edmonton, Canada; 16CHU de Cocody, Abidjan, Côte d’Ivoire; 17Pontificia Catholic University of Chile, Santiago, Chile; 18The Third People’s Hospital of Guilin, China; 19The Fifth People’s Hospital of Suzhou, China; 20The First Affiliated Hospital of Guangxi Medical University, China; 21The Second Xiangya Hospital of Central South University, China; 22The Third Affiliated Hospital of Hebei Medical University, China; 23Second Hospital of Shandong University, China; 24The First Affiliated Hospital of Wenzhou Medical University, China; 25Zhongshan Hospital, Fudan University, China; 26Department of Gastroenterology, School of Medicine, Ren JI Hospital, Shanghai Jiao Tong University, China; 27Department of Infectious Diseases, Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, China; 28Center of Infectious Disease, West China Hospital of Sichuan University, China; 29Beijing Youan Hospital, Capital Medical University, China; 30The Third Affiliated Hospital of Sun Yat-sen University, Guangzhou, China; 31Mengchao Hepatobiliary Hospital of Fujian Medical University, China; 32Hepatology Unit, Department of Infectious Diseases, Nanfang Hospital, Southern Medical University, China; 33Shuguang Hospital Affiliated to Shanghai University of Traditional Chinese Medicine, China; 34Second Affiliated Hospital of Chongqing Medical University, China; 35Mustapha Bacha University Hospital, Algiers, Algeria; 36St Paul’s Hospital Millenium Medical College, Addis Ababa, Ethiopia, Ethiopia; 37NIHR Nottingham Biomedical Research Centre, Nottingham University Hospitals, United Kingdom; 38Queens Elizabeth University Hospital, Birmingham, United Kingdom; 39Glasgow Royal Infirmary, United Kingdom; 40Royal Berkshire Hospital, United Kingdom; 41Royal Infirmary of Edinburgh, United Kingdom; 42Department of Medicine, School of Clinical Medicine, The University of Hong Kong, Hong Kong; 43Tel-Aviv Sourasky Medical Center, Tel Aviv, Israel; 44Jaslok Hospital, Mumbai, India; 45Asian Institute of Gastroenterology, Hyderabad, India; 46Department of Hepatology.
Background and aim: Define determinants, predictors, and variations in NI across a global population of cirrhosis inpatients.

Method: CLEARED Consortium prospectively recruited cirrhotic inpatients from 6 continents. Data were collected at baseline and follow-up visits, and the outcomes in NI across a global population of cirrhosis inpatients were recorded. Comparisons were made between NI vs no-NI variables and between regions. Multivariable (MV) analysis for NI was performed using admission variables.

Results: 3884 patients from 95 centers identified 474 pts (12%) with NI. Major NIs were respiratory (RTI 32%), UTI (18%), SBP (15%) and spontaneous bacteremia (11%). Most did not have an organism isolated (42%), then gram negative (29%), positive (16%) and fungal (6%). 16% had drug-resistant organisms (DRO) and 20% were second infections. NI pts were mostly female (p < 0.05), with alcohol as etiology (45% vs 40%, p < 0.05) and infections (28 vs 19%, p < 0.0001) and AKI (23 vs 15%, p < 0.0001), prior transplant listing (13 vs 9%, p < 0.005), admission lactulose use (20 vs 26%, p < 0.008) and lower GI bleed (20 vs 26%, p < 0.008). Rest of the admission variables were similar. Of admission infections, sites, culture positivity rates and resultant DROs were substantially different across regions.

Figure: Conclusion: In a global consortium of in-patients with cirrhosis, 12% developed NI, mostly women with alcohol cirrhosis, which led to poor outcomes and were difficult to predict. Most NIs were respiratory, UTI and SBP. NI sites, culture positivity rates and resultant DROs were substantially different across regions.

FRI-547 Metabolic biomarkers significantly enhance the prediction of HBV-related acute-on-chronic liver failure prognosis


We performed a metabolomics profiling of 1,024 serum samples collected from HBV-related chronic liver disease patients with acute exacerbation at hospital admission in a multi-year and multi-center prospective study (367 ACLF and 657 non-ACLF). The samples were randomly separated into equal halves as a discovery set and a validation set. We identified metabolites associated with 90-
day mortality in the ACLF group and the progression to ACLF within 28 days in the non-ACLF group (pre-ACLF) using statistical analysis and random forest analysis. We developed diagnostic algorithms in the discovery set and assessed the findings in the validation set.

**Results:** ACLF significantly altered the serum metabolome, particularly in membrane lipid metabolism, steroid hormone metabolism, oxidative stress pathways, and energy metabolism. Numerous metabolites were significantly associated with 90-day mortality in the ACLF group and/or pre-ACLF in the non-ACLF group. We trained and validated machine learning algorithms for the prediction of ACLF 90-day mortality (area under curve, AUC: 0.87) and the diagnosis of pre-ACLF (AUC: 0.94). To translate our discoveries into practical clinical tests, we developed targeted assays on selected metabolites using liquid chromatography mass spectrometry (LCMS).

**Combination of CLIF-C ACLF and ammonia levels as a predictor of outcome in patients with acute-on-chronic liver failure**

Sagnik Biswas, Manas Vaishnav, Shekhar Swaroop, Umang Arora, Shalimar Shalimar, All India Institute of Medical Sciences, New Delhi, India

**Email:** drshalima@gmail.com

**Background and aims:** The chronic liver failure consortium acute-on-chronic liver failure (CLIF-ACLF) score performs significantly better than Child-Pugh-Turcotte (CTP), model for end-stage liver disease (MELD) and MELD-Na scores in predicting outcome in patients with ACLF. It also defines futility of care to enable withdrawal of support in patients with irreversible organ failures. Elevated ammonia levels have pleiotropic detrimental effects in multiple organ systems and constitute an independent risk factor to predict hospitalization due to liver related complications and mortality in cirrhotics. We explored the effect of addition of ammonia levels to existing prognostic scores in predicting outcomes in patients with ACLF.

**Method:** All consecutive ACLF patients with available ammonia values at admission evaluated between January 2011 to June 2012 were included. ACLF was defined as per the EASL-CLIF definition. Prognostic scores including CLIF-C ACLF, MELD-Na, CTP were calculated at baseline. A new model was generated which included CLIF-C ACLF and ammonia levels. Receiver operator characteristic (ROC) curve was used to assess the performance of the prognostic model. Comparison of the area under ROC curves was performed using DeLong method.

**Results:** A total of 568 patients with ACLF were included, mean (± SD) age 42.4 ± 12.8 years, 456 (80.3%) males. Overall, 160 (28.2%) patients survived. Active alcohol consumption was the most common aetiology, both for the chronic liver disease and the acute insult (57.7% and 43.1% respectively). The mean (± SD) values of prognostic scores on day 1 were as follows: CTP (12.9 ± 1.5), MELD-Na (33.2 ± 6.3), CLIF-C ACLF (51.5 ± 10.0) and serum ammonia 108 (82 ± 140) micromoles/L. The area under curve (AUC) for CLIF-C ACLF score was 0.75 (0.71–0.79) followed by CTP, MELD-Na, and ammonia at 0.71 (0.67–0.75), 0.64 (0.60–0.68) and 0.63 (0.59–0.67) respectively (p = 0.02). The model based on combination of CLIF-C ACLF and serum ammonia levels at admission had numerically highest AUC 0.76 (0.72–0.79), and performed significantly better than the CTP (p = 0.050), MELD-Na (p = 0.001) and serum ammonia (p < 0.001) alone, but was equivalent to CLIF-C ACLF score in predicting survival.

**Conclusion:** Addition of ammonia to CLIF-C ACLF score does not improve the overall diagnostic accuracy of CLIF-C ACLF score in predicting in-hospital mortality.
tailor treatment strategies. Expression of urokinase plasminogen activator receptor (uPAR, CD87) and the release of its soluble variant, the cleaved soluble uPAR (suPAR), showed to be related to systemic inflammation in liver disease. Therefore, we were seeking to evaluate suPAR as a predictive marker for the outcome in ACLF.

**Method:** In a retrospective study plasma suPAR concentrations were measured in two different academic centers in a derivation cohort (n = 178 (healthy controls (n = 6), compensated cirrhosis (n = 17), decompensated cirrhosis (n = 120) or ACLF (n = 35)) and a validation cohort (n = 197 (decompensated cirrhosis (n = 135) or ACLF (n = 62)). SuPAR levels were analyzed with suPARnostic® TurbiLatex (Nr. T004, suPARnostic, ViroGates, Birkerød, Denmark) on a Cobas c501/502 clinical chemistry analyzer (Roche Diagnostics Ltd., Burgess Hill, UK).

Clinical data was obtained from patients medical records. Primary end point were death and disease dynamics during hospitalization.

**Results:** In the derivation cohort, 60.1% of patients were male, 36.5% female and in 3.4% no information on gender was provided. Alcohol related liver disease was the most common etiology before NASH and viral hepatitis. Median suPAR levels were significantly higher in patients with decompensated cirrhosis (13.7 ng/ml) and ACLF (20.0 ng/ml) compared to compensated cirrhosis (6.65 ng/ml) and healthy controls (1.9 ng/ml) (p < 0.001). Mortality during hospitalization was 13.7% in decompensated cirrhosis and 34.3% in ACLF. SuPAR levels showed a statistical significant correlation with other parameters indicating disease severity: Creatinine (r = 0.209, p < 0.012), Bilirubin (r = 0.473, p < 0.001), Albumin (r = −0.247, p = 0.02), INR (r = 0.323, p < 0.001), ALT (r = 0.273, p = 0.001) as well as disease severity scores such as MELD score (r = 0.486, p < 0.001) and CLIP-ACLF score in ACLF patients (r = 0.454, p < 0.001) and duration of hospitalization (r = 0.361, p < 0.001). SuPAR levels >14.1 ng/ml were associated with a higher in hospital mortality (p = 0.020, sensitivity: 75.0%, specificity: 50.8%, AUC = 0.641), need for ICU treatment (p < 0.001) and 90 days mortality (p = 0.001) and in patients with decompensated cirrhosis higher suPAR levels indicated a higher risk of developing ACLF (p = 0.014). These findings were validated in our second cohort: higher suPAR levels indicated a higher 28 days mortality (p < 0.001) as well as 90 days mortality (p < 0.001) and in Cox-Regression a lower survival (p < 0.001, HR = 1.012).

**Conclusion:** SuPAR might be used as biomarker for outcomes in patients with ACLF and acute decompensated liver cirrhosis indicating disease severity.

---

**FRI-550**

ACLF course profiles over screening period in the phase llb DHELIVER study

Frederik Nevens1, Dominique Thabut2,3, Marika Rudler4,5, Lannes Adrien6, Luc Lasser7, Vadim Brjalina7, Georges-Philippe Pageaux9, Ewa Janczewska10, Pierluigi Toniutto11, Javier Martinez12, Thomas Reibberger13, Jordi Sánchez-Delgado14, Victor Vargas15, Thierry Gustot16, Benjamin Maasoumy17, Henning Grønbæk18, Tony Bruns19, Christophe Bureau20, Kalina Gricevicha Stardelova21, Desislava Pavlova22, Iajaylo Nikolov23, Krum Katzarov24, Ventseaslav Draganov25, Vansela Bernal Monterde26, Noelia Gordillo27, Yelena Vainilovich27, Mustapha Najim27,28, Virginie Barthe27, Frederic Lin27, Etienne Sokal27,29. 1University Hospital Gasthuisberg, KU Leuven, Hepatology, Belgium; 2Groupement Hospitalier APHP-Sorbonne Université, Hôpital de la Pitié-Salpêtrière, Unité de Soins Intensifs d’Hépato-Gastro-Entérologie, Paris, France; 3Sorbonne Université, INSERM, Centre de Recherche Saint-Antoine (CRSA), Institute of Cardiometabolism and Nutrition (ICAN), Paris, France; 4Groupement Hospitalier APHP-Sorbonne Université, Hôpital de la Pitié-Salpêtrière, Unité de Soins Intensifs d’Hépato-Gastro-Entérologie, Paris, France; 5Sorbonne Université, INSERM, Centre de Recherche Saint-Antoine (CRSA), Institute of Cardiometabolism and Nutrition (ICAN), Paris, France; 6CHU Angers, Hepatology Department, Angers, France; 7CHU Brugmann (Site Horta), Gastroenterology Service, Belgium; 8West Tallinn Central Hospital, Estonia; 9CHU Montpellier, Pôle Digestif, France; 10ID Clinic, Mylowsice, Poland; 11ASU Friuli Centrale, Hepatology and Liver Transplant Unit, Udine, Italy; 12University Hospital Ramón y Cajal, Hepatology, Madrid, Spain; 13Medical University Vienna, Department of Internal Medicine III, Division of Gastroenterology and Hepatology, Vienna, Austria; 14Hospital Parc Taulí Sabadell, Department Hepatology, Sabadell, Spain; 15Hospital Vall d’Hebron, Universitat Autònoma, Hepatology, Barcelona, Spain; 16C.U.B. Hôpital Erasme, Gastroenterology and Hepato-Pancreatology, Brussels, Belgium; 17Medical University Hannover, Clinic for Gastroenterology, Hepatology and Endocrinology, Hannover, Germany; 18Aarhus University Hospital, Department of Hepatology and Gastrohepatology, Aarhus, Denmark; 19University Hospital Aachen RWTH, Internal Medicine III, Gastroenterology and Hepatology, Aachen, Germany; 20Hôpital Rangueil 1, Hepatology, Toulouse, France; 21Phyl University Clinic of Gastroenterohepatologia, Skopje, Macedonia; 22UMHAT Dr. Georgi Stranski, Gastroenterology Dept., Pleven, Bulgaria; 23UMHAT Svetna Anna, Gastroenterology, Sofia, Bulgaria; 24MMA-Sofia, Gastroenterology, Sofia, Bulgaria; 25UMBAL Medica, Russe, Bulgaria; 26Hospital Miguel Servet, Gastroenterology and Digestive, Zaragoza, Spain; 27Cellaion, Belgium; 28Laboratory of Pediatric Hepatology and Cell Therapy, Institute of Experimental and Clinical Research (IREC), UCouvain, Brussels, Belgium; 29Saint-Luc University Clinics, Belgium

**Email:** etienne.sokal@cellaion.com

**Background and aims:** Acute-on-chronic liver failure (ACLF) is a syndrome characterised by acute decompensation of cirrhosis associated with organ failures and high mortality. ACLF exhibits dynamic clinical course with final ACLF grade (G) defined 3 to 7 days after initial diagnosis in 81% of patients (Gustot, 2015). DHELIVER study is an ongoing Phase llb RCT double-blinded POC trial that aims to demonstrate the efficacy of HepaStem® on overall survival in patients with persistent ACLF G1 and G2. The purpose of current analysis is to study evolution of ACLF during screening and to describe patients' characteristics.

**Method:** Consented patients were re-assessed at the end of screening period, 3 to 7 days after initial ACLF diagnosis (according to EASL-CLIF definition). Only patients with confirmed G1 and G2 were randomized.

**Results:** Up to 26-JAN-2023, 96 patients with ACLF (69 M/27 F), aged 52.5 years (range: 25–73), were screened in 23 sites in 11 European countries: 61 G1 and 35 G2. During screening (3 to 7-days) ACLF recovered or improved in 27 patients (28.1%), stable clinical course was in 57 patients (59.4%) and 12 patients worsened (12.5%). By ACLF grade: among G1, ACLF resolved in 39.3%, was stable in 49.2%, and worsened in 11.5% (9.8% to G2 and 1.6% died); while among G2, clinical course of ACLF was stable in 71.4% (2.5% to G3 and 11.4% died), and improved in 8.6% (2.9% to G0 and 5.7% to G1). Fifty-five patients (34 G1 and 21 G2) were enrolled; 41 (27 G1 and 14
G2) were screen failures, mostly because their condition resolved (61.0%, 24 G1 and 1 G2) or worsened/died (14.6%; 1 G1 and 4 G2 died, 1 G2 to G3). Enrollment criteria were not met for 10 patients (24.4%). The etiology of cirrhosis was mainly alcohol (88.5%). Other etiologies included NASH (2.1%), a combination of alcohol with viral (HCV or HBV) infection, hemochromatosis, or NASH (5.2%) or were unknown (4.2%). Patients with alcohol etiology were slightly younger compared to other etiologies (52.0 vs 56.3 years) and had more pronounced biochemical (e.g., total bilirubin: 20.2 vs 9.4 mg/dL) or hematological (e.g., WBC: 12.7 vs 10.0 G/L) alterations. Precipitating events of ACLF were mostly acute alcoholic hepatitis/active alcoholism (71.0%; 43.8% of them were on steroids) and bacterial infection (29.3%). Other trigger events were GI bleeding (3.1%), DILI (2.1%), or unknown (13.5%). Organ failures affected mainly the liver (68.8%), coagulation (46.9%), and kidney (8.3%). Most patients with G1 had liver failure (57.4%), primarily associated with mild or moderate hepatic encephalopathy (HE) (85.7%).

### Table: Baseline Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Randomized</th>
<th>Screen failures</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>55</td>
<td>41</td>
</tr>
<tr>
<td>Age</td>
<td>52.0 ± 10.7</td>
<td>53.1 ± 9.5</td>
</tr>
<tr>
<td>M/F</td>
<td>42/13</td>
<td>27/14</td>
</tr>
<tr>
<td>Initial ACLF grade</td>
<td>G1 G2 G1 G2</td>
<td></td>
</tr>
<tr>
<td>Stable</td>
<td>34</td>
<td>21</td>
</tr>
<tr>
<td>Improved</td>
<td>28 (82.4%)</td>
<td>19 (90.9%)</td>
</tr>
<tr>
<td>Worsened</td>
<td>6 (17.6%)</td>
<td>2 (9.5%)</td>
</tr>
<tr>
<td>T-BIL (mg/dL)</td>
<td>21.5 ± 10.5</td>
<td>15.9 ± 9.0&lt;sub&gt;2&lt;/sub&gt;</td>
</tr>
<tr>
<td>WBC (G/L)</td>
<td>13.8 ± 7.7</td>
<td>10.4 ± 5.9&lt;sup&gt;4&lt;/sup&gt;</td>
</tr>
<tr>
<td>CRP (mg/L)</td>
<td>36.6 ± 26.1</td>
<td>33.4 ± 38.6&lt;sub&gt;1&lt;/sub&gt;</td>
</tr>
<tr>
<td>INR</td>
<td>2.3 ± 0.7</td>
<td>2.5 ± 0.8&lt;sup&gt;4&lt;/sup&gt;</td>
</tr>
<tr>
<td>CLIF-ACLF score</td>
<td>49.8 ± 5.2</td>
<td>47.5 ± 8.0&lt;sub&gt;2&lt;/sub&gt;</td>
</tr>
</tbody>
</table>
<sup>1</sup>: information missing for x patients

### Figure: Baseline characteristics

**Conclusion:** This prospective study confirms the variable and highly dynamic course of the disease in patients with ACLF G1 and G2 over the 3 to 7-day period post initial diagnosis. Improvement was most commonly observed in patients with ACLF G1 (39.3% vs 8.6% in G2). The most common etiology of cirrhosis was alcohol-related liver disease. Hepatic failure represented the most common type of organ failure, characterized by high level of bilirubin associated with HE.

**FRI-551**

Lower free and total serum cortisol levels are associated with higher risk of bacterial infection and acute-on-chronic liver failure in stable outpatients with advanced chronic liver disease

Lukas Hartl<sup>1,2</sup>, Benedikt Simbrunner<sup>1,2,3</sup>, Mathias Jachs<sup>1,2</sup>, Peter Wolf<sup>1</sup>, David JM Bauer<sup>1,2</sup>, Bernhard Scheiner<sup>1,2</sup>, Lorenz Balcar<sup>1,2</sup>, Michael Trauner<sup>1</sup>, Mattias Mandorfer<sup>1,2</sup>, Thomas Reiberger<sup>1,2,3</sup>, 
1 Division of Gastroenterology and Hepatology, Department of Medicine III, Medical University of Vienna, Vienna, Austria; 2 Vienna Hepatic Hemodynamic Lab, Division of Gastroenterology and Hepatology, Department of Medicine III, Medical University of Vienna, Vienna, Austria; 3 Christian Doppler Lab for Portal Hypertension and Liver Fibrosis, Division of Gastroenterology and Hepatology, Department of Medicine III, Medical University of Vienna, Vienna, Austria; 4 Department of Laboratory Medicine, Medical University of Vienna, Vienna, Austria.

**Background and aims:** We aimed to evaluate the prognostic value of free (f-Cort) and total serum cortisol (t-Cort) in a cohort of stable outpatients with advanced chronic liver disease (ACLD).

**Method:** We included consecutive outpatients with ACLD and hepatic venous pressure gradient (HVPG) measurement within the prospective VICIS (NCT03267615) study. Exclusion criteria were HVPG ≥ 12 mmHg, hepatocellular carcinoma, vascular liver disease, occlusive portal vein thrombosis, a history of liver transplantation, evidence of infection and intake of corticosteroids. Competing risk regression was performed considering liver transplantation and death (or non-liver-related death, as appropriate) as competing events.

**Results:** In total, 151 patients (compensated ACLD: n = 61; decompensated ACLD: n = 90) were included. There was a strong correlation between f-Cort and t-Cort (Spearman’s rho: 0.893).

Lower levels of f-Cort and t-Cort independently predicted bacterial infections (f-Cort: aHR per ng/ml: 0.89; p = 0.014/t-Cort: aHR per μg/dL: 0.91, p = 0.003) and acute-on-chronic liver failure (ACLF; f-Cort: aHR per ng/ml: 0.84; p = 0.003/t-Cort: aHR per μg/dL: 0.90, p = 0.001).

**Conclusion:** Lower levels of both f-Cort and t-Cort are independently linked to bacterial infections and ACLF in patients with ACLD, possibly due to an impaired stress response. Moreover, f-Cort <4.8 ng/ml and t-Cort <12 μg/dL tend to exhibit a more advanced clinical stage of ACLD (p = 0.095) and patients with t-Cort <12 μg/dL tended to have more severe ACLD (CTP score: ≥12 μg/dL: 6.0 points vs. <12 μg/dL: 7.0 points; p = 0.053) and more pronounced portal hypertension (HVPG: ≥12 μg/dL: 15 mmHg vs. <12 μg/dL: 18 mmHg; p = 0.073). With low t-Cort (i.e. <12 μg/dL), the cumulative incidences of bacterial infections (p = 0.026), (further) decompensation (p = 0.028), and ACLF (p = 0.005) were significantly higher (Figure), with similar-but non-significant-trends observed for low f-Cort <4.8 ng/ml. Both f-Cort <4.8 ng/ml and t-Cort <12 μg/dL were independently linked to increased risk of bacterial infections (f-Cort <4.8 ng/ml: aHR: 2.11; 95%CI: 1.06–4.23; p = 0.034/t-Cort <12 μg/dL: aHR: 2.91; 95%CI: 1.12–7.00; p = 0.017), (further) decompensation (f-Cort <4.8 ng/ml: aHR: 2.23; 95%CI: 1.27–3.91; p = 0.005/t-Cort <12 μg/dL: aHR: 1.87; 95%CI: 1.06–3.30; p = 0.032) and ACLF (f-Cort <4.8 ng/ml: aHR: 2.45; 95%CI: 1.16–5.19; p = 0.019/t-Cort <12 μg/dL: aHR: 3.51; 95%CI: 1.33–9.10; p = 0.009).

**FRI-552**

Acute on chronic liver failure is associated with prolonged clot initiation in rotational thromboelastometry as compared to acute decompensation, but clot formation time and firmness are similar

Tian Yu Qiu<sup>1</sup>, Louis Wang<sup>1</sup>, Chin Kimg Tan<sup>1</sup>, Eugene Wong<sup>1</sup>, Kenneth Lin<sup>1</sup>, Andrew Kwek<sup>1</sup>, James Weiquan Li<sup>1</sup>, Tiing Leong Ang<sup>1</sup>, Roshni Sahashiv<sup>2</sup>, Louis Ng<sup>3</sup>, Prasanna Tirukonda<sup>4</sup>, Rahul Kumar<sup>1</sup>.

1 Department of Medicine, National University Hospital (NUH), Singapore; 2 Department of Gastroenterology, National University Hospital, Singapore; 3 Department of Laboratory Medicine, National University Hospital, Singapore; 4 Department of Endocrinology, National University Hospital, Singapore.

**Background and aims:** The objective of this study was to compare the clotting properties of whole blood in patients with acute-on-chronic liver failure (ACLF) using rotational thromboelastometry (ROTEM) with patients in acute decompensation (AD). We hypothesized that ACLF would exhibit prolonged clot initiation.

**Method:** We recruited 10 AD and 10 ACLF patients. AD patients were admitted with acute decompensation within 24 hours of hospitalization. ACLF patients were admitted with acute decompensation after 7 days of hospitalization. Analysis included the clot initiation time, clot formation time, clot firmness, and clot degradation time.

**Results:** ACLF patients had longer clot initiation time and clot formation time compared to AD patients. ACLF patients also had lower clot firmness and higher clot degradation time. These findings suggest that ACLF is associated with prolonged clot initiation.

**Conclusion:** ACLF is associated with prolonged clot initiation in rotational thromboelastometry as compared to acute decompensation, but clot formation time and firmness are similar.
Background and aims: Viscoelastic Test (VET) such as Rotational Thromboelastometry (ROTEM) is increasingly used in cirrhosis to guide blood product transfusion strategies as compared to conventional coagulation tests (CCT). Although ROTEM successfully reduced transfusion requirements, there is little clarity around changes in ROTEM parameters with severity of presentation i.e., Acute Decompensation (AD) or Acute on Chronic Liver Failure (ACLF). We aim to compare coagulation panel amongst AD and ACLF population using ROTEM.

Method: This is a single-center observational study conducted from August 2021 to December 2022 which included all patients admitted for AD or ACLF (defined based on EASL-CLIF classification). ROTEM, CCT and severity of liver disease (Child-Pugh score and MELD score) of both groups were collected and compared. Data was analyzed using standard statistical tests in SPSS.

Results: A total of 54 participants were included (38 in AD and 16 in ACLF group). The results are shown in Table 1. The mean age was 60.3 ± 10.5 years and 77.8% were males. Child-Pugh score and MELD scores among AD vs ACLF were (10.0 vs 10.5; p = 0.227) and (15.82 vs 23.25; p = <0.001) respectively. CCT showed marked derangements in PT (15.05 seconds (s) vs 18.20 s; p = 0.012) and aPTT (35.29 s vs 51.12 s; p = <0.001) but platelet and fibrinogen levels were comparable. (p = NS). Comparison of ROTEM parameters between groups showed initiation of clot formation was delayed in ACLF patients as evidenced by statistically significant prolongation of clotting time (CT) in INTEM (205.86 s vs 258.13 s; p = <0.0001), EXTEM (73.39 s vs 91.06 s; p = 0.022) and FIBTEM (78.00 s vs 139.13 s; p = 0.003). However, interestingly clot formation time (CFT) in INTEM (132.83 s vs 165.44 s) and EXTEM (121.36 s vs 156.63 s) were similar between groups (p = NS), as was maximal clot firmness (MCF) in INTEM (48.75 millimeter (mm) vs 48.31 mm), EXTEM (50.25 mm vs 49.75 mm) and FIBTEM (11.69 mm vs 12.44 mm). (p = NS).

This data suggests that although there is a significant delay in clot initiation in ACLF patients, clot formation is not affected and the clot is as strong as in patients with AD. These findings have practical implications for ACLF patients undergoing either elective procedures or actively bleeding, as they should not be over transfused just to correct the delayed clot initiation. Another novel finding is although low fibrinogen levels were detected in AD, patients with ACLF had normal levels (p = NS). We cannot fully explain this finding mechanistically and it will require further exploration.

Conclusion: Our prospective exploratory study shows that in patients with ACLF as compared to AD, based on ROTEM parameters, although clot initiation is delayed, clot formation and strength of clot remains similar. Further studies are needed to validate our findings.

Background and aims: Acute decompensation (AD), especially accompanied by dysfunction of other organs, is a common cause of death or liver transplantation (LT) in chronic liver disease (CLD). However, when comparing the aetiology of CLD, little is known about how aetiology affects the adverse outcomes of AD in CLD.

Method: The prospective Korean Acute-on-Chronic Liver Failure (KACLiF) cohort consisted of 1,501 patients who were hospitalized with AD of CLD, including either liver cirrhosis (LC) or noncirrhotic CLD, from July 2015 to August 2018. We compared their clinical characteristics and analysed 28-day/overall adverse outcomes according to the aetiology of CLD.

Results: There was a median follow-up of 8.0 months (1.0–16.0 months), the mean age was 54.7 years, and 74.5% of patients were male. Cirrhosis was confirmed in 93.2% of patients. The most common aetiology of CLD was alcohol-related CLD (n = 1021), followed by viral hepatitis CLD (n = 206), viral hepatitis with alcohol-related CLD (n = 129), cryptogenic CLD (n = 108) and autoimmune-related CLD (n = 37). Viral hepatitis with alcohol-related CLD showed a poor liver function profile and a high frequency of acute-on-chronic liver failure (ACLF) (22.1%), with worse 28-day/overall adverse outcomes than other aetiologies. The difference in aetiology was a significant factor for 28-day adverse outcomes in multivariate analysis. In the subgroup analysis according to MELD, the differences in aetiology were stratified into 28-day adverse outcomes among patients with a high MELD score (≥15) (p = 0.001). Patients who
consumed alcohol or more than a small amount of alcohol (males, >20 g/day; females, >40 g/day) showed the most increased 28-day adverse outcomes of viral hepatitis with alcohol-related CLD compared with viral hepatitis or alcohol-related hepatitis.

**Conclusion:** The aetiology of CLD is a valuable factor that affects short- and long-term adverse outcomes of AD, determining patients with high MELD scores. Thus, the aetiology of CLD, especially viral hepatitis with alcohol-related CLD, should be considered when determining the priority of LT together with the MELD system for patients with AD of CLD. Additionally, patients with viral hepatitis should be careful even with small amounts of alcohol intake, which can cause aggravating adverse outcomes of AD.

**Figure:** 28-days adverse outcome according to etiology of CLD

**Table:** Association with alcoholic intake and adverse outcomes

**Conclusion:** The aetiology of CLD is a valuable factor that affects short- and long-term adverse outcomes of AD, determining patients with high MELD scores. Thus, the aetiology of CLD, especially viral hepatitis with alcohol-related CLD, should be considered when determining the priority of LT together with the MELD system for patients with AD of CLD. Additionally, patients with viral hepatitis should be careful even with small amounts of alcohol intake, which can cause aggravating adverse outcomes of AD.

**FRI-554**

**High histamine levels associate with acute-on-chronic liver failure and liver-related death in patients with advanced chronic liver disease**

Michael Schwarz1,2, Benedikt Simbrunner1,2, Mathias Jachs1,2, Lukas Harit1,2, Bernhard Scheiner1,2, Rafael Paternostro1,2, David Jm Bauer1,2, Matthias Pinter1,2, Albert Stättermayer1,2, Michael Trauner1, Thomas Reiberger1,2, Mattias Mandorfer1,2, 1Medical University of Vienna, Department of Internal Medicine III, Division of Gastroenterology and Hepatology, Austria; 2Medical University of Vienna, Department of Internal Medicine III, Division of Gastroenterology and Hepatology, Vienna Hepatic Hemodynamic Lab, Austria

Email: mattias.mandorfer@meduniwien.ac.at

**Background and aims:** Mast cells have been implicated in liver disease progression. The role of plasma histamine in advanced chronic liver disease (ACLD) is not fully understood, but may pose a potential target for pharmacological intervention.

**Method:** Patients (pts) included in the prospective Vienna Cirrhosis Study (VICIS) who underwent hepatic venous pressure gradient (HVPG) measurement (=baseline, BL) from April 2017 until March 2020 were considered. Inclusion criteria were portal hypertension (HVPG ≥6 mmHg) and/or a liver stiffness measurement by vibration-controlled transient elastography ≥10 kPa.

**Results:** Of the 251 included pts, 167 (66.5%) were male and median age was 58.5 years (IQR 49.8–67.0). The most common etiologies were alcohol-related liver disease (102 pts, 40.6%) and viral hepatitis (51 pts, 20.3%). Child-Turcotte Pugh (CTP) stages were: A 142 pts (56.6%), B 84 pts (33.5%), and C 25 pts (10.0%). A quarter of pts (67, 26.7%) had a model for end-stage liver disease (MELD) score ≥15 and half of pts were uncompensated at BL (135 pts, 53.8%). Median plasma histamine was 8.5 nmol/L (IQR 6.3–11.5) and 37.1% of patients had values above the upper normal limit (i.e., 9.9 nmol/L). Interestingly, histamine levels did not differ significantly across CTP, MELD, or HVPG strata. However, histamine concentrations showed weak positive correlations with markers of circulatory dysfunction (i.e., plasma renin and serum sodium).

During a median follow-up of 28.9 months, 69 patients developed acute-on-chronic liver failure (ACLF) or liver-related death. In univariate Cox proportional-hazards model, BL plasma histamine levels were predictive of overall mortality (hazard ratio [HR]: 1.021 per nmol/L; 95% confidence interval [95%CI]: 1.005–1.038; p = 0.010) as well as ACLF or liver-related death (HR: 1.023; 95%CI: 1.007–1.039; p = 0.004). When adjusting for either MELD, clinical stage, and serum albumin or CTP and serum sodium as well as age, sex, and HVPG, histamine levels remained associated with ACLF or liver-related death: CTP-based model: 1.033 (95%CI 1.014–1.053), p < 0.001; MELD-based model: 1.030 (95%CI 1.010–1.050), p = 0.003 (Figure).

**Conclusion:** High plasma levels of histamine were linked to circulatory dysfunction and associated with increased risks of ACLF and liver-related death during follow-up. Further studies investigating the underlying mechanism (i.e., mast cell activation vs. decreased degradation) and the implications of histamine for hyperdynamic circulation and ACLF development are warranted.

**FRI-555**

**Detection of 1,3-beta-D-glucan increases with the severity of decompensation stages in liver cirrhosis and is associated with lower survival in patients with acute on chronic liver failure**

Adam Herber1, Janett Fischer1, Cornelius Engelmann2, Niklas F Aehling1, Rhea Veeelen1, Sirak Petros1, Lorenz Weidhase3, Thomas Berg1, Florian van Bömmel1, 1Leipzig University Medical Center, Division of Hepatology, Department of Medicine II, Leipzig, Germany; 2Campus Charité Mitte/Campus Virchow-Klinikum, Department of Hepatology and Gastroenterology, Germany; 3University Hospital Leipzig, Medical Intensive Care Unit, Germany

Email: adam.herber@medizin.uni-leipzig.de

**Background:** Detection of 1,3-beta-D-glucan increases with the severity of decompensation and is associated with lower survival in patients with acute on chronic liver failure (ACLF) or liver-related death. In univariate Cox proportional-hazards model, BL plasma histamine levels were predictive of overall mortality (hazard ratio [HR]: 1.021 per nmol/L; 95% confidence interval [95%CI]: 1.005–1.038; p = 0.010) as well as ACLF or liver-related death (HR: 1.023; 95%CI: 1.007–1.039; p = 0.004). When adjusting for either MELD, clinical stage, and serum albumin or CTP and serum sodium as well as age, sex, and HVPG, histamine levels remained associated with ACLF or liver-related death: CTP-based model: 1.033 (95%CI 1.014–1.053), p < 0.001; MELD-based model: 1.030 (95%CI 1.010–1.050), p = 0.003 (Figure).

**Conclusion:** High plasma levels of histamine were linked to circulatory dysfunction and associated with increased risks of ACLF and liver-related death during follow-up. Further studies investigating the underlying mechanism (i.e., mast cell activation vs. decreased degradation) and the implications of histamine for hyperdynamic circulation and ACLF development are warranted.
Background and aims: Increased intestinal permeability (IP) and translocation of pathogen-associated molecular patterns (PAMPs) are factors contributing to the pathogenesis and outcomes of acute-on-chronic liver failure (ACLF). The polysaccharide 1,3-β-D-glucan (BDG) is a potential marker for increased IP. We have studied the correlation of BDG in patients with different stages of chronic liver disease.

Method: A total 230 individuals including 98 CLIF-ACLF patients (mean MELD score 27 ± 8, ACLF grade 1: n = 59, grade 2: n = 23, grade 3: n = 16), 84 patients with decompensated cirrhosis with ascites (mean MELD score 16 ± 6), 24 with compensated cirrhosis (mean MELD 12 ± 6) (76% male, mean age 57 ± 9 years, 77% alcohol related liver disease), and 24 controls were prospectively enrolled. Blood samples from patients were collected during the hospital stay and stored at −20°C. BDG levels were measured in the serum (n = 230) and, if available, in corresponding duodenal fluids samples (n = 125) by Kinetic Turbidimetric Assay (FUJIFILM Wako, Japan, LLOD = 2.57 pg/ml) and correlated with outcomes.

Results: BDG was more frequently detected in serum samples from ACLF patients (42/98, 43%) than in patients with decompensated cirrhosis (23/84, 27%), p = 0.03, compensated cirrhosis (3/24, 12%, p = 0.008) or healthy controls (2/24, 8%, p = 0.002). The BDG-detection rate correlated with the ACLF grade (ACLF 1: 120/59 (34%), ACLF 2: 10/23 (43%) and ACLF 3: 12/16 (75%); ACLF 1 vs. ACLF 3 p = 0.0004). The mean serum BDG concentration was higher in ACLF 3 than in ACLF 1 patients (22.6 ± 21.9 vs. 16.2 ± 27.31 pg/ml, p = 0.0003). In contrast, in duodenal fluid samples the frequency of BDG detection was similar across all groups (79%–100%). Within the ACLF group, mean 60-day, 90-day mortality (31.7 ± 8.3% vs. 59.5 ± 6.9%; p = 0.012) and overall survival were significantly lower in patients with detectable BDG compared to those without BDG. In a multivariate Cox-regression analysis for 90-day mortality adjusted for ACLF grade and MELD, the detection of BDG in serum showed an OR of 19.0 (95% CI 4.0 –100%). Within the ACLF group, mean 60-day, 90-day (31.7 ± 8.3% vs. 59.5 ± 6.9%; p = 0.012) and overall survival were significantly lower in patients with detectable BDG compared to those without BDG. In a multivariate Cox-regression analysis for 90-day mortality adjusted for ACLF grade and MELD, the detection of BDG in serum showed an OR of 19.0 (95% CI 4.0 –90.9), p = 0.0002. In all patients, there was one microbiologically proven fungal infection in blood samples.

Conclusion: The serum BDG detection rate increases with increasing severity of chronic advanced liver disease and this serum marker is a potential marker for increased IP . We have studied the correlation of BDG in patients with different stages of chronic liver disease.

**FRI-556**

**Parvovirus B19 infection associated with adverse outcomes in decompensated cirrhosis patients**

Changze Hong1, Beiling Li1, xiaojing wang2, Yanhang Gao2, weiyuan4, Qinquin He1, Xiaoqin Lan1, Qintao Lai1, Wenhao Luo1, Tingting Qi4, Jingjun Chen1,5. 1Hepatology Unit, Department of Infectious Diseases, Nanfang Hospital, Southern Medical University, Guangzhou, China, China; 2Centre of Integrative Medicine, Beijing Ditan Hospital, Capital Medical University, Beijing, China, China; 3Department of Hepatology, The First Hospital of Jilin University, Jilin University, Changchun, China, China; 4Department of Liver Intensive Care Unit, Shanghai Public Health Clinical Centre, Fudan University, Shanghai, China, China; 5Hepatology Unit, Zengcheng Branch, Nanfang Hospital, Southern Medical University, Guangzhou, China, China Email: chj@smu.edu.cn

Background and aims: Cirrhotic patients are characterized by cirrhosis associated immune dysfunction and have a non-hepatotropic viral signature which correlates with clinical progression and poor outcomes. Human parvovirus B19 (B19V), a non-hepatotropic virus, is rarely reported in cirrhotic patients and its potential pathogenic role remains unknown. This study aims to assess the clinical characteristics and outcomes of B19V infection in decompensated cirrhosis.

Method: Autely decompensated cirrhosis patients were recruited from two prospective, multi-center cohort study (from 2015 to 2020 and from 2021 to 2022, respectively). Demographics, laboratory data, antibiotic treatment and outcomes (death or transplant) were recorded. Metagenomic next-generation sequencing (mNGS) for plasma microbial cell-free DNA was performed in this study. According to the detection of plasma mNGS, patients with B19V or without any pathogens detectable (including only HBV detected) were included in analysis and were divided into “B19V positive” and “B19V negative” groups. Outcomes of patients with and without B19V infection were compared for transplant censored 28-day mortality by Log-rank test.

Results: Totally, 273 patients were enrolled. The mean age was 52 ± 11 years and male (81.3%) were predominant. HBV (71.1%) was the common etiology of cirrhosis. Human parvovirus B19 (B19V) was detectable in 10 (3.7%) patients by plasma mNGS testing, who were defined as the “B19V positive” group. Furthermore, 83 (30.4%) patients with complete

<table>
<thead>
<tr>
<th>Patient characteristics</th>
<th>Univariate HR (95% CI) p</th>
<th>MELD-based model aHR (95% CI) p</th>
<th>CTP-based model aHR (95% CI) p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, per year</td>
<td>1.015 (0.994 -1.034) 0.187</td>
<td>1.020 (0.998-1.041) 0.073</td>
<td>1.025 (1.001-1.047) 0.021</td>
</tr>
<tr>
<td>Sex, male vs. female</td>
<td>1.166 (0.698-1.948) 0.558</td>
<td>1.231 (0.710-2.137) 0.460</td>
<td>1.211 (0.704-2.085) 0.489</td>
</tr>
<tr>
<td>HVPG, per mmHg</td>
<td>1.069 (1.029-1.111) &lt;0.001</td>
<td>1.048 (0.999-1.100) 0.053</td>
<td>1.038 (0.991-1.088) 0.119</td>
</tr>
<tr>
<td>UNOS-MELD (2016), per point</td>
<td>1.056 (1.010-1.014) 0.017</td>
<td>1.024 (0.965-1.086) 0.434</td>
<td>-</td>
</tr>
<tr>
<td>Decompensation, yes vs. no</td>
<td>1.898 (1.155-3.177) 0.011</td>
<td>0.992 (0.547-1.832) 0.980</td>
<td>-</td>
</tr>
<tr>
<td>Albumin, g/L</td>
<td>0.923 (0.885-0.962) &lt;0.001</td>
<td>0.961 (0.910-1.014) 0.149</td>
<td>-</td>
</tr>
<tr>
<td>CTP A</td>
<td>1.002 Ref - 1</td>
<td>1.002 Ref - 1</td>
<td></td>
</tr>
<tr>
<td>CTP B vs. A</td>
<td>2.325 (1.380-3.915) 0.002</td>
<td>-</td>
<td>1.788 (0.980-3.261) 0.058</td>
</tr>
<tr>
<td>CTP C vs. A</td>
<td>3.933 (1.977-7.826) &lt;0.001</td>
<td>-</td>
<td>3.787 (1.688-8.495) 0.001</td>
</tr>
<tr>
<td>Sodium, mmol/L</td>
<td>0.931 (0.886-0.979) 0.006</td>
<td>-</td>
<td>0.959 (0.945-1.060) 0.884</td>
</tr>
<tr>
<td>Creatinine, per mg/dl</td>
<td>0.997 (0.747-1.331) 0.985</td>
<td>-</td>
<td>1.032 (0.725-1.469) 0.862</td>
</tr>
<tr>
<td>CRP, per mg/dl</td>
<td>1.280 (1.089-1.504) 0.003</td>
<td>1.264 (1.052-1.518) 0.012</td>
<td>1.303 (1.087-1.563) 0.004</td>
</tr>
<tr>
<td>Histamine, per nmol/L</td>
<td>1.023 (1.007-1.039) 0.004</td>
<td>1.030 (1.010-1.050) 0.003</td>
<td>1.033 (1.014-1.053) &lt;0.001</td>
</tr>
</tbody>
</table>

Figure: (abstract: FRI-554): Cox proportional-hazard models for ACLF or liver-related death. Univariate and multivariate models adjusted for MELD as well as for CTP are shown. Histamine was found to be an (independent) predictor of ACLF or liver-related death in the univariate model as well as in both multivariate models, which were adjusted for established prognostic indicators. HR = hazard ratio, aHR = adjusted hazard ratio, CI = confidence interval.
FRI-558

Spur cells in liver cirrhosis are predictive of ACLF and liver-related mortality regardless of severe anaemia

Michele Bevilacqua¹, Leonardo De Marco², Roberta Stupia², Francesco Dima³, Filippo Cattazzo², Veronica Paon⁴, Donatella Ieluzzi¹, Andrea Dalbeni², David Sacerdoti⁴, Azienda Ospedaliera Universitaria Integrata, Verona, General Medicine C and Liver Unit, Verona, Italy; General Medicine C and Liver Unit, Italy; Laboratory section, AOUI Verona, Italy; Liver Unit, Italy

Email: bevilacqua.michele@yahoo.com

Background and aims: Chronic anaemia in advanced liver disease is a frequent finding that need to be carefully evaluated. The aim was to explore the clinical impact of spur cells anaemia, a rare form of non-immune haemolytic anaemia in which red blood cells are spiky-like and that is typically associated with end-stage cirrhosis with poor outcome in absence of etiological therapy.

Method: 119 consecutive patients (73.5% males; 43.7% alcoholic, 35.7% viral, 10.1% autoimmune, 10.5% metabolic) referring to our Liver Unit outpatient clinic were enrolled. Inclusion criteria were consistent with a diagnosis of liver cirrhosis of any aetiology and disease severity but without hepatocellular carcinoma. Patients with bone marrow diseases or nutrients deficiencies (iron, folates, vitamin B12) were excluded. In all patients a blood smear was performed in order to assess red blood cells morphology and quantify spur cells (achantocytes and echinocytes). A complete blood biochemical panel was recorded together with Child-Pugh (CPS) and MELD score. For each patients clinical data (acute decompensation and acute-on-chronic liver failure, ACLF) and 1-year liver-related mortality were obtained. A cut-off of 5% of spur cell was considered as a threshold for clinical significance.

Results: 11 out of 119 patients (9.2%) had more than 5% of spur cells in blood smear, 7 out of 11 had alcoholic cirrhosis and 2 out of 11 had...
evidence of haemolysis; 33.6% (40/119) had more than 1%. In patients with more than 5% of spur cells, haemoglobin was lower compared with the other sub-group, while CPS, MELD score, prothrombin time, creatinine and unconjugated bilirubin were higher; no differences were shown in ferritin, folates, B12 vitamin, albumin and total bilirubin. Patients with more spur cells were more frequently decompensated, had more ascites (100% vs 55.1%, p = 0.002) and hepatic encephalopathy (63.6% vs 20.8%, p = 0.008). The median follow-up was 10 months (IQR 8–12 months). In multivariate Cox-regression analysis, CPS (HR 1.4 95% I.C.[1.2–1.7], p = 0.001) and spur cells >5% (HR 3.4 95% I.C.[1.5–8.0], p = 0.005), but not age, sex and MELD score, were independently related with ACLF development during follow-up. Similarly, the presence of more than 5% of spur cells (HR 3.3 95% I.C.[1.4–7.8], p < 0.001), together with CPS and MELD score, was independently associated with 1-year liver-related mortality.

Figure: (abstract: FRI-557): Re-hospitalization and survival of patients with AD and ACLF post discharge

Conclusion: Our results are consistent with a fairly high prevalence of spur cells in blood smear of cirrhotic patients. Despite not always associated with clinically overt haemolytic anaemia, the presence of spur red cells is associated per se with more severe disease, ACLF development and worse liver-related outcomes, underlining the role of blood smear in better stratifying prognosis and eventually prioritize patients for liver transplant.

FRI-559
Plasma thrombomodulin as a candidate biomarker for the diagnosis and prognosis of HBV-related acute-on-chronic liver failure
Xingping Zhou1, Jinjin Luo1, Xi Liang2, Peng Li1, Jiaojiao Xin1, Jing Jiang1, Dongyan Shi1, Jun Li1. 1The First Affiliated Hospital of Zhejiang University School of Medicine, State Key Laboratory for Diagnosis and Treatment of Infectious Diseases, National Clinical Research Center for Infectious Diseases, National Medical Center for Infectious Diseases, Hangzhou, China; 2Taizhou Central Hospital (Taizhou University Hospital), Precision Medicine Center, Taizhou, China

Background and aims: Hepatitis B virus-related acute-on-chronic liver failure (HBV-ACLF) is a complicated syndrome with high short-term mortality. Effective biomarkers for early diagnosis and prognosis of HBV-ACLF are needed. This study aimed to assess the diagnostic and prognostic value of thrombomodulin (THBD) in HBV-ACLF patients.

Method: The expression of THBD during disease progression was evaluated through transcriptomics analysis. Plasma THBD levels in 393 subjects with HBV-ACLF (n = 213), acute on-chronic hepatic dysfunction (ACHD, n = 50), liver cirrhosis (LC, n = 50), chronic hepatitis B (CHB, n = 50) and normal controls (NC, n = 30) from a prospective multi-center cohort were measured to validate the diagnostic and prognostic significance of THBD for HBV-ACLF patients by enzyme-linked immunosorbent assay (ELISA).

Results: THBD mRNA level was highly expressed in the HBV-ACLF group (compared with other groups, AUROC = 0.887). High expression of THBD predicted poor prognosis for HBV-ACLF patients in 28/90 days (AUROCs = 0.823/0.788). Functional analysis showed that THBD was significantly associated with complement activation and inflammatory signaling pathway. External validation confirmed its high diagnostic accuracy for HBV-ACLF patients (AUROC = 0.931). Plasma THBD levels were correlated with organ failure, including coagulation and kidney failure. Plasma THBD levels showed a potential prognostic value for 28-day mortality (AUROC = 0.702). Risk stratification of the THBD expression level (>8.4 ng/ml) specifically identified HBV-ACLF patients with a high risk of death.

Conclusion: This study reveals THBD could serve as a candidate biomarker for the diagnosis and prognosis of HBV-ACLF, which might play a crucial role in the coagulation and inflammatory response.

FRI-560
Frequency of ACLF and predictors of in-hospital mortality in cirrhotic patients in a tertiary care hospital of Pakistan
Marium Fatima Waqar1, Sulhera Khan1, Zeeshan Junejo1, Jinnah Postgraduate Medical Centre Karachi, Internal Medicine, Karachi, Pakistan

Background and aims: Acute-on-chronic liver failure (ACLF) is a severe complication in patients with cirrhosis that is associated with high mortality. Effective measures to identify and manage ACLF are needed. The aim was to assess the frequency of ACLF and identify predictors of in-hospital mortality in cirrhotic patients admitted to a tertiary care hospital in Pakistan.

Method: A retrospective observational study of patients with cirrhosis admitted to a tertiary care hospital in Pakistan from January 2015 to December 2019 was conducted. ACLF was defined according to the 2010 consensus criteria. Predictors of in-hospital mortality were identified using multivariate logistic regression analysis.

Results: During the study period, 200 patients were included. Of these, 12 patients (6%) developed ACLF. The predictors of in-hospital mortality were older age, higher Child-Pugh score, and lower albumin levels. Patients who developed ACLF had a significantly higher in-hospital mortality compared to those without ACLF (23.3% vs 6.0%; p = 0.002).

Conclusion: The frequency of ACLF in this study was lower than reported in other studies, possibly due to differences in patient characteristics and management practices. The predictors of in-hospital mortality in this study are similar to those reported in other studies and highlight the need for early identification and appropriate management of ACLF in cirrhotic patients.
Background and aims: Acute on chronic liver failure (ACLF) is characterised by acute decompensation of the liver in patients with chronic liver disease (CLD). This condition presents as jaundice, deranged (international normalised ratio) INR or liver failure. To grade patients, we need to utilise liver-failure-adapted organ assessment scores such as the European Association for the Study of the Liver-Chronic Liver Failure (EASL-CLIF) criteria. Our study focuses on determining the frequency of ACLF in our population and correlating different scoring systems to predict in-hospital mortality.

Method: This study is conducted on cirrhotic patients admitted to Jinnah Postgraduate Medical Centre. The organ failure was assessed with the CLIF-C score. Demographics, baseline characteristics and laboratory investigations were recorded. The severity of cirrhosis was assessed by using the Child-Pugh (CTP), Model for End Stage Liver Disease (MELD) and MELD sodium (Na) scores.

Results: Out of 148 patients, 29.1% (n = 43) of participants met the diagnosis of ACLF according to the EASL-CLIF criteria. 55.4% of the participants were males. The in-hospital mortality rate of the enrolled cirrhotic patients was found to be 20.1% (n = 23). It was observed the mortality in the ACLF (23.3%, n = 10) group was twice that of the non-ACLF (12.4%, n = 13) group. The highest mortality was seen in the ACLF grade 3 (100%, n = 6), whereas the combined mortality of ACLF grades 2 and 1 (10.8%, n = 4) was almost equivalent to the non-ACLF (12.4%, n = 13) group. The most common reason for admission was hepatic encephalopathy (44%). Renal (60.5%) and cerebral failure (23.8%) were identified as the most common organ failure in the ACLF and non-ACLF groups respectively. AUROC were 0.620 (CI95% 0.48–0.75), 0.646 (CI95% 0.52–0.77), 0.668 (CI95% 0.53–0.79) and 0.653 (CI95% 0.52–0.77) for MELD, MELD-Na, CLIF-C Organ Failure and CLIF-C ACLF scores, respectively. MELD, MELD-Na, and CLIF-C ACLF scores were independent predictors of mortality. Among these scores, the CLIF-C Organ Failure score was the strongest independent predictor of mortality (OR = 3.64, CI 95% = 2.34–5.65, p = 0.01). On ROC curve analysis, the maximum area (66.8%) under the curve was obtained for the CLIF consortium organ failure score (p = 0.01).

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Univariate analysis Odds Ratio (95% CI)</th>
<th>Multivariate analysis Odds Ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Pressure</td>
<td>0.9 (0.92–0.99)</td>
<td>0.9 (0.8–1.0)</td>
</tr>
<tr>
<td>Diastolic Pulse</td>
<td>1.0 (1.0–1.06)</td>
<td>1.0 (0.9–1.2)</td>
</tr>
<tr>
<td>Total Bilirubin</td>
<td>1.1 (1.0–1.2)</td>
<td>1.0 (0.9–1.2)</td>
</tr>
<tr>
<td>PT</td>
<td>1.0 (1.0–1.1)</td>
<td>1.0 (0.8–1.1)</td>
</tr>
<tr>
<td>INR</td>
<td>2.8 (1.3–6.0)</td>
<td>1.7 (0.3–10)</td>
</tr>
<tr>
<td>Urea</td>
<td>1.0 (1.0–1.04)</td>
<td>1.0 (1.0–1.04)</td>
</tr>
<tr>
<td>Creatinine</td>
<td>5.0 (2.7–9.2)</td>
<td>3.7 (1.4–9.4)</td>
</tr>
<tr>
<td>MELD Score</td>
<td>1.3 (1.20–1.44)</td>
<td>1.2 (1.08–1.33)</td>
</tr>
<tr>
<td>CTP Grade B</td>
<td>3.9 (1.8–18.0)</td>
<td>62 (1.7–230)</td>
</tr>
<tr>
<td>CTP Grade C</td>
<td>5.8 (1.2–27.0)</td>
<td>9.5 (0.3–287)</td>
</tr>
<tr>
<td>Liver failure</td>
<td>6.6 (1.6–26)</td>
<td>2.7 (0.01–86)</td>
</tr>
<tr>
<td>Cerebral failure</td>
<td>2.7 (1.3–5.8)</td>
<td>2.1 (0.5–8.8)</td>
</tr>
<tr>
<td>Circulation failure</td>
<td>1.0 (1.3–30)</td>
<td>2.5 (2.2–285)</td>
</tr>
<tr>
<td>Use of Vasopressors</td>
<td>8.9 (2.3–35)</td>
<td>1.0 (1.1–916)</td>
</tr>
<tr>
<td>MELD-Na Score</td>
<td>1.2 (1.16–1.36)</td>
<td>1.0 (1.06–1.17)</td>
</tr>
</tbody>
</table>

Figure: Risk estimation of ACLF using binary logistic regression

Conclusion: It is important to promptly identify ACLF as the patients identified early with two or more organ failures at presentation in resource-poor settings can be planned for aggressive management to reduce mortality. Upon analysis, it is seen that MELD Na, CLIF-C ACLF score, and EASL-CLIF organ failure score are superior to the MELD score and highly significant in predicting mortality in patients with ACLF.

Cirrhosis and its complications Experimental and pathophysiology

WEDNESDAY 21 TO SATURDAY 24 JUNE

TOP-042

Yaq-001, a non-absorbable, engineered carbon beads of controlled porosity impacts on gut dysbiosis, gut permeability, organ function and reduces mortality in rodent models of cirrhosis and ACLF

Jinxia Liu 1,2, Jane Macnaughtan 1, Yi Jin 3, Frederick Clasen 3, Francesco De Chiara 1, Ganesh Ingavle 4, Paul Cordero 1, Junpeoi Soeda 1, Jude A. Oben 1, Jia Li 5, I. Jane Cox 6, Susan Sandeman 7, Nathan Davies 1, Raj Mookerjee 1, Saeed Shoaei 7, Rajiv Jalan 1. 1UCL Institute for Liver and Digestive Health, Upper third floor, Royal Free Campus, Rowland Hill Street, Hampstead, London, NW3 2PF, United Kingdom; 2Department of Gastroenterology, Affiliated Hospital of Nantong University, Nantong, 226000, China; 3Centre for Host-Microbiome Interactions, Faculty of Dentistry, Oral and Craniofacial Sciences, King's College London, SE1 9RT, United Kingdom; 4Pharmacy and Biomolecular Sciences, University of Brighton, Moulsecoomb, Brighton, BN2 4GJ, United Kingdom; 5Department of Surgery and Cancer, Faculty of Medicine, Imperial College London, Sir Alexander Fleming Building, Imperial College Road, South Kensington, London, SW7 2AZ, United Kingdom; 6Roger Williams Institute of Hepatology, United Kingdom; 7Centre for Host-Microbiome Interactions, Faculty of Dentistry, Oral and Craniofacial Sciences, King's College London, SE1 9RT, United Kingdom

Email: r.jalan@ucl.ac.uk

Background and aims: Dysbiosis and translocation of bacterial lipopolysaccharide (LPS) stimulates a systemic inflammation in cirrhosis resulting in multiple organ dysfunction and acute on chronic liver failure (ACLF). Current strategies to target bacterial translocation in cirrhosis are limited to antibiotics with risk of resistance. Yaq-001 is a non-absorbable, engineered carbon bead that has been designed to adsorb small molecules such as ammonia and larger molecules such as LPS and bile acids from the gut. The aims of this study were to explore its therapeutic potential in models of cirrhosis and ACLF.

Method: Two rodent models of cirrhosis (4w, bile duct ligation, BDL) and ACLF (BDL+LPS). Eight groups: Sham (n = 36); Sham+Yaq-001 (n = 30); BDL (n = 36); BDL+Yaq-001 (n = 44); Sham+LPS (n = 9); Sham+LPS+Yaq-001 (n = 10); BDL+LPS (n = 16); BDL+LPS+Yaq-001 (n = 12). Yaq-001 was administered for 2-weeks prior to sacrifice. Portal pressure, organ function and transcriptome analysis of liver, colon, brain and kidney were performed. Stool in BDL rats was collected for 16 s microbiome study.

Results: In vitro studies: Yaq-001 exhibited rapid adsorption kinetics for endotoxin, ammonia and bile acids without exerting an antibiotic effect. In vivo, Yaq-001 supplementation resulted in a significant improvement in ALT, liver cell death (TUNEL stain), portal pressure, markers of systemic inflammation (TNFa, IL-8; white cell count) and renal function (creatinine) in BDL animals. ACLF animals treated with Yaq-001 had significantly better survival compared with controls, with significantly reduced ALT, portal pressure, brain water and creatinine. In addition to improvement in in vivo LPS sensitivity, ex-vivo LPS-induced reactive oxygen species production in both portal venous monocytes and Kupffer cell populations was diminished with Yaq-001 treatment. Transcriptomic analysis demonstrated a significant modulation of inflammation, cell death and senescence pathways in the liver, kidneys, brain and colon of Yaq-001-treated BDL rats compared to untreated controls. Abundance of Family Porphyromonadaceae and Genus Barnesiella were also significantly reduced with Yaq-001 treatment.

Journal of Hepatology 2023 vol. 78(S1) | S100-S1212 S205
**Conclusion:** Yaq-001 acts as a non-antibiotic enterosorbant of LPS, restores gut dysbiosis, reduces bacteria translocation, systemic inflammation and multiple organ dysfunction composition resulting in attenuation of LPS-driven oxidative injury, cell death and senescence pathways in the colon, liver, brain and kidneys.

**TOP-046**

The role of Toll-like receptor 4 in ammonia metabolism and as a therapeutic target for hyperammonemia

Annarein Kerbert¹, Anna Curto², Cornelius Engelmann³, Pavitra Kumar³, Mohsin Hassan³, Abeba Habtesion¹, Ferran Aguilar², Steven Olde Damink⁴, Celine Chollet⁵, Ludovic Brunet⁶, Joan Clària⁶, Richard Moreau⁶, Florence Castelli⁵, Francois Fenaille⁵, Fausto Andreola¹, Rajiv Jalan¹.¹ University College London, Institute for Liver and Digestive Health, United Kingdom; ²European Foundation for the Study of Chronic Liver Failure, Spain; ³Campus Virchow-Klinikum, Charité-Universitätsmedizin Berlin, Medical Department, Division of Hepatology and Gastroenterology, Germany; ⁴Maastricht University, Department of Surgery, NUTRIM School of Nutrition and Translational Research in Metabolism, Netherlands; ⁵CEA, INRA, Université Paris Saclay, MetaboHUB, Service de Pharmacologie et Immuno-Analyse (SPI), Laboratoire d’Etude du Métabolisme des Médicaments, France; ⁶Hospital Clinic de Barcelona, Spain

Email: j.c.kerbert@lumc.nl

**Background and aims:** Novel effective therapies for hyperammonemia are an unmet clinical need. The key enzymes that regulate the urea cycle and therefore ammonia metabolism are in the mitochondria. Hyperammonemia induces oxidative stress and is thought to activate the toll-like receptor 4 (TLR4) pathway inducing mitochondrial dysfunction. This study explored the role of the TLR4 pathway in ammonia metabolism and its modulation as a potential treatment for hyperammonemia.

**Method:** Hyperammonemia was induced by a 14-day amino acid (AA) diet in wild type (WT) and TLR4 knock-out (TLR4KO) mice. Two mouse models were studied: (1) WT mice ± AA diet with or without treatment with ornithine phenylacetate (OP, 300 mg/kg i.p.) or the TLR4 antagonist TAK-242 (10 mg/kg i.p.), (2) TLR4KO mice ± AA diet. Two other clinically relevant models of hyperammonemia were studied: (1) mice with genetic ornithine-transcarbamylase deficiency (OTCspf-ash) with or without treatment with sodium phenylacetate or TAK-242, (d) rats with bile-duct ligation (BDL)-induced liver cirrhosis with or without TAK-242 treatment. Plasma ammonia, urea and...
amino acids concentrations, liver multiplex immunofluorescence (IF) staining for the urea cycle enzymes (UCEs) and liver transcriptomics and metabolomics were studied.

Results: In WT mice, the AA-diet led to a significant increase in circulating ammonia levels (p < 0.0001), which was prevented by treatment with OP and TAK-242 (Fig.). Liver metabolomic analysis showed a distinct metabolic fingerprint in hyperammonemia with accumulation of metabolites related to the urea cycle, Krebs cycle and mitochondrial beta-oxidation. Comparative transcriptomics revealed that urea cycle-related pathways were downregulated in hyperammonemia, whereas the mitochondrial number was preserved. Hyperammonemia-induced changes in metabolomics, transcriptomics and IF were prevented by OP, TAK-242 and TLR4 deficiency. In hyperammonemia induced by OTC-deficiency and BDL, TAK-242 significantly reduced circulating ammonia levels.

Conclusion: These data point towards a novel mechanism of hyperammonemia-induced UCE dysfunction which is associated with a change in the metabolite fingerprint, primarily involving mitochondrial metabolism. Inhibition of the TLR4 pathway protects against hyperammonemia and is a potential novel therapy for hyperammonemia associated with liver disease and UCE disorders.

THURSDAY 22 JUNE

THU-337
Factor VIII synthesis by adipose tissue stromal cells contributes to coagulopathy in chronic liver disease

Sarita Gupta1, Kumaraswamy Parthasaradhy2, Archana Rastogi3, Perumal Nagarajan3, Shiv Kumar Sarin3, Viniyendra Pamecha2, Sanal Madhusudana Girija1,6. 1New Delhi, Molecular and Cellular Medicine, New Delhi, India; 2Vasant Kunj, Hepato Pancreato Biliary Animal Facility, New Delhi, India; 3Institute of Liver and Biliary Sciences, Surgery, New Delhi, India; 4National Institute of Immunology, Small Animal Facility, New Delhi, India; 5Institute of Liver and Biliary Sciences, Pathology, New Delhi, India; 6National Institute of Immunology, Small Animal Facility, New Delhi, India; 7Institute of Liver and Biliary Sciences, Pathology, New Delhi, India; 8Institute of Liver and Biliary Sciences, Hepatology, New Delhi, India; 9Institute of Liver and Biliary Sciences, Molecular and Cellular Medicine, New Delhi, India

Email: sanalmg@gmail.com

Background and aims: Adipose tissue also functions as an endocrine organ. Like bone-marrow, it’s derived from embryonic mesenchyme and is a rich source of mesenchymal stem cells. Adipose tissue has more mesenchymal stromal stem cells (MSC) than bone marrow. Lungs, kidneys, and brain are affected in cirrhosis but we don’t know about adipose tissue. In cirrhosis, the risk of both thrombosis and bleeding increases, however, the risk of thrombosis is less appreciated. Factor VIII (F8) levels are raised in cirrhosis, not lowered, despite shrinking liver. Liver makes most of the F8, but we know little, how much extra-hepatic sources contribute to F8 levels. Bone marrow transplantation studies showed marrow MSCs could synthesize factor F8 and ameliorate bleeding in hemophilic mice. Considering the total adipose tissue mass in the human body the total contribution of F8 from adipose tissue could be significant. Here we compared the expression of F8 in adipose tissue in health and cirrhosis.

Method: Adipose tissue was harvested from 15 liver cirrhosis patients (recipients) and same number of healthy adults (donors) during Living Donor Liver Transplantation (LDLT). We adapted an MSC isolation protocol for liposuction samples. We confirmed F8 by immunohistochemistry (IHC)/immunofluorescence (IF), western blot and flowcytometry. F8 functional assay was used to estimate F8 activity in plasma. Isolated MSC were transplanted to an immunodeficient F8 knock-out mouse model (factor VIII, Prkdc<sub>scid</sub> double knock-out). One million MSC suspended in PBS (isolated from adipose tissue of cirrhosis patients or healthy controls) were i.v. administered to animals (n = 9, in each test group). C57BL and the double knock-out animals (n = 5, in each control group) were injected PBS. The blood was collected at baseline and after 10 days and 3–6 months post-transplantation. Animals were sacrificed, various tissues were preserved in formalin/liquid nitrogen. T-test/ANOVA was used to calculate the statistical significance.

Results: Of the 15 cirrhosis patients eleven were males and 4 were females. Mean age was 45.5 years (Range:11–59 years). Mean BMI was 23.2 kg/m<sup>2</sup>. Mean MELD score was 22.2. Of the 15 donors, 2 were males and 13 were women. Mean age was 39.2 years (Range:19–50 years). Mean BMI was 23.2 kg/m<sup>2</sup>. Mean MELD score was 22.2. Of the 15 donors, 2 were males and 13 were women. Mean age was 39.2 years (Range:11–59 years). We compared the expression of F8 in adipose tissue in health and cirrhosis. We found higher expression of F8 in adipose tissue in cirrhosis compared to healthy. For the first time we demonstrated the contribution of F8 from adipose tissue to the body pool. Further we transplanted adipose derived MSC from healthy people and cirrhosis patients into F8 knock-out, immune-compromised mice. Transplanted cells seems to survive in these animals as shown by Real Time PCR in various tissues (Figure-1F-a) and IF (Figure-1F-b-e). F8 functional assay showed small but significant levels of F8 in all animals which received MSC treatment (Figure-1F-f). There is a small and insignificant increase in F8 in animals which received MSC from cirrhosis patients compared to the healthy controls.

Conclusion: We have demonstrated that adipose tissue contributes to F8 production, and this could be significant considering the total

---

**Figure:** (abstract: TOP-046).
mass of adipose tissue in the human body. The MSC from adipose tissue upon transplantation to F8 knock-out animals produce F8. It is a less appreciated fact that chronic liver disease is a thrombotic condition and the adipose tissue derived F8 could be a contributing factor in keeping delicate balance between bleeding and clotting in cirrhosis.

**THU-338**

ε-Lysine-melittin reduces pathological bacterial translocation and enhances gut immunity in experimental decompensated cirrhosis

Deepika Jakhar1, Pinky Juneja1, Aarti Sharma1, Impreet Kaur1, Dinesh Mani Tripathi1, Lakshminarayan Rajamani2, Savneet Kaur1. 1Institute of Liver and Biliary Sciences, Molecular and Cellular Medicine, New Delhi, India; 2Singapore Eye Research Institute, Singapore

Email: savykaur@gmail.com

**Background and aims:** Pathological bacterial translocation from intestine to mesenteric lymph nodes (MLN) is an important mechanism in development of systemic infections in liver cirrhosis. Melittin, major component of bee venom is cationic amphipathic peptide that has anti-microbial and cytolytic properties. We modified mellitin by replacing alpha-lysine with ε-lysine at multiple sites to enhance its selective bactericidal properties and reduce its in vivo toxicity and evaluated effects of modified mellitin on bacterial translocation, MLN immune responses and intestinal and liver inflammation in experimental cirrhosis with ascites.

**Method:** Rat models of cirrhosis were prepared by i.p. injections of CCl4 for 8–10 weeks. Melittin was administered i.p. 0.2 mg/kg, twice a week for 2 weeks in CCl4 rats. CCl4 rats given saline served as vehicle. Bacterial load was studied in MLNs. Intestinal permeability in ileum was assessed by immunohistochemistry of occludin protein. Immune cells were quantified in MLNs, portal and peripheral blood by flow cytometry. Gene expression of inflammatory markers in liver and ileum tissues was examined by RT-PCR.

**Results:** Modified mellitin did not result in adverse effects in mellitin treated CCl4 rats. Bacterial load in MLNs of cirrhotic (<18 000 CFU/g of liver) was reduced and bacterial load in ileum was reduced by 50% as compared to control (p<0.001). MLN immune response was enhanced with increased expression of IFN-γ and IL-12 and reduced expression of IL-10 in treated rats as compared to control (p<0.001). Intestinal permeability was reduced and gene expression of inflammatory markers in liver and ileum tissues was significantly reduced in treated rats as compared to control (p<0.001).

**Figure:** (abstract: THU-337).
tissue) was significantly reduced (>10,000 CFU/g) in MLNs of melittin-treated (p < 0.01) suggesting increased bacterial killing in MLNs. In treated rats, percentage of CD4+ (65.4 ± 0.6 vs 33.2 ± 0.7), CD8+ T (24.9 ± 1.3 vs 19.3 ± 1.5) and activated CD134+Th (34.6 ± 0.9 vs 30.1 ± 1.1) (p < 0.05) cells increased and CD25+Treg (3.20 ± 0.8 vs 56.1 ± 1.2, p < 0.05) cells decreased compared to vehicle, decreased inflammatory monocytes (CD43-low) (33.5 ± 1.5 vs 44.2 ± 1.7, p < 0.05) and increased dendritic cells (61.5 ± 0.3 vs 43.4 ± 0.5, p < 0.05) in treated compared to vehicle. In portal and peripheral blood, there was increased CD8+T (23.57 ± 1.4 vs 19.10 ± 1.1) and CD134+Th (34.13 ± 1.9 vs 24.25 ± 1.7) (p < 0.05) in treated compared to vehicle. In treated rats, occludin protein expression significantly increased (3.2-fold, p < 0.5) in epithelial cells of intestinal villi and crypts compared to vehicle. A significant decrease in gene expression of pro-inflammatory markers such as IL6 and TLR4 in both ileum (IL6: 3.5-fold, p < 0.5, TLR4: 10 fold, p < 0.5) and liver (IL6: 8 fold, p < 0.5, TLR4: 9 fold, p < 0.5) of treated rats compared to vehicle. There was no change in liver fibrosis after melittin treatment (Fig).

Conclusion: In decompensated cirrhosis, treatment with modified melittin reduces bacterial load in MLNs by decreasing intestinal permeability and enhancing adaptive T cell immunity in MLNs. It also attenuates inflammation in both gut and liver. Modified ε-lysine mellitin thus holds relevance as an emerging adjunct antimicrobial therapy for combating development of infections in cirrhosis.

THU-339
Combination of weekly albumin infusion, personalized nutrition and home-based exercise programme improves outcomes of patients with end stage liver disease (AI-Fit study)
Chandan Kedarisetty¹, Sasanka Vangara¹,², Sridhar Reddy Chappidi², Malleswari Nagam¹,², Rami Reddy Yalaka³, Sameer Godey³. ¹Gleneagles global hospital, Department of hepatology and liver transplant, Hyderabad, India; ²Gleneagles global hospital, Department of Radiology, Hyderabad, India; ³Gleneagles global hospital, Department of Nutrition, Hyderabad, India; ⁴Gleneagles global hospital, Department of Medical Gastroenterology, Hyderabad, India
Email: sasanka58v@gmail.com

Background and aims: Cirrhotic patients have progressive deterioration of liver functions and development of sarcopenia and frailty. Frailty has emerged as independent critical determinant of mortality and assessed by Liver Frailty index (LFI). We assumed improvement of LFI through weekly albumin supplementation, personalized nutritional counselling and monitored home based physiotherapy improves outcomes and quality of life in cirrhotic patients. We aimed to study the efficacy of combination therapy in improving physical performance assessed by LFI, reduction in decompensating events and improving quality of life.

Method: We randomized 60 cirrhotics with Model for end stage liver disease (MELD) score ≥ 15 in 1:1 ratio into 2 groups, A and B. Group A received combination therapy in the form of weekly once 20% 100 ml recombinant human albumin infusion, weekly diet recall ensuring calories 30–35 kcal/kg/day and proteins 1.2-1.5 g/kg/d and home-based rehabilitation exercises. Group B received only standard medical care. We assessed liver frailty index, MELD score, quality of life by chronic liver disease questionnaire (CLDQ) at baseline and at follow-up of 3 months.

Results: Mean age in the cohort was 49 ± 9.8 years, predominant etiology was alcohol related liver disease and more than 80% were male gender. Baseline LFI in Group A was 4.42 ± 0.4 vs. 4.3 ± 0.3 in Group B. There was a statistically significant reduction in LFI at 3 months compared to baseline in Group A (4.42 ± 0.4 to 4.3 ± 0.37), compared to an increase in Group B (4.3 ± 0.3 to 4.5 ± 0.45) (p = 0.007). The MELD score significantly reduced in Group A (17.5 ± 4.6 at baseline to 16.2 ± 2.6 at 3 months), compared to an increase in Group B (18 ± 3.2 at baseline to 19.7 ± 6.4 at 3 months) (p = 0.007). There was significant improvement of CLDQ score in Group A (23.7 ± 3.5 at baseline to 26.5 ± 4.4 at 3 months) compared to Group B (22.9 ± 2.7 at baseline to 21.7 ± 3.07 at 3 months) (p = 0.00001). There was no difference in number of hospital admissions in between the two groups (p = 0.19).
Conclusion: Liver transplantation offers improved long-term survival for these patients but is negatively influenced by deceased donor availability and progression of disease in the wait-list. The combination of weekly albumin infusion, personalized nutritional counselling and monitored home-based physiotherapy is first kind of study in patients with high MELD score more than or equal to 15 to show significant improvement in liver frailty index, reduces MELD score and overall improves quality of life. My study trial enrolment details are as follows-CTRI No : REF/2023/02/063149.

THU-340
Imperfect maturation in erythroid progenitors leads to severe anemia in cirrhotic patients
Deeplika1, Chhagan Bihari2, Jaspinder Maras1, Rakhhi Majwall3, Anupam Kumar1, Shiv Kumar Sarin1,3.
1Institute of liver and biliary sciences, Department of Medical and cellular medicine, New delhi, India; 2Institute of liver and biliary sciences, Department of pathology, New delhi, India; 3Institute of liver and biliary sciences, Department of hepatology, New delhi, India
Email: dr.anupamkumarllbs@gmail.com

Background and aims: Anemia is seen in nearly >70% patients with cirrhosis. It is often non-responsive to nutritional supplements known as refractory anemia. Therefore, to understand unrecognized anemia in cirrhotic patients.

Method: Flow cytometry was done to assess hematopoietic stem cells (HSCs) and erythroid population (EP) status in bone marrow (BM) aspirates of cirrhotic (N = 8) and healthy control (N = 3). Proteomics was done of HSCs and EP in cirrhotic and non-cirrhotic (NCPF) injury. Unlike NCPF, cirrhotic EP showed decreased expression of genes related to erythropoiesis and hemoglobin synthesis (>0.5 folds) [figure D, E]. They also showed significantly reduced number of erythroid colonies (BFU-E) as compared to control (p < 0.05). We found significant (p < 0.05) increase in inflammatory cytokines such as IL-5, TRAIL-R2, TGF-alfa and TGF-beta in cirrhotic BM plasma. Surprisingly, ESA required facilitating normal erythropoiesis such as erythropoietin, transferrin and growth factors IL-3, IL-6, FLT3 and SCF were also significantly increased in cirrhosis as compared to NCPF and control [figure F].

Conclusion: In cirrhosis, increased inflammatory cytokines in BM and altered erythroids intracellular physiological pathways involved in hemoglobin synthesis and erythroid cell development as well as decreased transferrin receptors leads to defective erythroid maturation.

THU-341
Study of epigenetic control of LSECtin in hepatic antigen presenting cells during experimental cirrhosis
Enrique Angel1,2, Sebastian Martinez1,2, Isabel Gomez-Hurtado3,2, Paula Boix1,2, Esther Caparrós1,2, Rubén Francés1,2,3,1 Hepatic and intestinal immunobiology group. Miguel Hernandez University, Clinical Medicine Department, San Juan, Spain; 2IIS Isabial. Hospital general universitario dr. Balmis, Alicante, Spain; 3Carlos III health institute, CIBERehd, Madrid, Spain
Email: evangel@umh.es

Background and aims: LSECtin, a C-type lectin that acts as Pattern Recognition Receptor and T-cell ligand, is expressed in Liver Sinusoidal Endothelial Cells (LSECs) and Kupffer Cells (KCs). The progressive reduction in the expression of LSECtin in animal models of experimental cirrhosis inhibits inflammatory response control associated to advanced chronic liver disease progression. The main aim of this work is to characterize the epigenetic control of LSECtin’s expression during cirrhosis (attending to DNA methylation and histone proteins post-translational modifications, HPTMs) in order to evaluate new potential strategies that could contribute to the recovery of its expression.

Method: C57BL/6 mice were treated by oral gavage of carbon tetrachloride (CCL4) or olive oil for 16 weeks, for cirrhotic and control groups, respectively. After laparotomy and liver perfusion, KCs and LSECs were isolated by cell sorting. DNA methylation analysis (Infinium Mouse Methylation BeadChip Array-Illumina) and chromatin immunoprecipitation followed by sequencing (ChiP-Seq) experiments were carried out in both APCs subpopulations.

Results: Analysis of DNA methylation allowed the identification of differentially methylated probes in pairwise comparisons using a Benjamini-Hochberg adjusted p value <0.05, distributed over gene body and proximal promoter of Clec4g, the gene that encodes LSECtin (Figure 1A). ChiP-Seq experiment for HPTMs associated to gene expression silencing showed a differential binding profile for all control vs CCl4 comparisons (KCs, H3K27Me3: 1099/300; H3K9Me3: 11594/4571; LSECs, H3K27Me3: 346/455; H3K9Me3: 2573/5802). Specific peak profile of Clec4g flank region for the aforementioned comparisons is depicted in Figure 1B.

Conclusion: The promoter region of LSECtin contains specific epigenetic marks in hepatic APCs during cirrhosis that include changes in DNA methylation and differences in the post-translational modification profile of histone proteins related to gene silencing, specifically H3K9Me3 and H3K27Me3.
Nitazoxanide counteracts lipopolysaccharide-induced hepatic inflammation and organ damage in a disease model of acute-on-chronic liver failure

Vanessa Legry1, Marie Bobowski-Geardin1, Nicolas Stankovic Valentim1, Philippe Delataille1, Valérie Daix1, Remy Hanf1, Dean Hum1, Bart Staels2, 1Genfit, RandD, Loos, France; 2Inserm U1011, University Lille, Inserm, CHU de Lille, U1011-EGID, LILLE, France

Email: vanessa.legry@genfit.com

**Background and aims:** Acute-on-chronic liver failure (ACLF) is characterized by multiple organ failures in patients with cirrhosis and is associated with high short-term mortality. Systemic inflammation, triggered by bacteria or endotoxins, such as lipopolysaccharide (LPS), is a primary driver of ACLF and a potential therapeutic target. Nitazoxanide (NTZ), a parasitic drug, has shown promising effects in disease models of systemic inflammation and ACLF. The objective of this study was to determine the mechanism of action of NTZ in ACLF.

**Method:** ACLF was induced by a single injection of LPS in cirrhotic rats. NTZ or vehicle was administrated daily for 3 days. Serum and tissues were collected 3 hours after LPS injection. Transcriptomes were assessed using RNA sequencing from 5 animals per group and pairwise comparisons were performed to identify differentially expressed genes. To evaluate tissue damages, serum levels of cystatin C and Ripk3 were measured.

**Results:** LPS injection in cirrhotic rats induced systemic inflammation as shown by elevated serum pro-inflammatory cytokines levels, which were significantly reduced upon NTZ treatment: −99% for IL6 (p = 0.001) and −94% for TNF alpha (p = 0.006). This was associated with a significant remodeling of the hepatic and renal transcriptome in ACLF compared to cirrhotic rats. Enrichment analysis revealed that differentially expressed genes mainly related to immune response and pro-inflammatory signaling pathways. Treatment of rats with NTZ reversed the inflammatory gene signature both in liver and kidney (Figure). Interestingly, the anti-inflammatory effect of NTZ was associated with a reduction of organ damages as shown by decreased serum, hepatic and renal levels of Ripk3, a marker of necroptosis associated with organ failure and ACLF severity.

**Conclusion:** NTZ is a promising candidate for the treatment of ACLF. Further studies are needed to evaluate its long-term effects and to determine its safety profile.
Figure: Heatmap displaying (log2) fold changes (FC) of genes differentially expressed in the liver and the kidney between ACLF and cirrhotic rats (adjusted p < 0.01 and FC >2). Genes strongly induced by LPS injection (column 1, blue lines) were found to be repressed by NTZ treatment (column 2, red lines) and vice-versa in both liver and kidney.

Conclusion: A single oral administration of nitazoxanide rapidly counteracted LPS-induced systemic and tissue inflammation and protected against organ damage in a pre-clinical model of ACLF.

THU-343
Metabolic Derangements in Hematopoietic Stem and Progenitor Cells (HSPCs) underlie monocye-macrophage dysfunction in cirrhosis
Deepanshu Maheshwari¹, Nidhi Nautiyal¹, Anupama Parasar¹, Rakhi Maiwall², Nirupama Trehanpati¹, Archana Rastogi¹, Shiv Kumar Sarin¹,², Anupam Kumar¹. ¹Institute of Liver and Biliary Sciences, Department of Molecular and Cellular Medicine, New Delhi, India; ²Institute of Liver and Biliary Sciences, Hepatology, New Delhi, India; ³Institute of Liver and Biliary Sciences, Department of Pathology, New Delhi, India
Email: dr.anupamkumar.ilbs@gmail.com

Background and aims: Myeloid-biased hematopoiesis play a key-role in promotion and resolution of injury and infection. Bioenergetic flexibility and metabolic adaptation in response to injury govern the balance between self-renewal and differentiation of hematopoietic stem and progenitor cells (HSPCs). In cirrhosis, this process gets dysregulated with poor resolution of infection and injury. We investigated the changes in energy metabolism of HSPCs and its impact on haematopoiesis to decipher the underlying cause of poor resolution of injury in cirrhosis.

Method: Cirrhosis was induced in C57Bl/6 mice (n = 35, 8–10 weeks) by i.p. injection of CCl4 for 18 weeks till the development of decompensated cirrhosis. Mice were sacrificed at week 3 (W3), 6 (W6), 10 (W10) and 18 (W18) to study kinetic changes in liver bone marrow derived macrophages (BMDMs), their function and bone marrow (BM) haematopoiesis. Bioenergetics of HSPCs was determined using Extracellular Flux Analyzer. Mitochondrial properties were studied using MitoTracker dyes and MitoSOX assay. Glucose uptake (GU) was measured by NBDG–GU kit.

Results: Histology of liver showed inflammation with development of portal fibrosis at W3, bridging fibrosis at W6, cirrhosis at W10, ascites (SAAG 1.8 (1.21–2) g/dL) and jaundice by W18. With increase in liver injury there was a reduction in percentage (p < 0.0001) and phagocytic function (p < 0.05) of liver macrophages from W6 (Fig. 1A). Compared to age matched healthy animals, the cirrhotic animals showed significant loss of Long-term HSC (p < 0.0001) with increase in myeloid progenitor (p < 0.0001) from W6 (i.e., in...
transition from fibrosis to cirrhosis and thereafter, Fig. 1B). Increase in myeloid progenitor in chronic liver injury was mainly contributed by neutrophil (p < 0.0001), with monocyte production being compromised (p < 0.01) (Fig. 1C). Bioenergetic analysis of HSPCs showed reduction in glycolysis (p < 0.01) due to compromised glucose uptake (p < 0.0001) (Fig. 1D) and increase in mitochondrial respiration (Fig. 1E) from W6. Interestingly while basal respiration was increased, there was a reduction in mitochondrial spare reserve (p < 0.05) with loss of total (p < 0.0001) and functional mitochondria. (p < 0.0001) in transition from fibrosis to cirrhosis and thereafter (Fig. 1E and F). In-vitro differentiation of HSPCs to BMDMs showed defects in their maturation (p < 0.001) and function (p < 0.01). These cells also showed metabolic defects with defective glycolysis and OXPHOS (p < 0.01).

**Conclusion:** Increased OXPHOS with loss of glycolysis disrupts the balance between HSC self-renewal and differentiation, leading to increased myelopoiesis and loss of Long-term HSC reserve in chronic liver injury. Further, increased mitochondrial dysfunction in HSPCs leads to production of defective myeloid cells particularly monocye-macrophages in chronic liver injury. This may underlie for poor monocyte-macrophage driven resolution during chronic liver injury.

**THU-344**

**Constant alcohol consumption exacerbates hepatic encephalopathy and leads to neuronal loss in rats with chronic liver disease**

Farzaneh Tamnanloo1,2, Xiaoru Chen1, Mariana M. Oliveira1, Mélanie Tremblay1, Christopher F Rose1,2, 1CRCHUM, Hepato-neuro lab, Montréal, Canada; 2Université de Montréal, Medicine, Montréal, Canada

**Background and aims:** Hepatic encephalopathy (HE) is a debilitating neurological complication of chronic liver disease. Alcohol is a major etiological factor known to induce liver injury and disease. However, excessive alcohol consumption has been shown to also induce atrophy of the cerebellum and cerebellar degeneration. To date, the role of alcohol in the development of HE remains unclear. Here we examined the effects of constant alcohol consumption on the neurological decline in rats with chronic liver disease induced following bile duct ligation (BDL).

**Method:** 5-week BDL rats and Sham-operated controls (Sham) were used. Starting day 7 after surgery, rats were gavaged twice a day (3 hours apart) with alcohol at a dose of 3 g/kg (51% v/v), 5 days per week, for 4 weeks. Motor coordination was assessed using Rotarod every week until week 5. At the end of the model (day 40), anxiety-like behavior was assessed using the open field (OF) and elevated plus maze (EPM). Upon sacrifice, brains were collected, and western blot and immunohistochemical (IHC) analyses were used to investigate the neuronal integrity as well as assess apoptosis and necroptosis pathways in the cerebellum.

**Results:** Alcohol worsened motor coordination performance in weeks 2, 3, 4, and 5 in BDL-alcohol rats (p < 0.01 vs respective shams). Anxiety-like behavior significantly increased in BDL-alcohol rats, with an increase in time spent in the closed arms of EPM and a decrease in time spent in the center of the open field (p < 0.05 vs respective shams). These impairments were associated with decreased neuronal markers of NeuN and SMI311 (p < 0.01 and p < 0.05, respectively), increased apoptotic markers of cleaved/pro-Caspase3 and Bax/Bcl2 ratio (p < 0.001 and p < 0.01 respectively), increased necroptosis markers of pRIP3 and pMLKL (p < 0.01 and p < 0.001, respectively), decreased total antioxidant capacity (p < 0.001) and increased oxidative stress marker of 4-HNE (p < 0.05) in the cerebellum of BDL-alcohol rats when compared to respective controls. IHC results confirmed the colocalization of apoptotic marker (cleaved Caspase3) and necroptosis marker (pMLKL) in the granular and Purkinje layer neurons of the cerebellum of BDL-alcohol rats.

**Conclusion:** Constant alcohol consumption exacerbates HE by worsening motor coordination impairment and increasing anxiety.

**Figure:** Metabolic Derangement in Hematopoietic Stem and Progenitor Cells (HSPCs) may underlie monocye-macrophage dysfunction in cirrhosis: Kinetic changes in (A) liver macrophages and their phagocytosis (B). Hematopoietic Stem and Progenitor Cells (HSPCs), LT-HSCs and Myeloid progenitors and (D) BM-Myeloid Cells (Neutrophils, Monocytes and MO/DCs) during chronic liver injury. (E) Changes in glycolysis, glycolytic capacity and glucose uptake and (E) Real time changes in oxygen consumption rate of HSPCs during chronic liver injury. (F) Changes in mitochondrial biomass and potential of HSPCs during chronic liver injury.
in BDL rats. Furthermore, our results show neuronal loss through apoptosis and necroptosis in the cerebellum of BDL-alcohol rats. Additionally, higher levels of oxidative stress marker of 4-HNE and decreased total antioxidant capacity in the cerebellum of BDL-alcohol rats suggest that oxidative stress is the triggering factor of apoptosis and necroptosis pathway leading to neuronal loss/injury. These results demonstrate the adverse effect of constant alcohol consumption on the development of HE and neuronal integrity in chronic liver disease.

**THU-345**
**Targeting myeloid-derived suppressor cells in a carbon tetrachloride-induced murine model of chronic liver injury**
Emilio Flint1, Caner Ercan2, Lucia Possamai3, Evangelos Triantafyllou3, Christine Bernsmeier1, Emilio Flint1, Caner Ercan1, Lucia Possamai4, Evangelos Triantafyllou2, Christine Bernsmeier4,2. 1University of Basel, Department of Biomedicine, Basel, Switzerland, 2University Hospital Basel, Institute of Medical Genetics and Pathology, Basel, Switzerland, 3University Hospital Basel, Institute of Medical Genetics and Pathology, Basel, Switzerland, 4Univesity Hospital Basel, Institute of Medical Genetics and Pathology, University Hospital Basel, Institute of Medical Genetics and Pathology, Imperial College, Department of Metabolism, Digestion and Reproduction, London, United Kingdom.

**Background and aims:** Previously, we identified immunosuppressive monocytic myeloid-derived suppressor cells (M-MDSC) in the circulation of patients with cirrhosis and liver failure. These cells increased with disease severity and were associated with distinct impaired innate and adaptive immune responses, increased infection susceptibility and mortality. Impaired immune responses and M-MDSC expansion were reversed by TLR3 agonism in vitro. Thus, we aimed to identify MDSC in murine models of fibrosis and assess the safety and efficacy of polyinosinic:polycytidylic acid (pI:pC) administration in vivo.

**Methods:** C57BL/6J mice were intraperitoneally (i.p.) administered carbon tetrachloride (CCL4) for 6 weeks. To mimic an acute bacterial challenge, a group of CCL4 mice was injected lipopolysaccharide (LPS) 24 hours prior to sacrifice. In another group, pI:pC (1 mg/Kg, i.p.) was administered 4 times for one week prior to sacrifice (A-B). Blood and liver cells were isolated and characterized with flow cytometry. Immunofluorescent stainings of CD11b+Gr-1+ identified MDSC in liver sections. Liver histopathology was evaluated on H&E or SiriusRed with Ishak Grade and Ishak Stage scores, plaque markers were quantified.

**Results:** CCL4-treated mice displayed liver inflammation, fibrosis, increased plasma ALT levels and changes in frequency of myeloid cells in both the circulation and the liver. Phenotypically distinct polymorphonuclear (PMN)-MDSC and M-MDSC expanded in the blood (2-fold per ml, p = 0.001, p < 0.0001) and liver (7-fold per gram, p < 0.0001 and p < 0.0001) in the CCL4 model (C). Moreover, LPS challenge significantly increased numbers of hepatic MDSC compared to saline-treated CCL4 controls (C). MDSC expansion in the liver of CCL4 mice was confirmed with immunofluorescent stainings (D). Both PMN-MDSC and M-MDSC expressed distinct markers Axl and Mertk, while M-MDSC expressed PD-L1. No changes in body weight were observed in CCL4 mice with or without pI:pC (B), and pI:pC did not reduce MDSC numbers in the current therapeutic protocol. In addition, liver damage, function and necroinflammation (Ishak-Grade) were unvaried following pI:pC administration, while liver fibrosis (Ishak-Stage) was reduced (p = 0.0240) (E).

**Conclusion:** We identified MDSC in the circulation and liver in murine models of fibrosis (CCL4 and CCL4 with LPS). Our data support the liver-related safety of pI:pC therapy, although MDSC numbers were unchanged. Yet, pI:pC alleviated fibrosis. Novel approaches targeting MDSC in vivo merit further evaluation.
Cirrhosis alters receptor mediated clearance of therapeutic antibodies by hepatic sinusoidal endothelial cells

Bethany James1, Louise Gliddon2, Matthew Gardener2, Chris J Weston3, Patricia Lalor1. 1University of Birmingham, Centre for Liver and Gastroenterology Research and National Institute for Health Research (NIHR) Birmingham Biomedical Research Centre, Institute of Immunology and Immunotherapy, Birmingham, United Kingdom; 2Antibody Pharmacology, Biopharm Discovery, Glaxo Smith Kline Research and Development, Hertfordshire, United Kingdom Email: bhj711@student.bham.ac.uk

Background and aims: Fully human or humanized monoclonal antibodies (mAbs) are increasingly used for immunotherapy; but the design of these molecules is complicated by the need to bypass normal antibody clearance mechanisms. The liver plays a key role in the internalisation and catabolic clearance of biological therapies via interactions with scavenger and Fc-receptors within the hepatic reticuloendothelial system. Liver sinusoidal endothelial cells (LSECs) express many of these receptors and play key roles in clearance of immune complexes and regulation of antibody pharmacokinetics. However, changes in the expression of key membrane receptors involved in antibody clearance in chronic disease are not well characterized and may impact on drug efficacy in target patients. Therefore, we wanted to investigate the impact of cirrhosis on the expression of key receptors by human LSEC and assess how this impacts on the uptake and clearance of varying formats of monoclonal antibodies.

Method: LSEC were isolated from diseased and normal human liver tissue; as well as use of whole liver for extraction of RNA and protein lysates. A novel recycling assay was designed using primary cells from both diseased and healthy livers in which the binding and internalisation of chimeric, human/humanised and bispecifics were visualised through immunofluorescence confocal imaging, flow cytometry and quantification of antibody within cells over 4 and 8 hours time periods via meso-scale discovery (MSD) assay. Furthermore, whole liver tissue wedges were used for antibody perfusion over a 4 hour period after which the wedges were either fixed for chromogen staining or mechanically digested to generate cell suspensions for flow cytometric analysis of antibody localisation. Fluorescence intensity and MFI was obtained using ImageJ and Flowjo and one-way ANOVA and student T tests were used to statistically analyse the data.

Results: Our results confirm that expression of three important receptors known for antibody clearance by human LSEC (CD32b, DC-SIGN and Mannan Receptor) is significantly altered at the protein level in cirrhosis. Importantly confocal imaging, MSD, flow cytometry and novel recycling assays on isolated diseased and healthy LSEC confirm that LSEC can bind and internalize therapeutic mAbs. We also found that the binding capacity is altered on cells that originated from cirrhotic livers with immunofluorescent staining revealing a statistically significant difference between healthy and cirrhotic LSEC at 4 hours (Figure). Cells from cirrhotic livers also lacked the ability to process therapeutic biomolecules as evidenced by the retention of fluorescent signal at the 8 hour time point when compared to cells from donor tissue.

Conclusion: Our novel assays using human LSEC have demonstrated that changes in LSEC phenotype accompanying chronic disease may explain altered drug pharmacokinetics and toxicity observed in early trials. Therefore, future antibody development pathways should incorporate testing in models representative of the target patient demographic to address issues of poor kinetics, unexpected toxicity and poor predictive ability.

Evaluation of the effect of glucocorticoids on cardiac chronotropic dysfunction in cirrhotic rats, do dopamine receptors also play a role?

Mohadase Shokrian Zeini1, Maryam Shokrian Zeini1,2, Qamar Niazi1,3, Sania Mehreeni2, Farahnaz Jazaeri1. 1Department of Pharmacology, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran; 2Experimental Medicine Research Center, Tehran University of Medical Sciences, Tehran, Iran; 3Department of Pharmacology and Toxicology, Faculty of Bio-Sciences, University of Veterinary and Animal Sciences, Lahore, Pakistan; 4Department of Zoology, Faculty of Fisheries and Wildlife, University of Veterinary and Animal Sciences, Lahore, Pakistan Email: fjazaeri@yahoo.com

Background and aims: Liver cirrhosis is defined by the regenerative nodules and fibrous septa formation, often causing a complication called cirrhotic cardiomyopathy (CCM) with chronotropic dysfunction. β-adrenergic receptors (β-ARs) are down-regulated in CCM. Glucocorticoids and the dopamine receptor’s downstream signaling affect this pathway. Thus, we investigated the dexamethasone treatment effect on chronotropic dysfunction and the possible involved pathways in cirrhotic rats.

Method: Bile duct ligation (BDL) or Sham surgery was performed on male Wistar rats to induce cirrhosis or used as control groups and grouped as BDL/NS (normal saline) and BDL/dexamethasone [2.2 mg/kg/day through intramuscular injection, a short term treatment for the last three days of 4 weeks of BDL (28 days)], Sham/NS, and Sham/dexamethasone groups. In vivo, chronotropic responses and corrected QT (QTc) interval were studied through electrocardiography (ECG) before and after stimulation with different concentrations of isoproterenol, each concentration for 5 minutes. The tumor necrosis factor-alpha (TNF-α) and interleukin-1β (IL-1β) in heart ventricles were investigated through ELISA. Immunohistochemistry was performed to investigate the dopamine receptor D1 (DRD1) and D2 (DRD2) protein expression levels in the heart ventricles. Real-time polymerase chain reaction (real-time PCR) was conducted to investigate the expression of DRD1, DRD2, and Guanine nucleotide-binding protein G (olf) subunit alpha L (GNAL) receptors (relative to GAPDH) in the heart atria.

Results: The chronotropic responses decreased in BDL/NS and increased in BDL/dexamethasone group. The QTc interval and
ventricular TNF-α level were increased in BDL/NS and decreased in BDL/dexamethasone group. The IL-1β level increased in BDL/NS group and was not affected in BDL/dexamethasone group. The atrial DRD1 mRNA expression level was not affected in BDL/NS group, while the DRD2 and GNAL mRNA expression levels were decreased in atria. The atrial DRD1 mRNA expression level was decreased in the BDL/dexamethasone group without affecting the DRD2 and GNAL mRNA expression levels in atria. The ventricular DRD1 and DRD2 protein expression levels were down-regulated in BDL/NS group, while the DRD1 protein expression level was up-regulated in the BDL/dexamethasone group without affecting the DRD2 protein expression level in ventricles.

**Conclusion:** Dexamethasone effectively treats the chronotropic hypo-responsiveness and decreases the QTc interval in CCM by affecting the inflammation and the DRD1 expression level in the cirrhotic rat’s hearts.

**THU-348**

Distinct changes in the inflammatory profile of patients with EASL-CLIF- versus APASL-acute-on-chronic liver failure

Mona-May Langer1,2, Sabrina Guckenbiehl2, Alina Bauschen2, Gerald Denk1, Christian M. Lange1,2,1Department for Internal medicine II, LMU hospital, Munich, Germany; 2Department for gastroenterology and hepatology, University hospital Essen, Essen, Germany

Email: monamay.langer@med.uni-muenchen.de

**Background and aims:** Definitions of acute-on-chronic liver failure (ACLF) are heterogeneous. Whereas in APASL-definition the liver is the most important organ failure, EASL-CLIF- and NACSELD-definitions focus on extrahepatic organ failures. In the present study, we...
therefore determined associations between the presence and absence of ACLF and correlate these with inflammatory molecules, clinical parameters and outcome.

**Method:** 208 hospitalized patients with liver cirrhosis with or without ACLF were recruited from a prospective cohort study. 76 inflammatory molecules were quantified by proximity extension analysis assay (Olink, Uppsala, Sweden). Associations between inflammatory profiles and types of ACLF were determined. Moreover, surface expression profiles of immune cells were analyzed by flow cytometry.

**Results:** Of 208 patients, 127 had no ACLF at all, while 81 had any ACLF. Of patients with ACLF, 20 had ACLF based on the APASL-definition only, while 30 had ACLF exclusively based on the EASL-CLIF-definition. All 12 patients with NACSELD-ACLF also fulfilled the EASL-CLIF criteria. A differential expression of inflammatory molecules according to the type of ACLF was observed. Overall, patients with APASL-ACLF (but without EASL/NACSELD-ACLF) had rather moderate changes of inflammatory mediators compared to patients with acute decompensation without ACLF whereas patients who met the EASL- or NACSELD-definition of ACLF showed signatures of substantial systemic inflammation. Furthermore, a differential increase of mediators between EASL-CLIF- and APASL-ACLF was observed, as for example FGF-19 and HGF were particularly increased in APASL-ACLF while VEGFA, FGF-23, TNF-beta or IL-17 are significantly upregulated in EASL-CLIF. Data on immune cell phenotypes will be presented.

**Conclusion:** Patients with APASL- versus EASL-CLIF-ACLF have partially distinct inflammatory profiles, which may point towards distinct pathophysiological mechanisms in different types of ACLF.

**THU-349**

**Bacterial DNA translocation-induced systemic inflammation is associated with overt hepatic encephalopathy and predicts mortality in patients with cirrhosis**

Kessarin Thanapirom1,2,3, Siriporn Sukswatamnuay1,2,3, Salisa Wejnaruemarn1,2,3, Panarat Thaimai1,2,3, Nipaporn Siripon1,2,3, Prooksa Ananchuensook1,2,3, Supachaya Sriphoosanaphan1,2,3, Sombat Treeprasertsuk1, Piyawat Komolmit1,2,3.1Division of Gastroenterology, Department of Medicine, Faculty of Medicine, Chulalongkorn University and King Chulalongkorn Memorial Hospital, Medicine, Bangkok, Thailand; 2Liver Fibrosis and Cirrhosis Research Unit, Chulalongkorn University, Bangkok, Thailand; 3Excellence Center in Liver Diseases, King Chulalongkorn Memorial Hospital, Thai Red Cross Society, Bangkok, Thailand.

**Background and aims:** There is mounting evidence that bacterial translocation (BT) and systemic inflammation play a key role in the pathogenesis of cirrhotic complications. However, the data on the relationship between BT, hepatic encephalopathy (HE), and mortality is limited. Therefore, we aimed to assess the association between bacterial DNA (bactDNA) translocation, inflammatory markers, ammonia level, and the presence of HE in patients with cirrhosis. In addition, we prospectively assessed the prognostic role of bactDNA translocation in predicting mortality and liver-related complication (LRC) within six months.

**Method:** Cirrhotic patients without bacterial infection were enrolled at Chulalongkorn University, Bangkok, Thailand, from June 2021 to October 2022. Grading of HE was classified by the West Haven Criteria and Psychometric hepatic encephalopathy score (PHES) <5. BactDNA, lipopolysaccharide-binding protein (LBP), tumor necrosis factor-alpha (TNF-alpha), interleukin-6 (IL-6), soluble CD14 (sCD14), and venous ammonia were evaluated. LRC was a composite end point of bacterial infection, variceal bleeding, overt HE, or new onset ascites.

**Results:** Overall, 294 cirrhotic patients were enrolled. Of these, 92 (31.3%) had covert and 58 (19.7%) had overt HE, respectively. Patients with overt HE had more bactDNA translocation (48.3% vs. 31.3%; p = 0.02), higher serum LBP (13.480.0 ± 9.469.3 vs. 10.788.5 ± 7.339.4 ng/ml; p = 0.01), IL-6 (105.9 ± 302.2 vs. 10.9 ± 25.6 pg/ml; p = 0.001), and ammonia level (92.7 ± 41.3 vs. 62.2 ± 26.8 ug/dl; p < 0.001) than those without HE. While these tests revealed no differences between patients with covert HE and those without HE. Patients with bactDNA detection exhibited a greater white cell count, serum LBP, and IL-6 than those without bactDNA. During the 6-month follow-up, 40 patients (13.6%) died, and 65 patients (22.1%) developed at least one of the LRC. The multivariate Cox regression analysis showed bactDNA translocation (aHR = 2.14, 95%CI: 1.01–4.51, p = 0.04), MELD (aHR = 1.11, 95%CI: 1.07–1.16, p < 0.001), age (aHR = 1.07, 95%CI: 1.04–1.11, p < 0.001) and serum IL-6 (aHR = 1.02, 95%CI: 1.00–1.03, p = 0.03) were independent predictors of the 6-month mortality. Only the MELD score (aHR = 1.10, 95%CI: 1.06–1.15, p < 0.001) was an independent predictor of LRC development.

**Conclusion:** Apart from hyperammonemia, bactDNA translocation-related systemic inflammation is a potential pathophysiological mechanism of overt HE in patients with cirrhosis. In addition, the detection of bactDNA translocation and IL-6 elevation are independent predictors of 6-month mortality in patients with cirrhosis.

**THU-350**

**Platelets from patients with decompensated cirrhosis display pro-inflammatory features**

Simone Di Cola1, Lucia Stefanini1,2, Ludovica Lombardi1, Stefano Fonte1, Francesca Maiorca1, Davide Pallucci1, Ramona Marrapodi1, Annamaria Sabetta1, Marzia Migliorino1, Roberto Cangemi1, Marcelia Visentini1, Oliviero Riggio1, Manuela Merli1, Stefania Basili1. 1Department of Translational and Precision Medicine, Sapienza University, Rome, Italy; 2Istituto Poste Italiana-Fondazione Cenci Bolognetti, Rome, Italy, Italy. Email: simone.dicola@uniroma1.it

**Background and aims:** Changes in platelet structure and function occur in chronic liver disease. These changes have also been implicated in progression of liver disease. Cirrhotic patients have a lower platelet count and a heightened risk of thrombosis. However, the functional state of circulating platelets in cirrhotic patients is debated and poorly understood. Thus, we aim to characterize the phenotypical and functional features of circulating platelets of cirrhotic patients.

**Method:** We here report the preliminary analysis of an ongoing interventional longitudinal study. (PVTRIFA2017-EudraCT 2017-000488-34). We analyzed the platelet phenotype at baseline of patients with cirrhosis (Child-Pugh score B and C) in comparison to healthy donors matched by age and sex. Exclusion criteria were assumption of aspirin or other non-steroidal anti-inflammatory drugs at the time of enrollment. Phenotype, function, and immune interactions of platelets were studied by multiparameter flow cytometry within 1 hour from blood withdrawal. The study was approved by the Ethics Committee of the Hospital Umberto I (Rome, Italy).

**Results:** Decompensated cirrhotic patients had a significantly lower platelet count compared to healthy controls. The platelet size was larger than controls, but the immature platelet fraction (i.e., the fraction of platelets that are younger) was not increased, suggesting that there may be a higher platelet turnover, followed by a near-immediate platelet consumption. Circulating platelets from cirrhotic patients displayed higher levels of receptors implicated in immune-like functions (P-selectin, GPIba, FcgRIIA) compared to controls and had a higher propensity to bind monocytes and lymphocytes in peripheral blood. Moreover, platelets from cirrhotic patients exhibited a higher platelet responsiveness to agonists of Immunoreceptor Tyrosine-based Activation Motif (ITAM)-coupled receptors, but a lower responsiveness to the thrombin-receptor agonist peptide (TRAP) signaling through G protein-coupled receptors (GPCRs) (Figure 1).
Background and aims: Immune dysfunction and systemic inflammation are the hallmarks of uncompensated liver cirrhosis (DLC) patients, which gets aggravated with the development of sepsis. We investigated immune responses in peripheral blood mononuclear cells (PBMCs) in DLC patients with sepsis using single-cell RNA (scRNA) transcriptomics.

Method: Twenty one DLC patients (age 42±7Yr, all males) with sepsis using single-cell RNA (scRNA) transcriptomic). Responses in peripheral blood mononuclear cells (PBMCs) in DLC patients with sepsis using single-cell RNA (scRNA) transcriptomic). Responses in peripheral blood mononuclear cells (PBMCs) in DLC patients with sepsis using single-cell RNA (scRNA) transcriptomic). Responses in peripheral blood mononuclear cells (PBMCs) in DLC patients with sepsis using single-cell RNA (scRNA) transcriptomic). Responses in peripheral blood mononuclear cells (PBMCs) in DLC patients with sepsis using single-cell RNA (scRNA) transcriptomic).

Results: Cells with high proportion of mitochondrial and low proportion of ribosomal reads were removed. Single cell sequencing technology have revealed 10 clusters and 7 cells with significant heterogeneity in monocytes. GSEA revealed, that in DLC patients, there was significant (p > 0.05) decrease in gene expression associated with O6-methylguanine-DNA methyltransferase (MGMT) mediated DNA damage reversal, Mitochondrial transcription termination and Melanin biosynthesis, but upregulated expression of genes belonging to lactose synthesis, hydroxyxcarboxylic-acid, FGFR1b and FGFR1c ligand binding and receptors compared to HC. Cluster pertaining to classical monocytes in DLC patients with sepsis, had significant down-regulation of genes related to NF-κB signaling, TNF-α signaling, IL-17 signaling compared to without sepsis group. scRNA technology also revealed that along with decreased HLA-DR expression other HLA markers like HLA-A, HLA-B and HLA-DQA1 were also decreased in sepsis but with unique increased expression of HLA-DRB1, HLA-C, HLA-E, HLA-DR, and HLA-DQA2. Genotyping of HLA-DRB1 by lumines assay revealed presence of HLA-B*11 allele in DLC patients with sepsis (HLA-DRB1*07DRB1*11, HLA-DRB1*11 DRB1*14, HLA-DRB1*11 DRB1*13) than without sepsis.

Conclusion: Our study indicated possible reason for sepsis development in DLC patients due to defects in NF-κB, TNF-α and IL-17 signaling in classical monocytes. Increased frequency of HLA-DRB1*11 in monocytes enhanced the potential of sepsis development in DLC patients.

THU-352 Role of extracellular vesicles in sarcopenia associated to chronic liver diseases

Simone Di Cola1, Laura Barberi1,2,2, Cristina Porcù3, Lucia Lapenna1, Stefano Rome1,2, Lorenzo Ridola1, Antonio Musarò2, Manuela Merli1.
1Department of translational and precision medicine, Sapienza university of Rome, Italy; 2: Sapienza University of Rome, Department of translational and precision medicine. Rome, Italy; 32 DAHFMO, Unit of histology and medical embryology, Sapienza university of Rome, Italy

Email: simone.dicola@uniroma1.it

Background and aims: Sarcopenia is a condition of reduced skeletal muscle mass, quality and strength highly prevalent in patients with chronic liver disease and associated with adverse clinical outcomes. Its pathogenesis is multifactorial and mainly resulting from an imbalance between muscle protein synthesis and degradation; however, mechanisms underlying sarcopenia in liver disease are still not completely understood as the mediators of the liver-muscle axis have not yet been identified. Given the emerging role of extracellular vesicles (EVs) in mediating intercellular communication and the metabolic cross-talk between skeletal muscle and liver, we aimed to evaluate whether circulating EVs in liver disease could vehicle to skeletal muscle bioactive molecules, such as microRNAs, able to induce sarcopenia.

Method: Primary human muscle cells were exposed to EVs isolated from serum of healthy (H-EVs; n = 9) and cirrhotic individuals with sarcopenia (C-EVs; n = 13) at different times of muscle culture. Finally, they were examined, by immunofluorescence analysis, for their ability to differentiate in myotubes and, by western blotting, for the expression of markers of protein synthesis and degradation.

Results: Cells with high proportion of mitochondrial and low proportion of ribosomal reads were removed. Single cell sequencing technology have revealed 10 clusters and 7 cells with significant heterogeneity in monocytes. GSEA revealed, that in DLC patients, there was significant (p > 0.05) decrease in gene expression associated with O6-methylguanine-DNA methyltransferase (MGMT) mediated DNA damage reversal, Mitochondrial transcription termination and Melanin biosynthesis, but upregulated expression of genes belonging to lactose synthesis, hydroxyxcarboxylic-acid, FGFR1b and FGFR1c ligand binding and receptors compared to HC. Cluster pertaining to classical monocytes in DLC patients with sepsis, had significant down-regulation of genes related to NF-κB signaling, TNF-α signaling, IL-17 signaling compared to without sepsis group. scRNA technology also revealed that along with decreased HLA-DR expression other HLA markers like HLA-A, HLA-B and HLA-DQA1 were also decreased in sepsis but with unique increased expression of HLA-DRB1, HLA-C, HLA-E, HLA-DR, and HLA-DQA2. Genotyping of HLA-DRB1 by lumines assay revealed presence of HLA-B*11 allele in DLC patients with sepsis (HLA-DRB1*07DRB1*11, HLA-DRB1*11 DRB1*14, HLA-DRB1*11 DRB1*13) than without sepsis.

Conclusion: Our study indicated possible reason for sepsis development in DLC patients due to defects in NF-κB, TNF-α and IL-17 signaling in classical monocytes. Increased frequency of HLA-DRB1*11 in monocytes enhanced the potential of sepsis development in DLC patients.
myotubes in culture, and downregulated expression of myosin protein (p < 0.05), and an increase in protein degradation, as showed by an upregulation of Murf-1 and Atrogin-1 mRNA expression levels (p < 0.05), compared with serum EVs from healthy individuals. Moreover, EVs from cirrhotic patients exhibited significant higher expression levels (p < 0.05) of microRNAs, such as miR-223, −133a, −29a, −128a, −21, and −199a-3p, targeting the two most important signaling pathways in muscle tissue: the TGF-β/myostatin/ BMP and PI3K/AKT/mTOR pathways, regulating protein synthesis and degradation respectively.

Conclusion: Serum EVs in cirrhotic patients, likely released by damaged liver, could affect skeletal muscle homeostasis and mediate sarcopenic processes by delivering to muscle cells a specific miRNA cargo. Therefore, circulating EVs could be key players of the liver-muscle axis in sarcopenia associated to liver disease.
**THU-353**

*Effects of β-adrenergic hyperstimulation, liver cirrhosis and acute-on-chronic liver failure (ACLF) on the small intestinal gut-vascular barrier (GVB)*

Marco Felber1, Reiner Wiest1. 1Institute for Visceral Surgery and Medicine, Gastroenterology, Bern, Switzerland

Email: marco.felber@unibe.ch

**Background and aims:** Acute on chronic liver failure (ACLF) is often characterized by precipitating events of which pathological bacterial translocation (BT) from the gut and/or bacterial infections have been proposed to be of particular pathophysiological relevance. In ACLF i) excessive adrenergic drive has been shown by markedly increased serum levels of norepinephrine (Jalan et al. (2015) *Liver international*) and ii) non-selective beta-blocker therapy appears to improve short-term mortality (Mookerjee et al. (2016) *Journal of Hepatology*). The only treatment in advanced ACLF is liver transplantation. ACLF patients even after transplantation present with up to 10% mortality within the first 60 months being most frequently caused by sepsis (Sundaram et al (2020) *Liver transplantation*). Thus, we aimed to characterize the small intestinal GVB in terms of function, structure and integrity in dependency on beta-adrenergic stimulation, blockade (by propranolol) and/or presence of liver cirrhosis and ACLF.

**Method:** ACLF was induced in C57Bl/6 cirrhotic mice (bile-duct ligation) via LPS i.p. and beta-adrenergic hyperactivity was induced by chronic intraperitoneal delivery of isoproterenol (by osmotic mini pump) for 7 days. Duodenal GVB-function was determined in-vivo by confocal laser endomicroscopy assessing extravasation of FITC-albumin. Endothelial intercellular junctions (VE-cadherin, claudin-5) were evaluated by immunofluorescence.

**Results:** Chronic beta-adrenergic hyperstimulation caused pathological increases in FITC-albumin extravasation into the duodenal lamina propria being even more pronounced in cirrhotic and ACLF mice. Moreover, propranolol-treatment ameliorated FITC-albumin extravasation in beta-adrenergic stimulated mice. Changes in GVB-function induced by beta-adrenergic stimulation were associated with significant reductions in VE-cadherin and claudin-5 in duodenal capillaries.

**Conclusion:** Beta-adrenergic hyperstimulation modulates intercellular junctions impairing vascular barrier integrity and function of small intestinal GVB. This GVB-dysfunction may be a leading cause of pathological loss of albumin as well as pathological BT fueling the gut-liver-axis in ACLF.

![FITC-albumin extravasation beta-adrenergic hyperstimulation](image)

**THU-354**

*Identification of complication-dependent gut microbial biomarkers for early detection of decompenated cirrhosis*

Ki Tae Suk1, Satya Priya Sharma1, Haripriya Gupta1, Sung-Min Won1, Jin-Ju Jeong1, Raja Ganesan1, Dong Joon Kim1. 1Institute for Liver and Digestive Diseases, Hallym University, Chuncheon, Korea, Rep. of South Korea

Email: ktsuk@hallym.ac.kr

**Background and aims:** Change in gut microbiome is closely associated with liver cirrhosis progression from compensated to decompensated phase. Therefore, gut microbial compositional shift in cirrhosis progression is significantly important to identifying the potential biomarkers for two cirrhotic clinical phases. Here, we have compared the gut microbiome in compensated and decompensated cirrhosis patients based on the complications, to identify the gut composition specific gut microbial biomarkers. Additionally, we have evaluated cirrhosis-dependent gut microbial and metabolic markers.

**Method:** Stool samples were collected prospectively from 142 cirrhosis patients and 52 healthy controls. 16S-based Microbiome Taxonomic Profiling was performed to discover the gut microbial biomarkers based on cirrhosis severity progression and complications. Next, total 51 samples (control (n = 17) + cirrhosis patients (n = 34)) were randomly selected for fecal samples metabolites profiling.

**Results:** Out of total 142 cirrhosis, 33% were females (n = 47) and overall mortality rate was 24% (n = 34), whereas higher mortality rate was found in male (74%) in comparison to female (26%). All 142 patients were classified in major two groups: compensated cirrhosis (n =10), and decomposed cirrhosis (n = 132), decomposed cirrhosis group further classified based on the occurring and non-occurring decomposed-associated complications. A prominent difference in gut microbial composition has been observed in healthy controls, cirrhosis, and cirrhosis+ complications patients. Whereas 3 species found high in cirrhosis (Clostridium clostridioforme, Bacteroides ovatus, Hungatella_ua) compared to cirrhosis+ complications and combinedly showed ROAUC up to 0.807. Furthermore, 4 species found high in cirrhosis+ complications (Bacteroides coprococola, Bacteroides caprophilus, Alistipes fiberglass, Parabacteroides goldsteinii) and combinedly showed ROAUC up to 0.847. We have also identified, 10 species high in healthy control and 8 species high in cirrhosis. Additionally, 8 metabolites found high in healthy and 11 in cirrhosis. These microbial and metabolic biomarkers showed significant correlation with clinical markers.

**Conclusion:** We have identified multiple bacterial species and metabolites which has the potential to become biomarkers for the cirrhosis. Also, we discovered bacterial species which can be used to detected early stage of decompensated cirrhosis. However, further studies are required to establish a robust pathophysiological mechanism between identified gut microbial species and liver cirrhosis.
Background and aims: Acute on chronic liver failure (ACLF) is characterized by severe systemic inflammation and high mortality rates. Its treatment is an urgent unmet need. DIALIVE is a novel liver dialysis device that aims to exchange dysfunctional albumin and remove damage and pathogen associated molecular patterns. In a recently completed clinical trial in patients with ACLF, its safety was confirmed and its use was associated with significantly faster resolution of ACLF (NCT03065699). The aim of this study was to evaluate pathophysiological factors associated with ACLF resolution in patients treated with DIALIVE or standard of care (SOC).

Method: 32 patients with ACLF grades 1-3a were included and randomized. Patients evaluated in the DIALIVE group had at least 3-treatment sessions. The main end point was resolution of ACLF at

Figure: (abstract: THU-354): Figure (A) LDA score high in cirrhosis and, (B) LDA score high in complications, (C) cirrhosis-dependent species ROAUC (D) complications-dependent species ROAU, (D) Correlation between microbial and metabolic markers with clinical markers.
Day-10. A range of biomarkers of albumin function, pathogen and damage associated molecular patterns, cytokines, endothelial function and ligands for toll-like receptors and inflammation were measured prior to randomization and then at days 5 and 10. Mixed Models for Repeated Measurements (MMMRM) analysis was performed to evaluate the statistically significant differences between groups.

Results: 60% patients in the DIALIVE group resolved ACLF compared with 33% in the SOC group. Resolution of ACLF in the DIALIVE group was associated with significant improvement in albumin function, reduction in endotoxin activity, coagulation factor VIII, IL-18, M30 component of cytokeratin-18 (p = 0.018) and RIPK3 (p = 0.031). In the SOC group, and an apparent paradoxical relationship with CCL5/Rantes (p = 0.004) and M65 component of cytokeratin-18 (p = 0.029). When both groups were combined, the data showed that a reduction in coagulation factor VIII (p = 0.018), IL-17 (p = 0.027), IL-18 (p = 0.030), RIPK3 (p = 0.034) and INR (p = 0.011) and, an increase in CCL5/Rantes (p = 0.003) were associated with resolution of ACLF.

Method: Liver cirrhosis was induced in rats using bile duct ligation (BDL) or CCl4 intoxication alone and in combination with western diet or ethanol in drinking water. When rats had ascites, as a sign of acute decompensation, ACLF was induced. Precipitants for ACLF were lipopolysaccharid (LPS) i.v. injections to mimic sterile inflammation, transnal stool inoculation (TNI) or cecal ligation and puncture (CLP) to simulate bacterial infections and alcohol binge mimicking severe alcoholic hepatitis. Hemodynamic measurements in vivo, blood and organ sampling was performed three days after ACLF induction. Markers for organ failure were assessed using standard blood analysis, colorimetric assays and animal behavioural tests. Histology, cRNA Microarray, multiplex-based immuno-assay, western blot and qPCR were used to further analyse markers of systemic inflammation and organ dysfunction.

Results: The BDL and CCl4 with western diet treated animals had earlier acute decompensation compared to CCl4 alone or CCl4 with ethanol. ACLF induction caused a high mortality rate in all tested groups. LPS, TNI, CLP and alcohol binge led to significant organ impairment shown by reduced mean arterial pressure, renal perfusion and increased blood creatinine, increased bilirubin and INR as well as reduced oxygen saturation and worse performance in behavioural tests. Of note, all animals had high levels of systemic inflammation, as attested by upregulated expression levels of pro-inflammatory cytokines in organs corresponding to ACLF development and significantly increased levels of circulating pro-inflammatory cytokines. Nevertheless, not all groups had similar severity and manifestation of organ dysfunction.

Conclusion: These novel experimental models in rats show typical characteristics of human ACLF. The obtained detailed characterization of organ dysfunction, organ- and systemic inflammation may be useful as a guide to choose an appropriate model for therapeutic preclinical ACLF studies. This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 847949.

This reflects only the author’s view and the Commission is not responsible for any use that may be made of the information it contains.

THU-357

Distinct patterns of hepatic and systemic inflammation in different types/aetiologies of liver disease

Benedikt Hofer1,2,3,4, Benedikt Simbrunner1,2,3,4, Philipp Königshofer1,3,4, Kerstin Zinobor1,2,3, Georg Semmler1,2, Thomas Sorz1,2,3,4, Vlad Taru1,3, Mattias Mandorfer1,2, Michael Trauner1, Philipp Schwabl1,2,3,4, Thomas Reiberger1,2,3,4.

1Medical University of Vienna, Division of Gastroenterology and Hepatology, Department of Internal Medicine III, Vienna, Austria; 2Medical University of Vienna, Vienna Hepatic Hemodynamic Laboratory, Division of Gastroenterology and Hepatology, Department of Internal Medicine III, Vienna, Austria; 3Medical University of Vienna, Vienna Hepatic Hemodynamic Laboratory, Division of Gastroenterology and Hepatology, Department of Internal Medicine III, Vienna, Austria; 4Center for Molecular Medicine (CeMM) of the Austrian Academy of Sciences, Vienna, Austria

Email: thomas.reiberger@meduniwien.ac.at

Background and aims: Systemic inflammation is a known driver of disease progression in advanced chronic liver disease (ACLD). Nevertheless, aetiology-specific characteristics of inflammation during disease progression and regression require further investigation. Thus, we analysed (i) hepatic inflammatory gene signatures in...
animal models of different types of liver injury and (ii) systemic inflammation in ACLD patients with different liver disease aetiologies.

**Method:** Intrahepatic gene expression of TNF-alpha, IL-6, CXCL1, IL-1beta and MCP1 was investigated in rat cirrhosis models induced by thioacetamide (TAA, n = 12), choline-deficient high fat diet (CDHFD, n = 12), or bile duct ligation (BDL, n = 12). Inflammatory gene expression was also analysed in two mouse models at 12 weeks of disease induction by TAA or carbon tetrachloride (CCl4) (i.e. peak fibrosis)—but also after regression for 1 (R1) or 2 (R2) weeks after withdrawing the toxic stimulus. In ACLD patients with different liver disease aetiologies, i.e., n = 226 alcohol-related liver disease (ALD), n = 40 non-alcoholic steatohepatitis (NASH), n = 21 cholestatic aetiologies (CHOL), systemic inflammation was assessed by white blood cell...
count (WBC), CRP and IL-6 levels. Disease regression in human ACLD was explored in a subgroup of ALD patients (n = 181) with sustained abstinence.

**Results:** In diseased animals (C+), we observed a significant upregulation of intrahepatic proinflammatory genes across all aetiologies when compared to the respective healthy control group (C-) (p < 0.05 for all; Fig. 1A). Particularly intrahepatic IL-6 (log2 fold changes; TAA: 5.18; CDHFD: 4.75; BDL: 5.77; p < 0.001 for all) and MCP1 (TAA: 2.85; CDHFD: 4.18; BDL: 3.41; p < 0.001 for all) showed a pronounced upregulation. Similarly, in ACLD patients, there was a significant positive correlation between IL6 and MELD in ALD (Spearman’s rho: 0.50, p < 0.001), NASH (r: 0.54, p < 0.001) and CHOL (r: 0.67, p < 0.001). For CRP, a comparable correlation was observed in ALD (r: 0.27, p < 0.001) and CHOL (r: 0.59, p < 0.005), but not in NASH (r: 0.08, p = 0.618). With regard to disease regression, we observed a significant decrease in intrahepatic inflammation during the regression period in the TAA and CCI4 models (Fig. 1B), with an immediate (R1) and sustained (R2) decrease of hepatic IL6 and CXCL1, but with a delayed (R2) decrease of TNF-alpha and MCP1. Accordingly, in abstinent ALD patients (n = 181), the duration of abstinence was negatively correlated to WBC (r: −0.26, p < 0.001), CRP (r: −0.23, p = 0.002) and IL-6 (r: −0.21, p = 0.004).

**Conclusion:** In animal models, the upregulation of hepatic proinflammatory genes follows a liver-injury-specific pattern. In ACLD patients, systemic inflammation is increased across all aetiologies of cirrhosis, and regresses gradually with sustained abstinence in ALD patients. In regressive toxic liver disease models, there is a time-dependent down-regulation of key proinflammatory genes.

**THU-358 Extracellular vesicles carrying oxidation-specific epitopes as effectors in acute hepatic decompensation and acute-on-chronic liver failure—a pilot study**

Benedikt Simbrunner1, Taras Afonyushkin2, Benedikt Hofer3, Philipp Königshofer4, Georg Semmler5, Lorenz Balcar6, Soreen Taqi2,

1Division of Gastroenterology and Hepatology, Department of Medicine III, Medical University of Vienna, Vienna, Austria; 2Department of Laboratory Medicine, Medical University of Vienna, Austria; 3Dongzhimen hospital, Beijing university of Chinese medicine, China; 4Beijing University of Chinese Medicine, Liver Diseases Academy of Traditional Chinese Medicine, China

**Background and aims:** Extracellular vesicles (EV) can act as mediators of intra- and extracellular hepatic crosstalk. Oxidation-specific epitopes (OSE) may act as danger-associated molecular patterns (DAMPs) in the context of liver disease. This pilot study aimed to investigate whether circulating hepatocyte-derived EVs carrying OSE in patients with acute decompensation (AD) and acute-on-chronic liver failure (ACLF) are linked to liver injury/disfunction and induce endothelial activation.

**Method:** Patients with AD (n = 9) and ACLF (n = 4) admitted at the University Hospital Vienna, Austria, were included. EVs were isolated from platelet poor plasma by differential centrifugation and characterized by flow cytometry. Annexin V (AnV) positivity and a size range of 0.2 to 1.1 μM was used to define larger EVs. Antibodies recognizing hepatocyte-specific ASGPR1 protein and LR04 for the immunodominant OSE, malondialdehyde (MDA), were used to define EVs of hepatocellular origin carrying OSE (ASGPR1+ LR04+ EV). EVs from healthy individuals (n = 8) served as controls. Human umbilical vein endothelial cells (HUVEC) were stimulated with EVs isolated from patients and healthy controls, in the presence or absence of LR04 antibodies.

**Results:** Patients had a median MELD of 20 (14–24) points, 53% had male sex, and alcohol-related liver disease was the most common liver disease etiology (46%). ASGPR1+LR04+ EVs were significantly more frequent in patients with higher MELD ≥20 vs. <20 and in those with elevated ALT (vs. normal ALT values; both p < 0.05), while overall EVs of either hepatocyte origin or carrying MDA epitopes were not significantly different across these patient strata. In contrast to EVs from healthy controls, EVs from patients with AD/ACLF robustly induced the expression of the cytokine IL-8 and the adhesion molecule VCAM in HUVECs (all p < 0.001; Figure). To assess whether this effect was primarily mediated by OSE-carrying EVs, HUVECs were stimulated with EVs either in the presence of LR04 or isotype control antibodies. Notably, the induction of VCAM and IL-8 expression in HUVECs was significantly blunted in the presence of LR04 antibodies (Figure).

**Conclusion:** Circulating OSE+ EVs from patients with AD/ACLF reflect liver dysfunction and liver injury and induce a pro-inflammatory state in ECs, suggesting them as propagators of systemic inflammation. Further studies should investigate the prognostic role of OSE+MV in AD and ACLF and the therapeutic potential of OSE+MV-neutralizing antibodies.

**THU-359 Multi-omics reveals the regulation mechanism of the Chinese herbal AnLuOHaXian formula on reversing liver cirrhosis in the rat**

an Ye1,2

1Division of Gastroenterology and Hepatology, Department of Medicine III, Medical University of Vienna, Vienna, Austria; 2Department of Laboratory Medicine, Medical University of Vienna, Austria

**Background and aims:** Liver cirrhosis is a common disease that seriously endangers human health. The efficacy of the Chinese herbal AnluoHuaXian formula (ALHX) in reversing liver cirrhosis is definite, but its specific mechanism of action is not yet perfected and needs further study, which is the purpose of this study.

**Method:** In this study, a rat model of liver cirrhosis was constructed by intraperitoneal injection of diethylnitrosamine for 12 weeks, with a gavage of ALHX granule aqueous solution starting at week 9. The therapeutic effects of ALHX in cirrhosis were investigated by basic situation analysis, histopathology, and serological analysis. Transcriptomics and non-target metabolomics of liver tissues, and further study, which is the purpose of this study.

**Results:** Compared to the control, the hepatic and splenic indices were significantly higher in the model and significantly lower after the ALHX intervention. HE and Masson staining showed that the histopathological changes in the liver of ALHX rats were significantly lower than those in the model. Furthermore, 16S ribosomal DNA gene polymerase chain reaction analysis of gut microbiota were used to investigate the protective effects of ALHX on cirrhosis.

**Conclusion:**
better than those in the model, with less fibroplasia, hepatocyte inflammation, and necrosis, and less collagen deposition and heterotypic proliferation. Meanwhile, the serological indexes of the model were significantly reduced after ALHX intervention, especially the liver function of ALT, AST, ALP, and GGT were significantly improved. Transcriptomics and non-target metabolomics enrichment analyses indicated that ALHX inhibited rat cirrhosis possibly through regulation of Glutathione metabolism, Ferroptosis, and PPAR signaling pathways. In addition, the transcriptomic analysis also showed that ALHX could restore the abnormal expression trend of several genes to normal in model rat hepatocytes, such as Slc7a11, Cyp4a3, Cyp8b1, Gsta2, Gsta3, and Gsta5. The above findings were supported by differentially expressed genes in the PPAR and Ferroptosis pathway gene sets, and by three representative Ferroptosis pathway metabolites with significant intergroup variability. Moreover, gut microbiota analysis suggested that ALHX altered the overall structure of gut microbiota in cirrhotic rats, particularly proteobacteria and elusimicrobiota.

**Conclusion:** Multi-omics analysis showed that ALHX might effectively inhibit the progression of cirrhosis in rats by regulating Ferroptosis and PPAR signaling pathways, as well as the ecological structure of gut microbiota.

**THU-360**

MCC950 reduces glial cell activation and neuroinflammation in an animal model of thioacetamide-induced hepatic encephalopathy

Syed Afroz Ali1, Ashok Kumar Datusalia1. 1National Institute of Pharmaceutical Education and Research-Raebareli (NIPER-R), Pharmacology and Toxicology, Lucknow, India

**Background and aims:** Hepatic encephalopathy (HE) a complex neurological disorder, characterized by increased levels of ammonia and inflammation resulting in glial cells activation and astrocyte swelling in individuals with liver disease. Despite past substantial investigations, the mechanisms regulating the neuroinflammation and pathogenies of HE remains unclear reflecting higher mortality rates and unsuccessful therapeutic strategies. This study aims to explore the role of inflammasome signalling in HE and to investigate the effects of NLRP3 inhibitor (MCC950), against neuroinflammation and its associated mortality in an animal model of HE.

**Method:** The effects of MCC950 were evaluated in a rat model of acute liver failure induced HE. HE was induced by administering thioacetamide (TAA 300 mg/kg, 3 doses i.p., n = 10). The MCC950 was concurrently administered for 3 days to explore its effects in HE and various biochemical parameters (serum and plasma), BBB
permeability (IVIS), behavioural, molecular and histological changes in cortex and hippocampus (neuroinflammation and glial cell markers) and liver (inflammatory and fibrotic markers) were studied. **Results:** HE rats demonstrate reduced performance in the open field task, while MCC950 prevented the behavioural alterations. Plasma ammonia and serum LFT markers (ALT, AST, ALP, bilirubin and albumin) were induced in TAA rats and the treatment with MCC950 reduced the aberrations and prevented mortality. The increase in the levels of ammonia correlated well with the induced neuronal cell injury (BBB damage and astrocyte swelling), neuroinflammation (NLRP3 downstream) and hepatic cell death (Figure). Whereas, the treatment with MCC950 prevented BBB leakage, astrocyte swelling, hepatic cell death and induction of inflammation associated with IL-1β, caspase-1, IL-18 and NF-κB in cortex, hippocampus and liver. While on the other end treatment with MCC950 mitigated the microglial and astrocyte activation (IBA-1/GFAP) in cortex and hippocampus of TAA rats. **Conclusion:** The findings from the current study for the first time demonstrated that treatment with MCC950 a direct inhibitor of NLRP3 inflammasome reduced hepatic injury, neuroinflammation, increased integrity of tight junction proteins and survival rate in HE rats. Altogether, these findings suggest that inhibition of NLRP3 inflammasome may be considered as a novel potential target for HE in the future.

**THU-361**

The pan-PPAR agonist lanifibranor decreases portal pressure in models of both hepatic and prehepatic portal hypertension

Anneleen Heldens1,2, Christophe Castleyn3, Louis Ongena1,2,4, Milton Antwi5,2, Benedicte Descamps6, Christian Vanhove6, Xavier Verhelst1,2, Hans Van Vlerbergh2,5, Lindsey Devisscher2,3, Jean-Louis Junien5, Anja Geerts1,2, Guillaume Wettstein2, Sander Lefere1,2, Ghent University, Internal Medicine and Pediatrics, Ghent, Belgium; 2Ghent University Hospital, Liver Research Center Ghent, Ghent, Belgium; 3Ghent University, Morphology, Imaging, Orthopedics, Rehabilitation and Nutrition, Merelbeke, Belgium; 4Ghent University, Gastrointestinal Surgery, Ghent, Belgium; 5Ghent University, Basic and Applied Medical Sciences, Ghent, Belgium; 6Ghent University, Electronics and Information Systems, Ghent, Belgium; 7Inventiva, France Email: anneleen.heldens@ugent.be

**Background and aims:** Portal hypertension (PHT) can cause severe complications in patients with advanced chronic liver disease (ACLD). Studies have indicated that the pan-peroxisome proliferator-activated receptor (pan-PPAR) agonist lanifibranor reduces portal pressure in preclinical models of ACLD. However, as lanifibranor simultaneously improves the underlying fibrosis, the effect on PHT might be secondary. Angiogenesis and liver sinusoidal endothelial cell (LSEC) dysfunction play a major role in the pathogenesis of PHT. Using a combination of prehepatic and pre-cirrhotic PHT mouse models, we investigated the effect of lanifibranor on PHT, LSEC dysfunction, hepatic and splanchic angiogenesis.

**Method:** Mice with prehepatic PHT (partial portal vein ligation; PPVL) and fibrotic mice with PHT (common bile duct ligation; cBDL) received daily lanifibranor (10 mg/kg or 30 mg/kg) or vehicle in a therapeutic setting for 7 or 14 days, respectively. The effect of lanifibranor on PHT, angiogenesis and LSEC was evaluated by analyzing hepatic and systemic hemodynamics, serum, hepatic and mesenteric histology, and hepatic, mesenteric and LSEC gene expression levels. Vascular corrosion casts of the venous mesenteric and hepatic vasculature were analyzed using μCT.

**Results:** Portal pressure was substantially increased in vehicle-treated PPVL mice. 10 and 30 mg/kg lanifibranor reduced the portal pressure by 30–35% compared to vehicle-treated PPVL mice (p = 0.0048 and p = 0.0008 respectively), without affecting central venous pressure or heart rate. The portal pressure was increased to a lesser extent in the cBDL model, with a non-significant, but dose-dependent trend to decrease by 12–20% with lanifibranor. Lanifibranor significantly alleviated splenomegaly in both models.
Superior mesenteric artery blood flow was significantly increased in vehicle-treated PPVL mice but tended to decrease in PPVL mice treated with 30 mg/kg lanifibranor (p = 0.07). Furthermore, the expansion of the venous mesenteric vasculature, as evaluated by µCT, and the increased mesenteric vascular wall thickness (mVWT) caused by PHT were partially reduced by lanifibranor. PPVL did not induce distinct liver damage, with fibrosis, LSEC dysfunction or decreases in albumin being absent. In cBDL mice, high-dose lanifibranor treatment reduced fibrosis (p = 0.0001) and restored the serum albumin to a level comparable to the sham-operated mice. Hepatic mRNA levels of inflammatory, fibrotic and angiogenic markers and cell adhesion molecules were significantly reduced in lanifibranor-treated cBDL mice compared to vehicle-treated cBDL mice. LSEC dysfunction was improved by lanifibranor treatment, whereas mVWT was not increased in this model.

**Conclusion:** Lanifibranor improves PHT, independently from fibrosis reduction, potentially through reducing the venous mesenteric vasculature expansion and intrahepatic angiogenesis, and ameliorating LSEC function.
THU-362
Whole transcriptomic analysis of bone marrow indicates distinct pathways to be at play in different stages of chronic liver disease patients
Pramod Gautam1, Varun Suriyia2, Shraddha Singh3, Prince Garg3, Pooja Rao4, Shruti Sureshan4, Rosny Babu1, Shiv Kumar Sarin4, Chhagan Bihari2.
1Institute of Liver and Biliary Sciences, Genome Sequencing Laboratory, New Delhi, India; 2Institute of Liver and Biliary Sciences, Genome Sequencing Laboratory, New Delhi, India; 3Institute of Liver and Biliary Sciences, Department of Hepatology, New Delhi, India; 4Institute of Liver and Biliary Sciences, Department of Hepatology, New Delhi, India

Background and aims: Anemia is one of the common complications in liver cirrhosis. We have earlier highlighted the contribution of dyserythropoiesis (DE) in cirrhosis related anemia. We aimed to investigate the possible signatures of dyserythropoiesis in cirrhosis patients.

Method: we have studied the bone marrows of cirrhosis and controls. Patients were divided into four different groups: early-stage cirrhosis (ESC, n = 11), late-stage cirrhosis (LSC, n = 16), non-liver disease controls (C, n = 10) and disease controls (CKD, n = 4). The samples were sequenced with 2 × 150 bp approach using NEBNextUltra-II kit.

Results: Out of 525,569 and 1105 differential gene expression (DGE) in cirrhosis vs HC, cirrhosis vs CKD and ESC vs LSC respectively. Based on fold change (LogFC ± 1.5) we selected and 33 and 13 down- and upregulated gene in cirrhosis vs HC, 84 and 78 down- and upregulated gene in cirrhosis vs CKD and 19 and 17 down- and upregulated gene in ESC vs LSC respectively.

In LSC vs. HC group, taking all the DGEs combined, we observed regulatory pathways related to platelet activation, clotting and Nitric oxide stimulation to be enriched in cirrhosis using both Reactome and MGI database. When looked separately for up- and downregulated genes, we observed retinoic acid signalling pathway to be significantly enriched among upregulated genes. While downregulated genes showed T-cell mediated immune.

In the comparison between LSC vs. CKD, we observed ERBB2 signalling pathways to be most enriched. Pathways enriched in upregulated genes included positive regulation of neutrophil extravasation and those enriched in downregulated genes included, antimicrobial immune response.

When compared LSC vs. ESC, we found cell-cycle checkpoints activation to be enriched. Terms enriched using MGI database included abnormal erythropoiesis, spleen hypertrophy and reticulocytosis. We found ERFE to be upregulated and BMP6 along with HMOX1 gene to be downregulated in this group. We also found high expression of ANGPTL4 (involved in iron homeostasis) in ESC. Importantly, GATA1 which is a crucial transcription factor in erythropoiesis was found to be moderately downregulated in LSC.

Conclusion: These findings indicate towards a possible mechanism involving retinoic acid signalling with ERFE suppressing hepcidin by inhibiting hepatic BMP/SMAD signalling via BMP subgroup. We believe that the possible role of retinoic acid in modulating erythropoiesis and could serve as a therapeutic target.

THU-363
Resection of mesenteric lymph nodes is associated with increased systemic immunosuppression in experimental cirrhosis following oral salmonella typhimurium challenge
Pinky Junea1, Deepika Jakhar1, Aarti Sharma1, Akash Kumar Mourya1, Implee Kaur1, Shiv Kumar Sarin2, Dinesh Mani Tripathi3, Savneet Kaur1.
1Institute of Liver and Biliary Sciences, Molecular and Cellular Medicine, New Delhi, India; 2Institute of Liver and Biliary Sciences, Department of Hepatology, vasant kunj, India; 3Institute of Liver and Biliary Sciences, Molecular and Cellular Medicine, vasant kunj, India

Background and aims: Mesenteric lymph nodes (MLN) are immune inductive sites that limit pathogens in gut, preventing their systemic spread. We studied the role of MLN in progression of endotoxemia and systemic inflammation in cirrhosis.

Method: Rat models of liver cirrhosis were prepared using ip CCl4 administration for 8 wk. MLNs were resected from control (control MLNx) and CCl4 (CCl4 MLNx). Post MLN removal, they were allowed to reconstitute lymphatic vessels (LV) connection for next 4 wk. LV in gut were immunostained with LyVE1. Labelled S. typhimurium was gavaged and bacterial load was calculated after 48 h. Immune cells were quantified in blood at different time points within 0–48 h after bacterial challenge. Expression of inflammatory genes and proteins were quantified in MLN, gut, liver, spleen and blood after 48 h.

Results: In controls, bacteria were restricted to MLNs, with no bacterial growth seen in other organs and blood while in CCl4, there was significant increase in bacterial load in lung, liver, spleen and blood at 48 h. Compared to control, there was an increase in percentage of activated CD134+ T cells (22 vs 41), CD25+ Treg (1.3 vs 3.2) and inflammatory cytokine (IL6 = 2.5 fc, IFN gamma = 1.4 fc) in MLNs of CCl4 at 48 h (p < 0.05 each). Increased percentage of CD134+ (32 vs 19) and CD25+ Treg (2.3 vs 1.8) was observed in blood of CCl4 vs control. Surgical resection of MLNs from control resulted in regeneration of gut LV within 4 wk, however LV were not restored in CCl4 MLNx. In contrast to control, there was enhanced bacterial growth in lung and blood of control MLNx 48 h after oral gavage of bacteria, similar to that observed in CCl4. In gut and liver, there was increased expression of IL 6 (<5 fc) and IFN gamma (<2 fc) in control MLNx in comparison to control (p < 0.05 each). In blood of control MLNx vs control, inflammatory cytokines, activated CD134+ T cell (45 vs 30) and CD25+ Treg (4.1 vs 1.8) were increased (p < 0.05 each). In CCl4 MLNx, there was reduced bacterial growth in all organs after bacterial challenge owing to failure of LV conduits restoration post MLN resection. In CCl4 MLNx, there was significant increase in expression of defence promoting cytokine genes (IL 6 = 10.2 fc, IFN gamma = 3.1 fc, p < 0.05) in gut as compared to CCl4. However, MLN resection in CCl4 was associated with increased immunosuppressive Treg (5.9 vs 3.2) and decreased expression of IL 6 (<4 fc) and IFN gamma (<3 fc) in liver, spleen, and blood as compared to CCl4 (p < 0.05 each).

Conclusion: In cirrhosis, MLNs mount an increased proinflammatory response to contain exogenous infection in gut, however an underlying immune dysfunction in MLNs fail to contain bacteria, condition that is immunologically similar to control without MLNs. Resection of MLNs in cirrhosis further aggravates systemic immunosuppression. The study provides first evidence of MLNs in maintaining systemic inflammatory responses to bacterial infection in cirrhosis.
THU-364
Gliaal transcriptional changes in experimental HE arise early and show similarities with established neuroinflammatory disorders
Wouter Claeys1,2,3,4, Lien Van Hoecke1,2, Clint De Nolf1,2, Hannah Lernout1,5, Griet Van Imschoot1,2, Elien Van Wonterghem1,2, Daan Verhaege1,2, Anja Geerts3,4,6, Christophe Van Steenkiste7,8, Roosmarijn Vandenbroucke1,2,2, VIB-Ugent Center for Inflammation Research, Barriers in Inflammation, Zwiinaarde, Belgium;2Gent University, Department of Biomedical Molecular Biology, Zwiinaarde, Belgium;3Gent University, Liver Research Center Ghent, Ghent, Belgium;4Hepatology Research Unit, Department of Internal Medicine and Paediatrics, Gent, Belgium;5Gent Gut Inflammation Group, Department of Internal Medicine and Paediatrics, Gent, Belgium;6Gent University Hospital, Department of Gastroenterology and Hepatology, Gent, Belgium;7Antwerp University, Department of Gastroenterology and Hepatology, Belgium;8Maria Middelares Hospital, Department of Gastroenterology and Hepatology, Gent, Belgium
Email: wouter.claeys@ugent.be

Background and aims: Hepatic encephalopathy (HE) is a common complication of liver cirrhosis, associated with poor outcomes. Astrocytes, the primary ammonia-metabolizing cell type in the brain, and microglia, the resident brain macrophages, exhibit altered morphology in the experimental bile duct ligation (BDL) mouse model of HE. Signaling mechanisms underlying these morphological changes remain elusive however. We aim to characterize time-dependent transcriptional changes in glial cells in HE mice.

Method: 10–12 week old male C57Bl/6j mice (n = 6/group/timepoint) underwent BDL/sham surgery for 14 or 28 days. Microglia and astrocytes were isolated using FACS, followed by RNA sequencing. Gene set enrichment analysis (GSEA) and ingenuity pathway (IPA) upstream regulator analysis was performed. Transcriptionic profiles of astrocytes and microglia in the BDL model were compared to gene expression profiles in other acute or chronic neurological diseases.

Results: BDL induces an early and sustained response in microglia, with differential expression of 350 genes 14 days and 448 genes 28 days after induction, and a large overlap (226 genes) between both timepoints. At both timepoints, inflammatory signaling and chemotaxis pathways are significantly enriched. TNF signaling is the top predicted upstream regulator of microglial transcription at both timepoints, along with other cytokines. The microglial transcriptome in BDL mice significantly overlaps at both timepoints with acute LPS-induced changes (14 and 28 days p = 0.001 and 0.002, respectively) and Alzheimer’s disease related ‘disease-associated microglia’ (14 and 28 days p = 0.001 and 0.02, respectively). In astrocytes, transcriptomic response is less strong, with 171 genes differentially expressed after 14 days, increasing to 495 after 28 days. As a consequence, pathway enrichment is limited at 14 days, while inflammatory signaling pathways are significantly enriched 28 days after BDL surgery. Comparative analysis with published transcriptomic responses shows significant overlap with both LPS-induced (p < 0.001 at both timepoints) and ischemia-induced (p < 0.001 at both timepoints) astrocyte subtypes. GM-CSF is the top upstream regulator at both timepoints. Corticoid receptor signaling is predicted to drive astrocyte transcription 14 days after BDL, while cytokines and interferon related signaling are mostly found at 28 days after injury. Conclusion: Glial cells in BDL mice exhibit marked transcriptional changes, with striking similarities to transcriptional phenotypes in other, non-liver-related, brain pathologies. Inflammatory signaling is predicted to drive the observed changes. These data provides useful insights to unravel the sequence of cellular changes in HE and direct future research into the interplay in the neuroimmune compartment in this disease.

THU-365
Ascites C8 T cells express a tissue-resident bystander phenotype that may contribute to disease pathogenesis in patients with decompensated liver cirrhosis
Christian Niehaus1,2,3, Benedikt Strunz4, Benjamin Maasoumy1,5, Heiner Wedemeyer1,5, Niklas Björkström4, Anke Kraft1,2,3,5, Markus Cornberg1,2,3,5, Hannover Medical School, Department of Gastroenterology, Hepatology and Endocrinology, Germany; 2Centre for Individualised Infection Medicine (CiIM), Germany; 3Twincentre, Centre for Experimental and Clinical Infection Research, Germany; 4Karolinska Institutet, Karolinska University Hospital Huddinge, Center for Infectious Medicine (CIM), Department of Medicine Huddinge, Sweden; 5German Center for Infection Research (DZIF), Partner-site Hannover-Braunschweig, Germany
Email: niehaus.christian@mh-hannover.de

Background and aims: Liver cirrhosis is the end-stage of many chronic liver diseases. Patients with advanced cirrhosis often develop hepatic decompensation, which is accompanied by systemic inflammation and may ultimately result in acute-on-chronic liver failure. One of the most frequent consequences of hepatic decompensation is the accumulation of substantial amount of ascites in the peritoneal cavity. As liver cirrhosis affects immune cells both in peripheral blood and locally, in this study we aim to investigate the role of C8+ T cells in the immune compartment ascites.

Method: Matched peripheral blood and ascites fluid were collected from 49 patients with decompensated cirrhosis. Phenotype and function of C8+ T cells were analyzed using high-dimensional flow cytometry and obtained data were compared to each other as well as to healthy controls and compensated cirrhosis patients (n = 11).

Results: CD4+ as well as C8+ T cells were decreased in the blood of patients with decompensated liver cirrhosis compared to healthy controls. Intriguingly, C8+ T cells were enriched in the ascites of patients with liver cirrhosis whereas CD4+ T cells were diminished. This was also in line with a decreased CD4/C8 T cell ratio in ascites compared to blood indicating a shift towards C8+ T cells within the ascites T cell compartment. Interestingly, ascites-derived C8+ T cells expressed an activated tissue-resident memory phenotype with high expression of tissue-homing markers. In addition, high-dimensional data analysis revealed unique ascites-specific (CXC6*CD69*) clusters of late effector-memory C8+ T cells that were rarely found in blood. Indeed, CXC6*CD69* C8+ T cells were vastly activated proliferative, and expressed markers of innate-like bystander inflammation. Remarkably, the frequency of ascites CXC6*CD69* C8+ T cells correlated significantly with clinical parameters of disease severity (p = 0.01 for bilirubin, p = 0.004 for International Normalized Ratio). In line with this, peritoneal C8+ T cells produced high levels of prof-inflammatory cytokines and cytolytic molecules following stimulation with the innate-like cytokines IL-12 + IL-18. Interestingly, the Janus kinase (JAK) inhibitor tofacitinib was effective in inhibiting the pro-inflammatory response by CXC6*CD69* C8+ T cells.

Conclusion: C8+ T cells are abundant in the ascites of patients with liver cirrhosis and exhibit a chronically activated bystander phenotype with innate like functions. Moreover, C8+ bystander T cells in ascites may potentially contribute to disease progression in patients with decompensated cirrhosis, and JAK inhibitors could be a conceivable therapeutic option to inhibit hyperinflammation (similar to COVID-19) originating from CXC6*CD69* C8+ T cells.

THU-366
Evaluation of myocardial inflammation and fibrosis in an experimental model of liver cirrhosis by quantitative cardio-hepatic MRI
Franziska Schneider1,2, Alexander Isaak3, Marko Bulic4, Michael Praktikno6, Christian Strassburg1,2, Oliver Weber6, Christoph Katemann6, Ulrike Attenberger2, Luetkens Julian2, Chang Johannes1,2,1Department of Internal Medicine I, University
Posters

Background and aims: Cardiac involvement in patients with end-stage liver disease is frequent. However, pathomechanisms contributing to the development of cirrhotic cardiomyopathy are not fully understood. Moreover, non-invasive biomarkers, including comprehensive imaging data with histopathological correlation are missing. The goal of this study was to explore the presence of cardiac involvement by multiparametric magnetic resonance imaging (MRI) in an experimental model of liver cirrhosis and correlate quantitative MRI biomarkers with parameters of fibrosis and inflammation of the heart-liver axis.

Method: Male Sprague-Dawley rats underwent bile-duct ligation (BDL) to induce cholestatic cirrhosis. Sham-operated rats served as controls. One group received combined liver and heart MRI after 3 weeks (BDL-3w), the other group after 5 weeks (BDL-5w). MRI scans were performed at 3-Tesla MRI. Myocardial function was assessed using cine imaging in standard axes, T1, T2, and extracellular volume fraction (ECV) values of the liver and the heart were assessed using quantitative MRI mapping techniques. After MRI, in-vivo portal pressure was measured. Gene expression studies and histological examinations were performed to evaluate fibrosis and inflammation of the heart and liver.

Results: Clinical and molecular parameters confirmed two distinct stages of liver cirrhosis, especially by portal pressure (4.56 ± 0.25 vs. 9.93 ± 0.39 [BDL-3w] or 13.29 ± 0.61 [BDL-5w] mmHg; p < 0.0001). Histopathological and molecular analyses revealed increased markers of cardiac inflammation and cardiac fibrosis/remodeling in BDL groups vs sham controls. Functional cardiac MRI analyses showed higher cardiac index, elevated left ventricular (LV) end-diastolic volume index and elevated LV mass in BDL groups. Myocardial T1, T2 and ECV values were elevated in BDL groups (T1: 946 ± 29 vs 952.9 ± 39 vs 987 ± 39 msec; p = 0.014; T2: 23 ± 4 vs 32 ± 3 vs 33 ± 4 msec; p < 0.0001; ECV: 27 ± 3 vs 32 ± 3 vs 37 ± 5; p < 0.0001; sham vs BDL-3w vs BDL-5w) and correlated with serum NT-proBNP levels and myocardial L11b, CCL-3 and MPP-9. Interorgan correlations were found between quantitative myocardial imaging parameters and parameters of hepatic fibrosis, inflammation and portal pressure.

Conclusion: Functional cardiac remodeling and elevation of inflammatory and fibrotic biomarkers of the myocardium were found in a preclinical model of cirrhosis. A marked increase in inflammatory gene expression suggests that hepatic cardiomyopathy is predominantly driven by inflammation. Fibrotic myocardial alterations might play a role as another structural component. Quantitative cardiac MRI provides non-invasive, sensitive detection of cirrhotic cardiomyopathy, particularly diffuse myocardial edema/inflammation. This study may lay the groundwork for further clinical application of multiparametric cardio-hepatic MRI in cirrhosis.

THU-367
Peripheral blood metabolite associations with cardiac diastolic dysfunction in advanced chronic liver disease
Madeleine Gill1,2,3, John O’Sullivan4,5, Geoff McGeaughan1,2,3, Eugene Slaughter1, Ren Ping Liu1, Imre Hunyor4,5, Stuart Moss4, Michele McGrady4,5, Ian Wilcox1,2, Avik Majumdar1,2,3,9, Royal Prince Alfred Hospital, AW Morrow Gastroenterology and Liver Centre, Camperdown, Australia; 2Centenary Institute, Camperdown, Australia; 3The University of Sydney, Faculty of Medicine and Health, Camperdown, Australia; 4Royal Prince Alfred Hospital, Cardiology, Camperdown, Australia; 5University of Melbourne, Liver Transplant Unit, Heidelberg, Australia; 6University of Melbourne, Parkville, Australia
Email: madeleine.gill@health.nsw.gov.au

Background and aims: Metabolomics offers the potential to comprehensively screen energetic and other changes in heart failure (HF), including cirrhotic cardiomyopathy (CCM). A burgeoning field in HF involves targeting the ‘broken energetic machinery’, which we aimed to explore with metabolomic screening in CCM, a type of HF with particular metabolic vulnerability.

Method: 47 patients with cirrhosis were included, with frozen plasma samples within six months of transthoracic echocardiogram (TTE), and 9 healthy controls. CCM and systolic dysfunction (SD) were defined by the 2020 CCM consortium criteria. Diastolic dysfunction (DD) was defined as any grade of diastolic impairment. Liquid chromatography tandem mass spectrometry (LC/MS-MS) was used to quantify more than 200 metabolites using two columns; hydrophilic interaction liquid chromatography (HILIC), and amide. Principal component analysis (PCA) was used to explore variation between patient groups. Linear and logistic regression with Benjamini-Hochberg adjustment were used for associations between metabolites, clinical traits and echocardiographic parameters.

Results: The median Model for End-Stage Liver Disease (MELD) was 16 (IQR 12–22), with median Child-Pugh Score of 10 (IQR 7–12). There were no differences in baseline characteristics of cirrhotic patients with CCM (n = 10) versus without (n = 37). When adjusted for age and sex, moderate to severe ascites was associated with lateral E/e’ (p = 0.006) and medial E/e’ (p = 0.002), volume-independent markers of DD. With respect to plasma metabolite profiles, there was clear separation between controls and cirrhotic patients on PCA, but there was no separation between patients with and without CCM. However, there were associations between several metabolites and TTE parameters, when analysed according to type of cardiac dysfunction (see table).

<table>
<thead>
<tr>
<th>Pathway</th>
<th>Metabolites</th>
<th>Association</th>
<th>FC</th>
<th>Adjusted p value</th>
<th>Type of cardiac dysfunction</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAD Nicotinate</td>
<td>Increased with medial</td>
<td>1.19</td>
<td>0.029</td>
<td>CCM</td>
<td></td>
</tr>
<tr>
<td>Nicotinic acid</td>
<td>e’</td>
<td>0.96</td>
<td>&lt;0.001</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>NaAD_B</td>
<td>Decreased with IVRT</td>
<td>0.99</td>
<td>0.048</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>N-methyl-2-pyridone-5-carboxamide</td>
<td>Decreased with DT</td>
<td>1.26</td>
<td>0.04</td>
<td>CCM</td>
<td></td>
</tr>
<tr>
<td>ATP</td>
<td>Increased with TR velocity</td>
<td>1.19</td>
<td>&lt;0.001</td>
<td>AB</td>
<td></td>
</tr>
<tr>
<td>Adenine</td>
<td>Increased with medial</td>
<td>1.48</td>
<td>0.026</td>
<td>DD</td>
<td></td>
</tr>
<tr>
<td>Adenosine</td>
<td>e’</td>
<td>1.01</td>
<td>0.013</td>
<td>DD</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>diphosphate-ribose</td>
<td>Increased with DT</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(continued)
(Continued)

<table>
<thead>
<tr>
<th>Pathway</th>
<th>Metabolites</th>
<th>Association</th>
<th>FC</th>
<th>Adjusted p value</th>
<th>Type of cardiac dysfunction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orotate</td>
<td>Increased with TR</td>
<td>1.07</td>
<td>0.006</td>
<td>All</td>
<td></td>
</tr>
<tr>
<td>Uric acid</td>
<td>velocity</td>
<td>1.08</td>
<td>0.005</td>
<td>All</td>
<td></td>
</tr>
<tr>
<td>Glutaryl carnitine</td>
<td>Increased with TR</td>
<td>1.08</td>
<td>0.022</td>
<td>All</td>
<td></td>
</tr>
<tr>
<td>3-Methoxy-4-hydroxyphenylglycol</td>
<td>Increased with TR</td>
<td>1.10</td>
<td>0.005</td>
<td>All</td>
<td></td>
</tr>
<tr>
<td>Citraconic acid</td>
<td>Increased with TR</td>
<td>1.18</td>
<td>0.016</td>
<td>CCM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increased with medial E/IC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Metabolite associations with echocardiographic markers of cardiac dysfunction: FC-fold change; NAD-nicotinamide adenine dinucleotide; NaAD_B-nicotinic acid adenine dinucleotide; IVRT-isovolumetric relaxation time; DT-deceleration time; TR-tricuspid regurgitation; CCM-cirrhotic cardiomyopathy; SD-systolic dysfunction; DD-diastolic dysfunction; ATP-adenosine triphosphate.

Figure:

**Conclusion:** Several NAD pathway intermediates were decreased in association with TTE parameters that indicate DD, while adenosine derivatives were increased. Our data buttress previous findings regarding the emerging NAD+ target in HF, and for the first time replicate this deficiency in DD associated with chronic liver disease, suggesting NAD+ repletion may also be a successful strategy in this disease.

**THU-368**

**Biological differences between clinically different muscle wasting phenotypes in patients with decompensated ESLD undergoing assessment for liver transplantation: a UK prospective cohort UK study**

Amritpal Dhalwali1,2,3, Jonathan Quinlan1,4, Felicity Williams1,4, Thomas Nicholson1,2, Sophie Allen1,4, Gareth Lavery1, Simon Jones1,3,6, Leigh Brenn1,4,6, Carolyn Greig1,4,6, Ahmed Elsharkawy1,2, Matthew Armstrong1,2, Janet Lord1,3,6.

1National Institute for Health and care Research (NIHR) Biomedical Research Centre (BRC) Birmingham, Birmingham, United Kingdom; 2Liver Unit, Queen Elizabeth Hospital Birmingham, United Kingdom; 3Institute of Inflammation and Ageing, University of Birmingham, United Kingdom; 4School of Sport, Exercise and Rehabilitation Sciences, University of Birmingham, United Kingdom; 5Department of Biosciences, Nottingham Trent University, United Kingdom; 6MRC-Versus Arthritis Centre for Musculoskeletal Ageing Research, University of Birmingham, United Kingdom

Email: adhaliwal85@gmail.com

**Background and aims:** Muscle wasting is an independent predictor of poor outcomes in ESLD, however there is a phenotypic heterogeneity present within these patients. The aim of this study was to determine distinct muscle phenotype and investigate any differences between clinical and biological parameters.

**Method:** 39 ESLD patients (mean age 55.0 ± 10.5yrs (23 m/16f), mean MELD 13.6 ± 4.7) were categorised into 4 distinct clinical muscle phenotypes based upon adequate or inadequate lower limb muscle mass (quadriceps volume index (QVI)) and function (leg extensor peak torque (PT)), from 18 age-sex matched healthy controls (mean age 50.0 ± 15.2 yrs (11 m/7f). Thresholds for adequate and inadequate mass or function was determined by the >25th quartile and ≤25th quartile control values for QVI and PT respectively. Muscle mass (quadriceps MRI and ultrasound, L3 skeletal muscle index, bioimpedance analysis), muscle function (PT, handgrip strength, composite function tests, accelerometry), and biological parameters (cytokine panel, steroid and vitamin D analyses) were analysed using a principal component analysis (PCA) to identify any clustering between these phenotypes. PCA is used to reduce dimensionality amongst multiple variables to aid in identifying trends within data. Principal components (PC) describe the linear combinations of the original data variables and PC1 describes the maximum variance. The loading plots show the linear coefficients for the PCs shown.

**Results:** 9 participants (23.1%) had adequate lower limb muscle mass and function, 13 (33.3%) had adequate lower limb muscle mass yet inadequate function and 17 (46.2%) had both inadequate muscle mass and function. No participants had inadequate mass/adequate function. A PCA was performed with: all measures; muscle mass and function only; biochemistry parameters only. Figure 1a shows the PCA plot outlining the projections of the biological variables which demonstrated natural clustering between the ESLD and controls. Figure 1b shows those with ESLD, especially those with inadequate muscle mass and function, were separated by loadings from IFN beta, cortisol: DHEA ratio. The control group appear to be separated by loadings from DHEAS, which has been shown to influence sensitivity to oxidative stress and insulin sensitivity with a positive effect on muscle mass and strength; cortisol to cortisone ratio (a measure of 11βHSD1 activity) and PDGF BB, a potent inducer of proinflammatory cytokines.

**Conclusion:** This is the first study to consider clinical muscle wasting phenotypes. The data shows there is a difference in clusters between the distinct ESLD groups and controls suggesting there are potential variations in the mechanistic drivers of muscle wasting in each group. Further validation with greater sample sizes are required however there may be potential specific therapeutic targets for clinical muscle wasting phenotypes in ESLD.
THU-369
Effect of fibrinogen substitution in hypofibrinogenemic CTP class C patients on viscoelastic coagulation tests
Moritz Tobiasch 1, Anna Tobiasch 2, Volker Schäfer 2, Johannes Bösch 2, Mirjam Bachler 1, Philipp Lichtenberger 2, Heinz Zoller 4, Dietmar Fries 2, 1Landeskrankenhaus Hall, Dept. of Medicine, Hall in Tirol, Austria; 2Medical University Innsbruck, Anaesthesiology and Intensive Care Medicine, Innsbruck, Austria; 3UMIT University for Health Sciences, Institute for Sports Medicine, Alpine Medicine and Health Tourism, Hall in Tirol, Austria; 4Medical University Innsbruck, Dept. of Medicine I. Austria
Email: moritztobiasch@gmail.com

Background and aims: Coagulation deficits in decompensated cirrhosis are complex and usually not reflected in classical coagulation group tests. Therapeutic interventions to optimize the coagulation function are thus difficult to guide. In hypofibrinogenemic CTP class C patients, viscoelastic test parameters, single factor tests and group tests (INR, aPTT, thrombin time) were assessed in an in-vitro model of fibrinogen substitution.

Method: After obtaining informed consent of all participants, citrated plasma of 17 CTP class C patients with a fibrinogen level below or equal 150 mg/dL and 18 healthy control subjects was tested in classical group tests (prothrombin time/INR, activated partial thromboplastin time (aPTT), thrombin time (TT)), in single factor tests, and in viscoelastic tests (ExTest, InTest, FibTest) with and without addition of fibrinogen, hereby mimicking a therapeutic supplementation of fibrinogen. Fibrinogen levels were determined by Claus’ method and by immunoassay.

Results: Both classical coagulation group tests and viscoelastic test generally performed well in differentiating the CTP class C and the healthy control cohorts. Addition of fibrinogen had only marginal effects on the classical group tests (PT/Quick median absolute difference, −1.5% (IQR −11% to 2%)), whereas particularly FibTest parameters showed a clear and dose-dependent response to fibrinogen concentrations. Elevating the fibrinogen concentration with 200 mg/dL fibrinogen concentrate normalized FibTest clot firmness parameters A5, A10, A20, and maximum clot firmness (MCF) to normal levels (for MCF, R2.0, 38, p < 0.0001). The response to fibrinogen augmentation was markedly higher in hypofibrinogenemic CTP class C patients than in healthy control subjects. All factors synthesized in the liver (F V, VII, IX, X, XI, XII, XIII, and alpha-2-antiplasmin) also showed clear correlations with FibTest parameters in both groups, whereas F VIII, and von Willebrand factor did not influence the response in CTP class C patients.

Conclusion: Viscoelastic tests might provide a better estimate of coagulation function in CTP class C patients than classical coagulation group tests. In hypofibrinogenemic patients, a significant effect on coagulation function is plausible. With a high robustness in vitro, FibTest parameters might be valid surrogates for fibrinogen substitution in end-stage liver disease.

THU-370
The gene expression profile of skeletal muscle in end-stage liver disease patients undergoing assessment for liver transplantation with muscle wasting
Sophie Allen 1,2, Amritpal Dhalwal 2,3, Jonathan Quinlan 1,2, Thomas Nicholson 2,3, Felicity Williams 1,2,3, Matthew Armstrong 4, Ahmed Elsharkawy 2,4, Simon Jones 2,3,5, Carolyn Greig 1,2,5, Gareth Lavery 2,6, Janet Lord 2,3,5, Leigh Breen 2,3,6, 1University of Birmingham, School of Sport, Exercise and Rehabilitation Sciences, Birmingham, United Kingdom; 2University Hospitals Birmingham, National Institute for Health Research, Birmingham Biomedical Research Centre, Birmingham, United Kingdom; 3University of Birmingham, Institute of Inflammation and Ageing, Birmingham, United Kingdom; 4Queen Elizabeth Hospital Birmingham, Liver Unit, Birmingham, United Kingdom; 5University of Birmingham, MRC- Versus Arthritis Centre for Musculoskeletal Ageing Research, Birmingham, United Kingdom; 6Nottingham Trent University, Department of Biosciences, Nottingham, United Kingdom

Email: s.allen@bham.ac.uk

Background and aims: Sarcopenia, defined as a loss of muscle mass, strength and physical function is a common condition affecting end-stage liver disease (ESLD) patients. However, the molecular pathways which may underpin the progression of sarcopenia in ESLD are largely unclear. Therefore, the aim of this study was to characterize intracellular signaling pathways that may contribute to sarcopenia progression in ESLD patients with differing levels of muscle mass and physical function.

Method: Fasted muscle and blood samples were obtained from 23 decompensated ESLD patients (aged 54.7 ± 6.4 years, MELD 13.7 ± 4.6). Physical function and body composition assessments were also conducted. ESLD patients were divided into 3 clinically defined groups dependent on muscle mass and function; 1-adequate muscle mass and function (n = 7), 2-adequate muscle mass, inadequate function (n = 5) and 3-inadequate muscle mass and function (n = 11). The skeletal muscle transcriptome was determined by RNA-sequencing using a QuantSeq 2’ kit (Lexogen, Austria) and sequenced on Illumina’s NextSeq500. Transcripts were mapped to the human genome (hg38) and were analyzed using Ingenuity Pathway Analysis (Qiagen, UK).

Results: BMI and weight was significantly lower in patients with inadequate muscle mass and function compared to patients with adequate muscle mass and function (p < 0.05). Pathway analysis revealed a significant enrichment in canonical pathways related to mitochondrial dysfunction and oxidative phosphorylation in ESLD patients with inadequate muscle mass and function vs. patients with adequate muscle mass and function (Figure A), and patients with adequate muscle mass, with inadequate function (Figure B). A significant enrichment in canonical pathways related to oxidative stress and mTOR related signaling was also identified in patients with inadequate muscle mass and function compared to those with adequate muscle mass and inadequate function. Furthermore,
Hepatic encephalopathy (HE) manifests with symptoms such as poor memory, impairment in neuropsychiatric syndrome arising from chronic liver disease (CLD). Montréal, Medecine, Montréal, Canada

Chantal Bemeur1,2, Christopher F Rose 2,4, Alexandre Bourgeois1,2, Félix Veillette 2, Mariana Oliveira 2, Mirella Pastore1, Francesco Vizzutti 1, Davide Roccarina 1, Davide Roccarina 1, Valentina Cacciato1, Fabrizio Fanelli2, Fabio Marra3, 1University of Florence, Italy; 2Azienda USL Toscana Centro, Italy; 3Azienda Ospedaliero-Universitaria Careggi, Italy

Email: fabio.marra@unifi.it

Background and aims: Recent data have indicated that decompensated cirrhosis is characterized by an imbalance in the innate immune system, leading to low-grade systemic inflammation. In particular, inflammatory cytokines secreted by monocytes and macrophages have been implicated in the pathogenesis of portal hypertension and its complications. Additionally, MerTK-expressing monocytes participate in the determination of severity of acute liver failure. Trans-jugular intrahepatic portosystemic shunt (TIPS) is currently used for the treatment of complications of portal hypertension, but whether portosystemic derivation results in changes in the biology of inflammatory cell is currently unknown.

Method: Fifteen patients with severe portal hypertension referred for TIPS placement were enrolled. During the TIPS procedure, blood from the portal and jugular vein was drawn, and at 4 weeks after TIPS placement a sample from a peripheral vein was repeated. Monocytes were isolated from peripheral blood mononuclear cells by adherence after Ficoll-Hypaque purification, and stimulated with LPS (1 μg/ml) for 2, 8 and 24 hours. Gene expression was evaluated by real-time PCR.

Results: Upon exposure to LPS, a significant increase in gene expression of IL-1beta, IL-6, TLR4 and MERTK was observed in monocytes isolated from either the portal or the jugular vein. Basal and LPS-stimulated mRNA levels of these molecules were markedly lower in the post-TIPS compared to pre-TIPS, in particular after exposure to LPS. Expression of the anti-inflammatory cytokine, IL-10, was significantly increased after LPS stimulation for 2 and 8 hours. After TIPS, mRNA levels of IL-10 were reduced in unstimulated conditions but increased after LPS stimulation for 2 hours.

Conclusion: Reduction of portal pressure through TIPS placement is associated with reduced expression of pro-inflammatory mediators and modulation of anti-inflammatory IL-10. Increased portal pressure in cirrhotic patients may be a direct modulator of the complex changes in the inflammatory balance observed in these patients.

Cirrhosis and its complications Other clinical complications except ACLF

WEDNESDAY 21 TO SATURDAY 24 JUNE

TOP-041
Randomised controlled trial of intravenous versus oral iron in treatment of iron deficiency anaemia after variceal bleeding in patients with cirrhosis
Tabish Mohammad1, Sanchit Sharma2, Samagra Agarwal1, Srikanth Gopi1, Randee Rana1, Deepak Gunjan1, Anoop Saraya1. 1All India Institute Of Medical Sciences, Gastroenterology and Human Nutrition Unit, New Delhi, India, 2Queen Elizabeth Hospital Birmingham, Gastroenterology. United Kingdom

Email: ansaraya@yahoo.com

Background and aims: There is limited evidence on the optimal strategy to correct iron deficiency anaemia after an episode of variceal bleeding (VB) in patients with cirrhosis. We evaluated the efficacy and safety of intravenous iron in this setting compared to oral iron therapy.
Method: In this single centre randomised controlled trial with superiority study design, eligible patients with cirrhosis with iron deficiency anaemia after VB were randomised to receive either intravenous iron (Ferric carboxymaltose, 2 doses, 7 days apart, haemoglobin and weight-based dose calculation) or oral iron (Carbonyl iron, 100 mg elemental iron per day) for 3 months. The primary outcome was increase in haemoglobin in both arms at 3 months. Secondary outcomes included resolution of anaemia.
Nutritional therapy improves minimal hepatic encephalopathy in cirrhosis by improvement in sarcopenia, proinflammatory cytokines and myostatin: a double blind randomized controlled trial

Sudhir Maharshi1, Barjesh Sharma1, Sanjeev Sachdeva2, Bhawna Mahajan2, Ashok Sharma3, Sushma Bara3, Siddharth Srivastava4, Ajay Kumar5, Ashok Dalal4, Ujjwal Sonika1. 1G.B Pant Hospital, Gastroenterology, New Delhi, India; 2G.B Pant Hospital, New Delhi, India; 3G.B Pant Hospital, Radiology, New Delhi, India; 4G.B Pant Hospital, New Delhi, India

Background and aims: Minimal hepatic encephalopathy (MHE) impairs health related quality of life (HRQOL), predicts development of overt hepatic encephalopathy (HE) and associated with poor prognosis. We assessed the effects of nutritional therapy on cognitive functions, HRQOL, anthropometry, endotoxins and inflammatory markers in patients of cirrhosis with MHE.

Method: In a double blind randomized controlled trial patient of cirrhosis with MHE were randomized to nutritional therapy (group I: 30–35 kcal/kg/day and 1.0–1.5 gram of protein/kg/day) and no nutritional therapy (group II: diet as patients were taking before) for 6 months. MHE was diagnosed based on psychometry hepatic encephalopathy score (PHES). Anthropometry, ammonia, endotoxins, inflammatory markers, myostatin and HRQOL were assessed at baseline and after 6 months. Primary end points were improvement or worsening in MHE and HRQOL.

Results: A total 150 patients were randomized to group-I (n = 75, age 46.3 ± 12.5 years, 58 men) and group-II (n = 75, age 45.2 ± 9.3 years, 56 men). Baseline PHES (−8.16 ± 1.42 vs −8.24 ± 1.43; p = 0.54) was comparable in both the groups. Reversal of MHE was higher in group I (73.2% vs 21.4%; p = 0.001). Improvement in PHES (ΔPHES 4.0 ± 0.60 vs −4.18 ± 0.40; p = 0.001), HRQOL (ΔSIP 3.24 ± 3.63 vs 0.54 ± 3.58; p = 0.001), anthropometry, ammonia, endotoxins, cytokines and myostatin levels were also significantly higher in group I compared to group II. Overt HE developed in 6 patients in group I and 13 in group II (p = 0.04).

Conclusion: Nutritional therapy is effective in treatment of MHE and associated with improvement in nutritional status, HRQOL, ammonia, endotoxins, inflammatory markers and myostatin levels.
reduction from baseline at 4 h, 8 h, 24 h, and 7 d after initial administration.

**Results:** In the analysis of the FAS data set, after 7 days of treatment, the improvement rate of HE in the arginine glutamate injection group was 88.9%, and that in the LOLA group was 90.7%. The improvement rate of HE (non-efficacy threshold = −15.0%, P = 0.020) and the reduction rate of blood ammonia were similar between the two groups. The serum ammonia level of the arginine glutamate injection group was lower than that of the LOLA group at all time points, especially at 4 h and 24 h. The serum ammonia level (4 h p = 0.011, 24 h p < 0.001), the decreased value of serum ammonia from baseline (4 h p = 0.023, 24 h p = 0.005), and the reduced rate of serum ammonia (4 h p = 0.011, 24 h p < 0.001) in the arginine glutamate injection group were significantly superior to that in the LOLA group. When there was no significant difference in blood ammonia reduction rate, the total treatment cost and the cost of reducing blood ammonia value by 1 unit/1% in the arginine glutamate injection group were significantly lower than LOLA, indicating that the economy of arginine glutamate injection was better. No significant difference in the incidence of adverse reactions was seen between the groups.

**Conclusion:** Compared with intravenous LOLA, arginine glutamate injection reduces blood ammonia faster and has a more significant effect in the early stage. Arginine glutamate injection has lower costs and more pharmacoeconomic advantages.

---

**WEDNESDAY 21 JUNE**

**WED-319**

Rifaximin plus lactulose is more effective than lactulose alone for the prevention of overt hepatic encephalopathy in patients with or without diabetes

Jasmohan S Bajaj1, Robert Wong2, Zeev Heimanson3, Christopher Allen4, Robert Israel4, Arun Sanyal1, 1Virginia Commonwealth University and Central Virginia Veterans Healthcare System, Richmond, United States, 2Stanford University School of Medicine and Veterans Affairs Palo Alto Healthcare System, Palo Alto, United States, 3Salix Pharmaceuticals, Bridgewater, United States

Email: jasmohan.bajaj@vcuhealth.org

**Background and aims:** Rifaximin is approved for reduction in risk of overt hepatic encephalopathy (OHE) recurrence. Diabetes mellitus is a common comorbidity in patients with cirrhosis. Limited published data suggest that it may impact effectiveness of some OHE therapies. The aim was to evaluate the efficacy/safety of rifaximin + lactulose vs lactulose alone in patients with cirrhosis, with/without diabetes.

**Method:** Data were pooled from 2 randomized trials (1 phase 3 double-blind; 1 phase 4 open-label) of adults with cirrhosis and history of OHE within 6 months (in OHE remission). In phase 3 trial, patients received rifaximin 550 mg BID or placebo, with optional lactulose (2–3 soft stools/d) for 6 months; for phase 4 trial, rifaximin 550 mg BID + lactulose (2–3 soft stools/d) for 6 months. Patients were subgrouped post hoc by baseline diabetes (yes/no). Outcomes assessed included time to onset of OHE episode (Conn score ≥2) and time to first HE-related hospitalization.

**Results:** 135 patients had diabetes (rifaximin + lactulose [n = 84]; lactulose alone [n = 51]), and 246 had no diabetes (rifaximin + lactulose [n = 152]; lactulose alone [n = 94]) at baseline. At baseline, 78.5% of patients with diabetes had mean MELD scores 11–24 (median, 13.0) and 69.1% without diabetes had MELD scores 11–24 (median, 12.3). Treatment with rifaximin + lactulose resulted in significantly lower percentage of patients with OHE episode vs lactulose alone during 6 months among those with (22.6% vs 51.0%; p < 0.001) and without diabetes (17.1% vs 49.5%; p < 0.0001). Rifaximin + lactulose reduced OHE recurrence risk by 64% (HR, 0.36; 95% CI, 0.20–0.65; number needed to treat [NNT], 3.5) vs lactulose alone during 6 months of treatment in patients with diabetes (Figure); reduction in risk among those without diabetes was 70% (HR, 0.30; 95% CI, 0.18–0.49; NNT, 3.3). Also, significantly fewer patients receiving rifaximin + lactulose vs lactulose alone had an HE-related hospitalization among those with (14.3% vs 29.4%; p = 0.01) and without (10.5% vs 20.2%; p = 0.008) diabetes. Patients with diabetes treated with rifaximin + lactulose had a 60% reduction in risk of first HE-related hospitalization during 6 months vs lactulose alone (HR, 0.40; 95% CI, 0.19–0.86; NNT = 6.6); without diabetes, the risk reduction was 59% (HR, 0.41; 95% CI, 0.21–0.81; NNT = 10.3). Comparing with vs without diabetes, rifaximin + lactulose arms had similar outcomes for rate of OHE episodes (p = 0.31) and HE-related hospitalizations (p = 0.34). Addition of rifaximin to lactulose was well tolerated.

**Conclusion:** Rifaximin + lactulose was more efficacious than lactulose alone for reducing the risk of OHE recurrence and HE-related hospitalization in adults regardless of diabetes status. Thus, both groups would benefit from addition of rifaximin to lactulose for reducing OHE recurrence risk. Also, although the sample size was small, diabetes may not impact rifaximin treatment outcomes; further studies are warranted.
Background and aims: Based on the results of the ANSWER randomized clinical trial, long-term albumin treatment (LTA) is now standard of care in patients with decompensated cirrhosis in many Italian liver units. However, several issues (i.e., better characterization of patients amenable to LTA, personalization of albumin infusion, clinical trajectories, stopping rules) should be addressed. Thus, this “real-life” study aimed to increase our knowledge on LTA.

Method: Patients with cirrhosis and ascites receiving albumin for at least one month were enrolled in a multicenter retrospective observational study. Data on patient’s characteristics, modalities of albumin treatment, clinical trajectories and outcomes were collected in 5 liver units across Italy.

Results: 326 patients (male 69%, median age 63) were included in the study from January 2016 to January 2022. Alcohol followed by NASH were the predominant etiologies. At baseline, median Child-Pugh score was 9, MELD 15, and MELD-Na 18; serum albumin concentration was 31 (27–35) g/dl. 36% of patients had grade 3 ascites and 27% refractory ascites. About 2/3 of them presented previous or ongoing barriers in 5%. In the 71 patients who stopped albumin for clinical improvement, median length of treatment was 257 (125–415) days. Patients were observed at 4-week intervals to monitor any changes in cramping and adverse events. Skeletal muscle index (SMI), handgrip strength, biochemical tests, and the chronic liver disease questionnaire (CLDQ) were assessed at enrollment and study completion. The primary outcome was a relative change in muscle cramp frequency from baseline.

Conclusion: These initial results of the Real-ANSWER study indicate that: 1. LTA is frequently added to diuretics as part of medical treatment of ascites in Italy; 2. adherence to treatment in real-life clinical practice is very high; 3. permanent interruption of LTA due to resolution of ascites and improvement of liver function can occur in almost 20% of cases, and 4. besides patients with uncomplicated ascites, also patients with refractory ascites can be responsive to LTA.

WED-320 Real-word experience of long-term albumin treatment in a large cohort of patients with cirrhosis and ascites (Real-Answer study)

Giuliana Iannone1, Clara De Venuto1, Salvatore Piano2, Antonino Lombardo3, Davide Bitetto4, Stefania Gioia3, Giacomo Zacherlini5, Roberta Gagliardi2, Vincenza Calvaruso3, Enrico Pompli1, Marta Tonon1, Maurizio Baldassarre5, Silvia Nardelli5, Pierluigi Toniutto4, Vito Di Marco3, Paolo Angelì2, Paolo Caraceni1,6. Alma Mater Studiorum-University of Bologna, Department of Medical and Surgical Sciences, Bologna, Italy, 2University and Hospital of Padova–Unit of Internal Medicine and Hepatology, Department of Medicine-DIMED, Padova, Italy, 3UOC di Gastroenterologia, Dipartimento di Promozione della Salute, Materno Infantile, Medicina Interna e Specialistica (PROMISE), University of Palermo, Italy, 4Hepatology and Liver Transplantation Unit, University Academic Hospital of Udine, Udine, Italy, 5Sapienza University of Rome, Department of Translational and Precision Medicine, Rome, Italy, 6IRCSS Azienda Ospedaliero-Universitaria di Bologna, Unit of Semeiotics, Liver and Alcohol-related diseases, Bologna, Italy

Email: paolo.caraceni@unibo.it

WED-321 Efficacy and safety of branched-chain amino acids supplementation on muscle cramps in patients with cirrhosis: a randomized double-blinded controlled trial

Tanongsak Chinaroonchotchinda, Thanapat Athakkhitmongkol, Supot Nimamong, Watcharak Patthiyaphaha, Phunchai Charatcharoenwithaya, Sawasak Tanwandee, Siawporn Chainuvati, Siriraj Hospital, Mahidol University, Division of Gastroenterology, Department of Medicine, Bangkok, Thailand, Phang Nga Hospital, Department of Medicine, Phangnga, Thailand

Background and aims: Patients with cirrhosis commonly experience muscle cramps, which are attributed to poor quality of life. The standard therapies, however, are not effective. This randomized controlled trial aimed to compare the efficacy and safety of branched-chain amino acids (BCAA) versus placebo for treating muscle cramps in cirrhotic patients.

Method: A total of 40 patients with cirrhosis who have experienced muscle cramps at least once per week were randomized to receive either a placebo (n = 21) or 12.45 grams of BCAA (n = 19) orally per day for 12 weeks. Patients were observed at 4-week intervals to monitor any changes in cramping and adverse events. Skeletal muscle index (SMI), handgrip strength, biochemical tests, and the chronic liver disease questionnaire (CLDQ) were assessed at enrollment and study completion. The primary outcome was a relative change in muscle cramp frequency from baseline.

Results: The mean age of the patients was 64.2 ± 9.4 years, with a female predominance of 67% and 90% were Child-Pugh A. Chronic hepatitis B or C was the primary cause of cirrhosis. The two groups were similar in baseline clinical characteristics, severity of liver disease, frequency and duration of muscle cramps, SMI, hand grip strength, and laboratory tests. At the end of the study, no significant difference in the percentage change of muscle cramps was observed between the BCAA group (−68.8%, 95% CI −100% to −46.4%) and the placebo group (−56.3%, 95% CI −75.0% to −20.0%) (p = 0.235). There were also no significant differences in the duration and severity of muscle cramps, SMI, hand grip strength, and CLDQ score between both two groups. However, a significant improvement in the activity and worry domains of the CLDQ score was observed in the BCAA group but not in the placebo group. In the subgroup of 30 participants having muscle cramps at least 3 times per week, BCAA supplementation showed a significant reduction in the muscle cramp frequency than the placebo group (p = 0.010) after the 12 weeks of treatment. Mild adverse events, including nausea or abdominal discomfort occurred in 31.6% and 23.8% of patients received BCAA and placebo, respectively (p = 0.583).

Figure:
Conclusion: A 12-week supplementation of BCAA significantly reduced the frequency of muscle cramps in cirrhotic patients who had cramping at least 3 times per week. However, there was no discernible improvement in skeletal muscle mass or function. Further studies with larger sample sizes and longer duration of BCAA supplementation are needed to validate these findings.

WED-322
Effects of nutritional therapy on Sarcopenia in patient with liver cirrhosis-a randomised controlled trial
Sudhir Maharshi1, Shyam Sunder Sharma1, SMS Medical College and Hospital, Gastroenterology, Jaipur, India
Email: sudhir.maharshi@gmail.com

Background and aims: Sarcopenia has been associated with poor survival in patients with cirrhosis. Nutrition may have direct influence on sarcopenia and functional status. There are limited data on nutritional management in cirrhosis with sarcopenia. We assessed the effects of nutritional therapy on sarcopenia in cirrhotic patients.

Method: A randomized controlled trial conducted in a tertiary care setting on patients of cirrhosis with sarcopenia who were randomised to nutritional therapy (group A: 30–35 kcal/kg/day and 10–15 gram of protein/kg/day) and no nutritional therapy (group B: diet as per patients were taking before) for 6 months. Sarcopenia was diagnosed based on computerized tomography psoas muscle index (PMI), hand grip strength (HG) and gait velocity (GV). Primary end points were improvement or worsening in sarcopenia. Secondary end points were improvement of other nutritional parameters and liver functions.

Results: 141 patients were randomized to group A (n = 70, age 42.7 ± 101 yr, 58 men) and group B (n = 71, age 42.1 ± 98 yr, 57 men). Baseline characteristics including age, body mass index (BMI), hemoglobin, mid arm circumference (MAC), hand grip, gait velocity and PMI were comparable in both the groups. Improvement in MAC (ΔMAC 2.78 ± 0.26 vs −2.13 ± 0.32; p = 0.001), hand grip strength (ΔHG 4.91 ± 1.4 vs −3.1 ± 0.73; p = 0.001), hand grip (ΔHG 4.91 ± 1.4 vs −3.1 ± 0.73; p = 0.001), gait velocity (ΔGV 0.98 ± 0.20 vs −0.74 ± 0.32; p < 0.01), PMI (ΔPMI 3.5 ± 0.24 vs −2.7 ± 0.42; p < 0.001) was higher in group A compared to group B at the end of study. Liver functions assessed by Child Turcotte Pugh and Model for End stage liver disease also significantly improved in group A compared to group B, p < 0.001.

Conclusion: Nutritional therapy is effective in the improvement of sarcopenia and liver function in cirrhosis.

WED-323
Real-world treatment of decompensated liver cirrhosis in Italy: a propensity score-matched analysis of long-term versus acute albumin therapy
Wim Laleman1, Jonel Trebicka2, Giacomo Zaccherini3, Paolo Caraceni4, Dirk Steffen Schmidt5, Joana Rodrigues6, Kyle Rodney6, Sofia Schweiger7, Paolo Angeli8.

Background and aims: International guidelines recommend short-term albumin in specific acute conditions related to liver cirrhosis, but clinical trial data (e.g., ANSWER) show long-term albumin (LTA) treatment can be beneficial. We compared real-world outcomes in patients with decompensated cirrhosis receiving LTA or acute albumin therapy (non-LTA).

Method: A retrospective chart analysis was undertaken (Adivo Associates, funded by CSL Behring) to assess adults diagnosed with decompensated cirrhosis presenting ascites and treated in Italy with LTA (≥40 g per infusion per week) or non-LTA (administered at non-regular intervals). The observation period was from 1 Jan 2019 to 31 Dec 2021. In the LTA group, patients must have completed ≥3 months of LTA treatment by the start of the observation period. In the non-LTA group, patients must have received albumin for an acute complication at least once in the 12 months before the observation period. Data collection stopped if the patient received a transplant or switched treatment. The primary end point was the annualised therapeutic paracentesis rate. Propensity score matching (PSM), utilizing sex, Child-Pugh (CP) score and the presence of multiple comorbidities as covariates, was applied for the comparison of the two cohorts. The incidence rates of other cirrhosis-related complications were secondary end points. A negative binomial generalized linear model was used to adjust for the non-normality of the real-world data.

Results: The charts of 311 patients from 14 centres were screened and 125 matched pairs of LTA and non-LTA patients were analysed. In both cohorts, the mean age was 63.5 years, 64% were female, 14.4% had multiple comorbidities, and the mean CP score was 9.0. The mean standard difference between the cohorts for all three covariates included in the PSM model was 0.0% for all matched pairs (100% bias reduction). The mean annual number of therapeutic paracentesis episodes per patient was reduced by 47.8% in the LTA vs the non-LTA cohort (2.21 vs 3.97; p < 0.001; Figure). Statistically significant reductions in refractory ascites (44.2%, p = 0.018), spontaneous bacterial peritonitis (52.7%, p = 0.009), heporenal syndrome (62.6%, p = 0.003), hospital admissions (24.6%, p = 0.050) and length of stay for hospitalised patients (35.0%, p = 0.015) were also seen in the LTA cohort vs the non-LTA cohort. Hepatic encephalopathy did not show a statistically significant difference between the groups (13.1% reduction with LTA vs non-LTA, p = 0.605). Transplant and mortality rates were numerically lower in the LTA cohort (7% and 22%) than in the non-LTA cohort (12% and 26%) but were inconclusive due to the limited observation period.

Conclusion: These data provide further evidence of the benefits of LTA in patients with cirrhosis. LTA may reduce healthcare resource utilisation and has the potential to be cost-effective in real-world clinical practice.
Background and aims: Hepatic encephalopathy (HE) is a complex and debilitating complication of cirrhosis that may be precipitated by use of specific medicines and nonadherence with prophylaxis. We aimed to explore the association between ‘potentially inappropriate medicine’ use, nonadherence, and hospitalisation with HE in a real-world cohort.

Method: A random sample of 1,318 public hospital encounters among 326 CirCare participants (multi-site, prospective, observational study) with ≥1 admission between July-2017 and August-2019 were selected for review. Clinical and demographic information, comprehensive decompensation history, and medication data including adherence were abstracted from medical records. Encounters without medication documentation were excluded. A multinomial logistic regression model (adjusted for age, current infection, unplanned vs. elective presentation, and taking benzodiazepines, opioids and proton pump inhibitors (PPIs)) was used to calculate the odds of having covert (minimal, grade 1, or suppressed by medication) or grade 2/3 HE compared to no HE at admission. Adjusted odds ratios (OR) and 95% confidence intervals (CI) are reported.

Results: 354 of 1,318 encounters were selected, of which 245 had medication documentation and were included in the study (mean = 1.3 (standard deviation (SD) = 0.6) encounters among 184 patients). Mean age at encounter was 60 (SD = 11) years, and most encounters were unplanned presentations (75.1%) among males (69.4%) with decompensated cirrhosis (58.4%) in a tertiary hospital (69.4%). Nonadherence with ≥1 medicine was documented in 63 (25.7%) encounters. HE was identified in 69 (28.2%) encounters including 13 presentations of new HE. Among 56 encounters with chronic/recurrent HE, patients were prescribed lactulose in 50 (nonadherence rate 42.0%), rifaximin in 27 (nonadherence 7.4%), and other laxatives in 19 (nonadherence 21.5%). Lactulose was prescribed as a laxative in an additional 30 encounters (nonadherence 46.7%), including 8/13 with new HE (4/8 nonadherent). Nonadherence with HE prophylaxis occurred in 31.3% of admissions with grade 2/3 HE and 43.2% with covert HE. 47.8% of people with HE were nonadherent with ≥1 medicine compared to 17.0% without HE (chi-square p < 0.01). At least one ‘potentially inappropriate medicine’ was taken in 60/69 HE encounters (Figure). People taking benzodiazepines (OR = 3.75, 95%CI 1.50–9.35; p = 0.01) and those taking opioids (OR = 2.96, 95%CI 1.18–7.39; p = 0.02) were more likely to have covert HE, than people not taking these medicines. The indication for 45.8% of PPIs.

Conclusion: Nonadherence is common in HE, and people taking opioids and benzodiazepines are at higher risk of grade 2/3 HE. Further exploration of indication and potential alternative therapies is required.
**WED-326**

Impact of intrapulmonary vascular dilatations and hepatopulmonary syndrome on the clinical course of patients after transjugular intrahepatic portosystemic shunt insertion


**Background and aims:** Implantation of a transjugular intrahepatic portosystemic shunt (TIPS) is an established therapy of cirrhosis. However, reports and case series are available. Some authors suggested that TIPS insertion might exacerbate the hyperdynamic circulatory state that is present in patients with advanced liver disease and could therefore result in a higher incidence of hepatic or cardiac decompensation. Hence, this study aimed to investigate the impact of TIPS implantation on the clinical course of patients that underwent TIPS implantation.

**Method:** A number of 366 consecutive patients who received a TIPS between 2009 and 2021 were considered for this study. Contrast-enhanced echocardiography and blood gas analysis (BGA) were conducted to assess the presence of IPVD and HPS. Patients with Budd-Chiari syndrome, relevant lung disease, absence of liver function and contraindication for an echocardiography or BGA were excluded from this study. Multivariable competing risk analysis was conducted to assess the presence of IPVD and HPS. Patients with IPVD had lower MELD scores (12 ± 4 vs. 13 ± 4, p = 0.028), while ascites as TIPS indication was less frequent than in those without IPVD (75% vs. 90%, p < 0.001). The alveolar-arterial oxygen gradient was higher in the IPVD group (29 ± 15 vs. 21 ± 17, p < 0.001), while arterial-oxygen partial pressure was lower (80 ± 15 vs. 86 ± 17, p = 0.006). Presence of IPVD was not associated with a lower LTx-free survival within one year after TIPS implantation (22% vs. 22%, HR: 1.26, 95%CI: 0.75–2.11, p = 0.380). However, IPVD were linked to cardiac decompensation (28% vs. 18%, HR: 1.78, 95%CI: 1.03–3.07, p = 0.040) and a numerically higher risk of hepatic decompensation (55% vs. 46%, HR: 1.37, 95%CI: 0.98–1.91, p = 0.064) in the follow-up. In those with HPS, LTx-free survival and hepatic decompensation did not differ from those without HPS or IPVD (26% vs. 22%, HR: 1.22, 95%CI: 0.68–2.19, p = 0.510, hepatic decompensation: 54% vs. 46%, HR 1.21, 95% CI: 0.82–1.78, p = 0.340). However, incidence of cardiac decompensation was numerically increased (32% vs. 18%; HR: 1.74, 95%CI: 0.97–3.13, p = 0.061).

**Conclusion:** Presence of IPVD or HPS increases the risk of cardiac decompensation but does not impact overall mortality after TIPS implantation.

**WED-327**

Efficacy and safety of nalfurafine hydrochloride for pruritus in patients with chronic liver disease in Japan


**Background and aims:** Nalfurafine hydrochloride, a selective kappa-opioid receptor agonist has been approved for treatment of pruritus in patients with chronic liver disease. However, not all patients respond to nalfurafine hydrochloride. The aim of this study was to clarify the efficacy and safety of nalfurafine hydrochloride.

**Method:** The subjects were patients with chronic liver disease complicated by pruritus who were treated with nalfurafine hydrochloride between May, 2015, and May, 2022. The degree of pruritus was evaluated based on the Visual Analog Scale (VAS) score and the Kawashima’s pruritus score. Nalfurafine hydrochloride 2.5 μg was orally administered once a day for 12 weeks. A decrease in the VAS score of ≥25 mm or the Kawashima’s pruritus score of ≥1 scores was designated as relevant response. The former of ≥50 mm or the latter of ≥2 scores as remarkable response. The 332 patients who were
evaluated the efficacy at 12 weeks. The median time suffering from pruritus to administration of nalfurafine hydrochloride was 4 months.

Results: The median VAS score improved from 70.0 mm before administration to 40.0 and 30.0 mm at 4 and 12 weeks of treatment, respectively. On multivariate analysis, shorter itching period and lower the fibrosis-4 (FIB-4) index value were extracted as the independent factors related to remarkable responder. On multivariate analysis, shorter itching period was extracted as the only independent factor related to relevant responder. The dose escalation (from 2.5 to 5.0 μg/day at 4 weeks of treatment) was performed in 24 patients. Of the 24 patients with dose escalation, 16, 8, and 8 had relevant response, remarkable response, and non-response, respectively.

Conclusion: This study suggested nalfurafine hydrochloride treatment markedly improves pruritus in patients with chronic liver disease. A short pruritus period and less-advanced fibrosis were associated with response to nalfurafine hydrochloride.

WED-328 Safety and efficacy of continuous infusion terlipressin in acute kidney injury-hepatorenal syndrome: the Infuse study K. Rajender Reddy1, Ethan Weinberg1, Stevan Gonzalez2, Manhal Izzy3, Douglas Simonetto4, Richard Frederick5, Raymond Rubin6, Zachary Fricker7, Grace Kim-Lee1, Sherry Wiktieiwicz8, William Tobin8, Khurram Jamil9. 1University of Pennsylvania, Division of Gastroenterology and Hepatology, Philadelphia, PA, United States, 2Simmons Transplant Institute, Baylor University Medical Center, Baylor Scott and White All Saints Medical Center, Hepatology, Dallas, TX, United States, 3Vanderbilt University Medical Center, Department of Gastroenterology and Hepatology, Nashville, TN, United States, 4Mayo Clinic, Rochester, MN, United States, 5California Pacific Medical Center, Hepatology and Liver Transplantation, San Francisco, CA, United States, 6Piedmont Healthcare, Piedmont Transplant Institute, Atlanta, GA, United States, 7Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA, United States, 8International HealthCare, LLC, Norwalk, CT, United States, 9Mallinckrodt Pharmaceuticals, Scientific Affairs, Hampton, NJ, United States

Background and aims: Safety and efficacy of terlipressin for AKI-HRS may be greater with a continuous infusion strategy as opposed to bolus administration (CONFIRM: NCT02770716).

Method: An open-label study of continuous infusion terlipressin (INFUSE; NCT04460560) has been completed in 50 patients with cirrhosis and AKI-HRS. The cohort was enriched with those who were treated as a continuous infusion from 2 to 8 mg/day based on SCr response and tolerability. Complete Response (CR): ≥ 30% decrease in SCr with EOT SCr ≤ 1.5, Partial Response (PR): ≥ 30% decrease in SCr with EOT SCr > 1.5, Non-Response (NR): <30% decrease in SCr. Follow-up was up to 30 days post-treatment.

Results: (See table) There were no unexpected drug-related serious adverse events. One patient had hypoxic respiratory failure attributed to fluid overload and responded to diuretics. There were 3 deaths (2 progressive liver failure, 1 progressive renal failure). Midodrine and octreotide use prior to enrollment was in 37/50; 74%.

Table:

<table>
<thead>
<tr>
<th>Variable</th>
<th>All Patients</th>
<th>CR</th>
<th>PR</th>
<th>NR</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age, 57, 54%</td>
<td>50</td>
<td>31</td>
<td>50</td>
<td>11</td>
<td>50 (22%)</td>
</tr>
<tr>
<td>Male</td>
<td>40</td>
<td>20</td>
<td>20</td>
<td>10</td>
<td>0.037</td>
</tr>
<tr>
<td>AKI Stage 1/2/3</td>
<td>14/50 (28%)</td>
<td>9/31 (29%)</td>
<td>1/8 (12.5%)</td>
<td>4/11 (36%)</td>
<td>NS</td>
</tr>
<tr>
<td>MELD, Baseline</td>
<td>26, 17–34</td>
<td>25, 18–34</td>
<td>27, 17–34</td>
<td>27, 17–33</td>
<td>NS</td>
</tr>
<tr>
<td>MELD, EOT</td>
<td>20, 11–32</td>
<td>18, 11–31</td>
<td>20, 14–29</td>
<td>23, 16–32</td>
<td>NS</td>
</tr>
<tr>
<td>SCr, Baseline</td>
<td>2.6, 1.5–4.9</td>
<td>2.3, 1.5–3.9</td>
<td>3.0, 2.3–4.4</td>
<td>2.8, 1.7–4.9</td>
<td>0.02</td>
</tr>
<tr>
<td>SCr, EOT</td>
<td>1.4, 0.8–4.9</td>
<td>1.2, 0.8–1.5</td>
<td>1.9, 1.7–2.4</td>
<td>2.6, 1.5–4.9</td>
<td>NS</td>
</tr>
<tr>
<td>Days of treatment</td>
<td>8, 1–14</td>
<td>7, 3–14</td>
<td>10, 3–14</td>
<td>4, 1–14</td>
<td>NS</td>
</tr>
<tr>
<td>Terlipressin dose (mg)</td>
<td>21, 3–87</td>
<td>21, 3–79</td>
<td>47, 5–87</td>
<td>13, 3–67</td>
<td>NS</td>
</tr>
<tr>
<td>Concurrent albumin dose (g)</td>
<td>150, 25–475</td>
<td>175, 50–400</td>
<td>125, 50–475</td>
<td>100, 25–188</td>
<td>0.037</td>
</tr>
<tr>
<td>RRT within 30 d</td>
<td>10/50 (20%)</td>
<td>1/31 (3%)</td>
<td>2/8 (25%)</td>
<td>7/11 (64%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Alive at 30 d</td>
<td>47/50 (94%)</td>
<td>30/31 (97%)</td>
<td>8/8 (100%)</td>
<td>10/11 (91%)</td>
<td>NS</td>
</tr>
<tr>
<td>Transplant candidates</td>
<td>20/50 (40%)</td>
<td>15/31 (48%)</td>
<td>3/8 (37.5%)</td>
<td>2/11 (18%)</td>
<td>NS</td>
</tr>
<tr>
<td>- Waitlist</td>
<td>5/40 (15%)</td>
<td>2/23 (9%)</td>
<td>1/8 (12.5%)</td>
<td>2/9 (22%)</td>
<td>NS</td>
</tr>
<tr>
<td>- Eligible</td>
<td>15/40 (37.5%)</td>
<td>13/23 (57%)</td>
<td>5/8 (62.5%)</td>
<td>5/9 (56%)</td>
<td>NS</td>
</tr>
<tr>
<td>- LT</td>
<td>20/50 (40%)</td>
<td>15/31 (48%)</td>
<td>3/8 (37.5%)</td>
<td>2/11 (18%)</td>
<td>NS</td>
</tr>
<tr>
<td>SLKT</td>
<td>4/40 (10%)</td>
<td>1/4 (25%)</td>
<td>2/4 (50%)</td>
<td>1/4 (25%)</td>
<td>NS</td>
</tr>
</tbody>
</table>

Values are median, range unless otherwise stated.

Conclusion: A high CR of 62% was observed with continuous infusion terlipressin with a favorable safety profile. Fifteen underwent LT alone; 9/15 (60%) were CR, 1/15 (7%) PR, 5/15 (33%) NR, and 4 had simultaneous liver kidney transplants (SLKT). In patients with AKI-HRS, treatment with terlipressin was followed by LT alone in a high proportion of complete responders.

WED-329 Abstract withdrawn
WED-330
The effects of alfapump on ascites control and quality of life in patients with cirrhosis and recurrent or refractory ascites: pivotal trial results
Florence Wong1, Hugo Vargas2, K. Rajender Reddy3, Mangesh Pagadala4, Christine Pocha5, Vinay Sundaram6, Jasmohan Bajaj7, Jeroen Capel8, Patrick S. Kamath9, 1University of Toronto, ON, Canada, 2Mayo Clinic, Phoenix, AZ, United States, 3University of Pennsylvania, PA, United States, 4Methodist Dallas Medical Center, TX, United States, 5Avera Medical Group, Sioux Falls, United States, 6Cedars-Sinai Comprehensive Transplant Center, Los Angeles, CA, United States, 7Richmond VA Medical Center, United States, 8Sequana Medical NV, Zürich, Switzerland, 9Mayo Clinic, Rochester MN, United States.

Email: florence.wong@utoronto.ca

Background and aims: The standard of care for recurrent or refractory ascites (RA) in cirrhosis is repeat large volume paracentesis (LVP). The alfapump system, providing slow but continuous paracentesis (para) via a subcutaneous pump, has been shown to be a possible alternative in selected patients. The aim was to assess the effects of alfapump on ascites control and quality of life (QoL) in patients with cirrhosis and RA.

Method: Patients with cirrhosis and RA and TIPS contraindications or refusal who had required ≥2 paras in the 30 days prior were enrolled. Patients served as their own controls with ≥5 paras in 3 months (M) before pump implantation. Patients received post-implant prophylactic antibiotics and follow-up was ≥6 M. Data collected were demographics, albumin use, ascites control, safety, QoL, and ascites symptoms using SF36 and Ascites Q questionnaires, respectively. The 3 M pre-pump and 4–6 M post-pump data were compared, after initial 3 M post-pump stabilization. Primary efficacy end point was reduction in para requirement; safety end points were pump system adverse events that resulted in intervention, explan or death.

Results: 40 patients with RA, mean age 64 ± 9 yrs, 65% men, mean MELD-Na 15 ± 4, 48% alcohol-related cirrhosis received an alfapump. Efficacy: Para requirement decreased from 3.2 ± 1.5 to 0.2 ± 0.6 times/M (p < 0.001) from pre- to post- pump implant period, with 77% of patients having a ≥50% reduction (Figure). Ascites volume removed by para fell from 54.2 ± 23.3 pre- to 2.8 ± 9.1 L/M post-pump (p < 0.001). Safety: 6 (17.6%) pumps were explanted, 3 due to pump skin erosion and 3 due to bladder discomfort. There were 17 serious adverse events (SAEs) in 11 patients in the pre-, and 81 SAEs in 24 patients (p < 0.001) in the post-implant period, respectively. Six primary safety events post-implant were related to procedure, device or alfapump therapy. There was no AKI in the pre-, but 23 AKIs in the post-implant period (0–6 M), with 16/24 cases being stage 1, 5 stage 2, and 2 stage 3 AKI. Albumin use was 95 ± 105 g/M in the post-implant vs. 102 ± 127 g/M in the pre-implant period (p = 0.38), likely due to AKI treatment. There were 4 SBP SAEs and 1 UTI SAE. There were 5 deaths in the 6 M post-implant period, none related to device or alfapump therapy, renal dysfunction or infection. QoL: Patients reported reductions in ascites related symptoms with an Ascites Q score of 32.2 ± 21.9 at 6 M post- vs. 51.0 ± 19.3 pre-implant (lower value = improvement) (p < 0.001). Physical but not mental component of SF36 improved [35.6 ± 9.3 pre-implant to 42.8 ± 8.5 at 6 M (p < 0.001)].

Conclusion: The alfapump system was very effective in control of ascites, virtually eliminating the need for LVP. Patients with the alfapump need close monitoring for the development of AKI or infection, which must be treated promptly to prevent adverse outcomes. In carefully selected patients with RA, the alfapump is an alternative to repeat LVP.

WED-331
Quickstroop, an App-based strategy that takes <1 minute, predicts time to overt hepatic encephalopathy development and hospitalizations
Gowthami Kanagalingam1, Dan Park1, Bryan Badal1, Andrew Fagan1, Leroi Thacker1, Jasmohan S Bajaj1, Virginia Commonwealth University, United States. Email: jasmohan.bajaj@vcuhealth.org

Background and aims: Prediction of overt hepatic encephalopathy (OHE) development needs to be refined beyond current clinical markers. Covert HE (CHE) diagnosis with QuickStroop (1st 2 runs of EncephalApp Off stage) takes <1 min vs the total EncephalApp. Both are comparable cross-sectionally but use of Quickstroop to predict OHE and hospitalizations is unclear. Aim: Determine the ability of QuickStroop to predict OHE and related hospitalizations, other hospitalizations and death in cirrhosis outpatient.

Method: Outpatients with cirrhosis underwent QuickStroop testing and were divided into CHE or not based on age, gender and education adjusted norms. Follow-up for OHE development (grade ≥2 needing Rx changes), OHE-related non-elective hospitalizations, all hospitalizations and death was performed. Demographics, cirrhosis details and medications were recorded. Cox proportional hazard models for CHE by QuickStroop for OHE and hospitalizations were created unadjusted and then adjusted for cirrhosis severity and complications.

Results: 250 pts (62.5 ± 8.2 years, 96% men, education median 12 years) were included. Median MELD-Na (range) was 11 (6, 37) with most pts with NAFLD (33%) then HCV (24%) and alcohol (18%). Prior OHE was seen in 33% (all on lactulose, 29% on rifaximin). 41% had ascites, 37% had varices and 24% were on non-selective beta-blockers (NSBB). Patients were followed a median of 7 (1–107) months from testing. The median time-to-event for those who developed OHE was 5 (1, 47) mths, HE-related hospitalizations was 5 (1, 47) months and all hospitalizations was 6 (1, 72) months post-testing. CHE: CHE on QuickStroop was found in 126 (50%) patients. MELD was higher (14.3 ± 6.4 vs 11.4 ± 5.1, p < 0.001), with higher prior OHE (45% vs 23%, p = 0.002), higher ascites (51% vs 32%, p = 0.003) and lower albumin (3.3 ± 0.7 vs 3.5 ± 0.5, p = 0.001) CHE pts had higher risk of OHE development (24% vs 7%, p = 0.003), OHE-related hospitalizations (16% vs 5%, p = 0.004) and death (31% vs 5%, p = 0.002) but similar all-cause hospitalizations (62% vs 57%, p =
0.45). This pattern was also seen in time-to-event analysis. After adjustment for other variables, CHE on Quickstroop remained significantly linked with lower time to OHE development and hospitalizations but not death or all-cause hospitalizations (Fig 1A/B).

**Conclusion:** Using the Quickstroop, an App-based strategy providing CHE diagnosis within one minute, is associated with lower time to develop outcomes specific to Overt HE development.

**WED-332**

**On-treatment factors predict recompensation in entecavir-treated hepatitis B patients with decompensated cirrhosis**

You Deng1, Huanwei Zheng2, Xiang Huiling3, Yuemin Nan4, Jinhua Hu5, Qinghua Meng6, Hong Zhao1, Qi Wang1, Jilian Fang7, Jie Xu8, Xiao Ming Wang9, Calvin Q Pan10, Hong You9, Xiaoyuan Xu11, Wen Xie1, Ji-Dong Jia9. 1Beijing Ditan Hospital, Capital Medical University, China, 2Shijiazhuang Fifth Hospital, China, 3Tianjin Third Central Hospital, China, 4The Third Hospital of Hebei Medical University, China, 5The Fifth Medical Centre of Chinese PLA General Hospital, China, 6Beijing You-an Hospital, Capital Medical University, China, 7Peking University People’s Hospital, China, 8Peking University Third Hospital, China, 9Beijing Friendship Hospital, Capital Medical University, China, 10Division of Gastroenterology and Hepatology, Department of Medicine, NYU Langone Medical Center, NYU School of Medicine, United States, 11Peking University First Hospital, China

**Email:** jia_jd@ccmu.edu.cn

**Background and aims:** Recompensation is achievable in certain decompensated cirrhotic hepatitis B patients treated with nucleos (t) ide analogues (NAs). However, the prediction factors of recompensation are still unclear. Therefore, we aimed to develop a prognostic model for recompensation prediction in NA-treated hepatitis B patients with decompensated cirrhosis.

**Method:** In a multi-centre study enrolled decompensated chronic hepatitis B (CHB) patients with ascites and treated with entecavir for 120 weeks, clinical events, viral and biochemical tests were monitored every 12 weeks. The primary outcome was the rate of recompensation as defined by the Baveno VII definition and the criteria of stable improvement in liver function tests reported by us. Multivariate logistic regressions were used to identify the optimal prediction time and to build prediction models.

**Results:** Of the 320 recruited patients, 283 completed the 120-week entecavir treatment and follow-up, with 56.2% (159/283) of them achieving recompensation at week 120. Treatment week 24 was the optimal time to predict recompensation, with an albumin level of 34 g/L or greater being a reliable threshold for recompensation (AUROC: 0.676) at treatment week 120. Furthermore, a model based on platelet count, serum albumin, and sodium level (Brec-PAS models) at treatment week 24 offered better predictability (AUROC: 0.749) for recompensation at treatment week 120, outperforming the MELD (AUROC: 0.629, p = 0.002) and FIB-4 scores (AUROC: 0.702, p = 0.097).

**Conclusion:** At treatment week 24, the serum albumin level of 34 g/L or greater was a simple predictor, whereas Brec-PAS model was a more accurate predictor tool for 120-week recompensation in entecavir-treated CHB patients with decompensated cirrhosis.

**WED-333**

**Temporal trajectory of the model for end-stage liver disease (MELD) score for prediction of mortality among patients with liver cirrhosis**

Niv Zmora1, Lian Bannon1, Oren Shibolet1, Liane Rabinowich1. 1Tel Aviv Sourasky Medical Center-Ichilov, Department of Gastroenterology and Hepatology, Tel Aviv-Yafo, Israel

**Email:** nivz@tlvmc.gov.il

**Background and aims:** The Model for End-Stage Liver Disease (MELD) score and its modification, the MELD-Na score, are important prognostic indicators for patients with liver cirrhosis, as predictors of 3-month survival as well as prioritization and organ allocation in liver transplantation. The scores provide a snapshot of mortality risk at a specific time-point, irrespective of the preceding course of liver disease. Our aim was to assess whether the trajectory in MELD-Na score over time affect mortality rates in patients with liver cirrhosis.

**Method:** MELD-Na score was retrospectively applied to patients diagnosed with liver cirrhosis who died between the years 2004–2023 at the Tel-Aviv Sourasky Medical Center. Patients with at least 5 records of relevant blood tests required for MELD-Na score calculation (serum bilirubin, creatinine, sodium and international normalized ratio [INR]) within 2 years prior to death were included. The cumulative MELD-Na score was calculated for each patient throughout the study period using incremental area under the MELD-Na curve, and was correlated to patient survival for each MELD-Na score from 9 onwards.
Results: Within the study period there were 1,905 reported deaths among patients diagnosed with liver cirrhosis, of whom 982 were eligible for analysis, encompassing 13,136 calculated MELD-Na scores (average MELD-Na score 19.26 ± 6.88). Observed 3-month mortality rates for each MELD-Na score were higher than predicted by the published model (59.03% for scores in the range of 10–19; 84.14% for scores in the range of 20–29; and 97.27% for scores between 30–39). MELD-Na scores between 9–15 exhibited a statistically significant dependence on MELD-Na history (p values 0.0–0.05), with an inverse correlation between survival and cumulative MELD-Na scores (correlation coefficient range 0.07–0.20).

Figure: Top: Correlation between cumulative MELD-Na score to survival in instances where MELD-Na = 13 (left) and 15 (right). Blue fill denotes a 90-day mortality time frame; Bottom: percentage of 90-day mortality binned by iAUC values

Conclusion: In patients with cirrhosis and mild liver dysfunction, temporal trajectories in MELD-Na scores may aid in optimizing prediction of 90-day mortality.

WED-334
Smoking and obesity promote systemic inflammation in patients with compensated and decompensated cirrhosis
Benedikt Hofer1,2,3, Benedikt Simbrunner1,2,3, Georg Semmler1,2, Michael Schwarz1,2, Lorenz Balcar1,2, Lukas Hartl1,2, Mathias Jachs1,2, Katharina Pomej1,2, Rafal Paternostro1,2, Theresa Müllner-Bucsics1,2, Philipp Schwabl1,2, Bernhard Scheiner1,2, Michael Trauner1,2, Mattias Mandofer1,2, Thomas Reiberger1,2,3, 1Medical University of Vienna, Division of Gastroenterology and Hepatology, Department of Internal Medicine III, Vienna, Austria, 2Medical University of Vienna, Vienna Hepatic Hemodynamic Laboratory, Division of Gastroenterology and Hepatology, Department of Internal Medicine III, Vienna, Austria, 3Medical University of Vienna, Christian Doppler Lab for Portal Hypertension and Liver Fibrosis, Vienna, Austria
Email: thomas.reiberger@meduniwien.ac.at

Background and aims: Cigarette smoking and obesity have been linked to systemic inflammation in patients with cardiovascular disease. The relative contribution of these two factors to the proinflammatory state in patients with advanced chronic liver disease (ACLD) remains unknown.

Method: ACLD patients with either compensated (cACLD, n = 284) or decompensated (dACLD, n = 416) disease and available information regarding smoking status and body mass index (BMI) were included. Blood markers of systemic inflammation (white blood cell count [WBC], C-reactive protein [CRP]) were evaluated in groups of “never-smokers” vs “ex-smokers” vs “active smokers” and in BMI strata “BMI <25” vs “BMI25-30” vs “BMI >30.”

Results: Overall, 106 cACLD patients (37.3%) and 160 dACLD patients (38.5%) reported active smoking. 84 cACLD patients (29.6%) and 78 dACLD patients (23.5%) grade 3 ascites patients [n = 84] were excluded from all BMI analyses) presented with obesity (i.e., BMI > 30 kg/m2). In cACLD patients, median WBC increased according to smoking status (never: 4.3 vs ex: 5.1 vs active: 6.0 G/L; p = 0.001), with a significant difference between never-smokers and ex-smokers (p = 0.025) or active smokers (p < 0.001), as well as between ex-smokers and active smokers (p = 0.009). No significant difference was observed for CRP (p = 0.649). In dACLD, active smokers and ex-smokers demonstrated a significant increase in WBC (never: 4.4 vs ex: 4.8 vs active: 5.6 G/L; p = 0.001) and a clear trend for CRP (never: 3.9 vs ex: 4.9 vs active: 5.1 mg/L; p = 0.176). Importantly, the link between active smoking and increased WBC remained significant in both cACLD (<0.001) and dACLD (p < 0.001) after adjusting for MELD in a multivariable linear regression model. With regard to obesity, BMI showed a significant positive correlation with CRP both in cACLD (Spearman’s r: 0.17; p = 0.004) and dACLD patients (r: 0.11; p = 0.039). Accordingly, CRP was significantly higher in patients with BMI >30 vs BMI25-30 and BMI <25 in cACLD patients (2.7 vs 1.6 and 1.8 mg/L; p = 0.035) and in dACLD patients (4.7 vs 3.3 and 3.2 mg/L; p = 0.113). Taking cACLD and dACLD together, active smokers with BMI >30 [n = 46] showed significantly higher levels of systemic inflammation compared to never-smokers with BMI <25 (n = 79): WBC (6.6 vs 4.3 G/L; p = 0.001), CRP (4.7 vs 2.2 mg/L; p = 0.004). WBC (p = 0.134) and CRP (p = 0.145) in ex-smokers with BMI 25–30 [n = 72] were not significantly different from never-smokers with BMI <25 (Figure).

Conclusion: In a large cohort of patients with compensated and decompensated cirrhosis, both active smoking and obesity promote a proinflammatory state. Thus, cessation of smoking should be encouraged in all ACLD patients, and weight loss in those with obesity.

WED-335
Association of polymorphisms in genes of the innate immunity with transplant-free survival of patients with decompensated liver cirrhosis
Niclas Selzer1, Janett Fischer1, Adam Herber1, Niklas Aehling2, Madlen Matz-Soja1, Thomas Berg1, 1Division of Hepatology, Department of Medicine II, Leipzig University Medical Center, Germany, 2Internal Medicine III-Gastroenterology, University Hospital of Augsburg, Germany
Email: janett.fischer@medizin.uni-leipzig.de

Background and aims: Liver cirrhosis is associated with severe complications such as acute-on-chronic-liver-failure (ACLF), ascites as well as infections, especially spontaneous bacterial peritonitis (SBP). Several single nucleotide polymorphisms (SNP) have been
reported to affect innate immune responses. In previous studies, some SNPs in patients with liver cirrhosis were associated with altered patient survival, the occurrence of SBPs or cytokine response to bacteria. The aim of our study was to assess the impact of known SNPs in the genes of toll-like receptor 1, 2, 4, 5, and 6, the cluster of differentiation 14 (CD14), nucleotide-binding oligomerization domain-containing protein 2 (NOD2), the farnesoid-X receptor (FXR) and the Mannose-binding lectin 2 (MBL2) on disease progression and transplantation-free survival of patients with liver cirrhosis and ascites in a large, well-characterized cohort.

**Method:** In our study, we genotyped 409 patients with liver cirrhosis and ascites for 28 SNPs of the innate immune system. We then correlated the genotypes with clinical data from the time of inclusion and with the incidence of infections and survival over a period of 180 days after inclusion. Both the entire cohort and subgroups divided according to a low and high MELD-score (cut-off 17) and sex were examined.

**Results:** In the main cohort, the genotypes CT and TT of the TLR4 SNP rs4986791 (p = 0.039; OR: 1.881) as well as the genotype CG of the NOD2 SNP rs2066845 (p = 0.025; OR: 2.853) were associated with a reduced transplant-free survival. Additionally, we found an association between CT and TT genotypes of the SNP FXR rs386377 and an increased occurrence of SBP (p = 0.01; OR: 2.986). Patients with the CC genotype of the MBL2 SNP rs5030737 survived significantly longer than other patients (p = 0.037; OR: 0.406). We observed more associations between variants and a worsened course of disease in the females compared to male patients (8.3% vs. 2.4%) as well as in the low-MELD subgroup compared to the high-MELD cohort (4.8% vs. 0%).

**Conclusion:** We identified several variants in the innate immune system that affect the clinical course of disease in patients with decompensated liver cirrhosis independent from other known risk factors. Thus, panels with different risk genotypes should be implemented into personalized medicine to identify patients with an increased risk of a severe course of the disease.

**WED-336**

Applicability of EASL clinical guidelines recommendations of empiric antibiotic treatment for spontaneous bacterial infections in patients with cirrhosis in South America

*Melisa Dirchwolf, Melisa Dirchwolf, Marina Agozino, Gonzalo Gomez Perdiguero, Ivonne Giselle Duarte, Maria Dolores Murga, Hernando Bessone, Sebastian Eduardo Ferrer, Diego Arufe, Andres Bruno, Astrid Smud, Diego Giunta, Martín Elizondo, Hugo Fainboim, Adrian Gadano, Julia Brutti, Josefina Pages, German Rojas, Esteban Gonzalez Ballerga, Alina Zerega, Maria Garrido, Sebastian Marciano, Hospital Privado de Rosario, Argentina, Hospital Privado de Rosario, Liver Unit, Rosario, Argentina, Sanatorio Guemes, Argentina, Hospital Italiano de Buenos Aires, Argentina, Hospital 4 de Junio, Argentina, Hospital A.C. Padilla, Argentina, Hospital Provincial del Centenario, Argentina, Sanatorio Parque de Rosario, Argentina, Sanatorio Sagrado Corazón, Argentina, Hospital Argerich, Argentina, Unidad Bi-Institucional de Trasplante Hepático: Hospital Militar HCFPA and Hospital de Clínicas, Uruguay, Hospital de Infectiosas Francisco Javier Mulliz, Argentina, Hospital Aleman, Argentina, Hospital Universitario Austral, Argentina, Hospital de Clínicas José de San Martín, Argentina, Sanatorio Allende, Argentina, Hospital Central Ramon Carrillo, Argentina, Hospital Central de Mendoza, Argentina, Hospital Privado de la Comunidad de Mar del Plata, Argentina*

*Email: marinaagozino@hotmail.com*

**Background and aims:** Clinical practice guidelines of major scientific societies are widely used to choose empiric antibiotic treatment for patients with cirrhosis. It is paramount to assess these recommendations’ applicability in each epidemiological setting to guarantee optimal patient coverage. We aim to evaluate the applicability of the latest EASL clinical guidelines recommendations for empiric antibiotic treatment for spontaneous bacterial infections according to the acquisition site.

**Method:** Cross-sectional study on the database of a multicenter prospective cohort study of patients with cirrhosis and bacterial infections in Argentina and Uruguay (NCT03919032). Only culture-positive spontaneous infections were included in this study: spontaneous bacterial peritonitis (SBP), spontaneous bacterial empyema (SBE), and spontaneous bacteremia (SB). We estimated the proportion of antibiotic susceptibility according to where the infection was acquired: community-acquired (CA), healthcare-associated (HCA), or nosocomial (NOS). Regarding applicability, approximately 80% coverage is advisable for empiric treatments in stable patients, and 90% for critically-ill patients.

**Results:** We included 154 patients: 74 (48%) SBP, 70 (45%) SB, and 10 (7%) SBE. Regarding the site of acquisition, 42% were CA, 34% NOS, and 24% HCA. Gram-positive and negative bacteria were isolated in 53% and 47% of the infections. The prevalence of multidrug-resistant organisms (MDROs) was 34%. Only cefepime and piperacillin-tazobactam offer rational coverage for CA and HCA infections, and imipenem or meropenem for NOS infections. Only meropenem or imipenem combined with vancomycin offer a coverage superior to 90% (table). When considering EASL recommendations for CA that include third generation cephalosporins or piperacillin-tazobactam, empiric coverage ranges from 43–81%; whereas for HCA or nosocomial infections the observed coverage with carbapenems with/without vancomycin ranges from 53–97%, depending on which antibiotic is considered even within the same antibiotic group.

**Table:** Proportion of isolations that were susceptible to selected antibiotics, according to the site of acquisition of the infection

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Community Acquired (n = 64)</th>
<th>HCA (n = 37)</th>
<th>Nosocomial (n = 53)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceftriaxone</td>
<td>34 (53%)</td>
<td>17 (46%)</td>
<td>18 (34%)</td>
</tr>
<tr>
<td>Cefepime</td>
<td>47 (75%)</td>
<td>23 (64%)</td>
<td>49 (94%)</td>
</tr>
<tr>
<td>Cefazidime</td>
<td>27 (43%)</td>
<td>11 (31%)</td>
<td>36 (68%)</td>
</tr>
<tr>
<td>Piperacillin-tazobactam</td>
<td>52 (81%)</td>
<td>28 (76%)</td>
<td>31 (59%)</td>
</tr>
<tr>
<td>Imipenem or meropenem</td>
<td>53 (83%)</td>
<td>29 (78%)</td>
<td>36 (68%)</td>
</tr>
<tr>
<td>Imipenem or meropenem + Vancomycin*</td>
<td>63 (100%)</td>
<td>35 (97%)</td>
<td>49 (94%)</td>
</tr>
<tr>
<td>Ertapenem</td>
<td>47 (73%)</td>
<td>22 (59%)</td>
<td>28 (53%)</td>
</tr>
</tbody>
</table>

*available in 151 patients.*

**Conclusion:** When considering EASL recommendations for empiric antibiotic treatment in spontaneous infections in cirrhosis according to the site of infection, we observed a wide range of coverage depending on which antibiotic is considered in this cohort of patients from South America. These findings demonstrate that all recommended regimens are not equivalent, even within antibiotic groups, which underlines the urgent need to tailor clinical practice guidelines to local epidemiology to optimize treatment efficacy.

**WED-337**

Progression of cirrhosis is not associated with clinically significant alterations in hemostasis assessed by thromboelastography

*Alina Buliarca, Bogdan Procopet, Daniela Matei, Horia Stefanescu, Rares Cociun, Zeno Sparciuz, Julio Hatieganu* University of Medicine and Pharmacy, Cluj-Napoca, Romania, Prof. Dr. O. Fodor* Regional Institute of Gastroenterology and Hepatology, Cluj-Napoca, Romania, Regional Institute of Gastroenterology and Hepatology, Liver Unit and Clinical Ultrasound Department, Cluj Napoca, Romania*

*Email: bogdan.procopet@umfcluj.ro*

**Background and aims:** Standard coagulation tests (SCTs) do not adequately reflect hemostasis in patients with cirrhosis. Thromboelastography (TEG) provides a more balanced overview of coagulation, assessing clotting factors (R-time), fibrinogen (K, alpha
Conclusion: K-time (p = 0.40). No periprocedural bleeding events were recorded. There were no significant differences regarding the reference range. There were no significant differences regarding INR-1.43 (1.25–1.61) vs. 2.57 (1.77–3.37) and fibrinogen levels-248 (189.5–306.5) vs. 155 (90.5–210.5) mg/dl between the two groups. The TEG abnormalities were assessed in relation to traditional cut-offs for interventional procedures.

Results: Of the 106 patients, 44 (41.5%) were included in group 1 and 62 (58.5%) in group 2. 65.1% of patients had a normal TEG. However, none of the remaining patients fulfilled the TEG-guided transfusion criteria. There were significant differences regarding INR-1.43 (1.25–1.61) vs. 2.57 (1.77–3.37) and fibrinogen levels-248 (189.5–306.5) vs. 155 (90.5–210.5) mg/dl between the two groups. In contrast, there were no significant differences regarding platelet count (p = 0.16) or any of the TEG variables (R-P = 0.51, K-P = 0.28, alpha angle-p = 0.70, MA-P = 0.72, and Ly30-P = 0.74). While there were significant differences in R time between patients with an INR below (n = 56) or above (n = 50) 2 (9.95 ± 4.31 vs. 12.44 ± 5.55, p = 0.01), only two patients (4%) with an INR >2 exceeded the reference values for R. Patients with a platelet count below 50000/μl (n = 36) had a lower MA compared to those (n = 70) exceeding the threshold value (42.38 ± 13.85 vs. 55.02 ± 14.10, p < 0.001). The overall accuracy for the 50000/μl platelet cut-off in predicting platelet dysfunction expressed by MA was 72.64%. Regarding fibrinogen, patients with a value above 200 mg/dl had a higher alpha angle (44.86 ± 15.62 vs. 36.29 ± 16.08, p = 0.01). Nevertheless, only 4 (3.7%) patients had values below the reference range. There were no significant differences regarding the K-time (p = 0.40). No periprocedural bleeding events were recorded.

Conclusion: There is no evidence of progressive worsening of the coagulation status with a more advanced liver disease based on native TEG analysis. Overall, SCTs have poor correspondence with TEG variables.

WED-338 Decreased platelet function is an independent predictor of liver-related and all-cause mortality in patients with advanced chronic liver disease

Benedikt Hofer1,2,3,4, Ksenia Brusilovskaya1,3,4, Benedikt Simbrunner1,2,3,4, Beate Eichelberger1, Silvia Lee1,2, David JM Bauer1,2, Mattias Mandorfer1,2, Philipp Schwab1,2,3,4, Simon Panzer2, Thomas Reiberger1,2,3,4, Thomas Gremmel5,6,7,8

1 Medical University of Vienna, Division of Gastroenterology and Hepatology, Department of Internal Medicine III, Vienna, Austria, 2 Medical University of Vienna, Vienna Hepatic Hemodynamic Laboratory, Division of Gastroenterology and Hepatology, Department of Internal Medicine III, Vienna, Austria, 3 Medical University of Vienna, Christian Doppler Lab for Portal Hypertension and Liver Fibrosis, Vienna, Austria, 4 Center for Molecular Medicine (CeMM) of the Austrian Academy of Sciences, Vienna, Austria, 5 Medical University of Vienna, Department of Blood Group Serology and Transfusion Medicine, Vienna, Austria, 6 Medical University of Vienna, Department of Internal Medicine II, Vienna, Austria, 7 Karl Landsteiner Society, Institute of Cardiovascular Pharmacotherapy and Interventional Cardiology, St. Pölten, Austria, 8 Landesklinikum Mistelbach-Gänserndorf, Department of Internal Medicine I, Cardiology and Intensive Care Medicine, Mistelbach, Austria

Email: thomas.reiberger@meduniwien.ac.at

Background and aims: Patients with advanced chronic liver disease (ACLD) are at an increased risk of both bleeding and thromboembolic events. Thrombocytopenia due to portal hypertension (PH), as well as abnormal platelet activation and function, have been reported in ACLD. We aimed to assess whether alterations in platelet activation predict liver-related events.

Method: Within this prospective study, we included patients with ACLD undergoing a baseline measurement of the hepatic venous pressure gradient (HVPG). Platelet responsiveness was assessed by measuring surface expression of P-selectin by flow cytometry after stimulation with either the protease-activated receptor (PAR)-1 agonist TRAP (thrombin receptor activating peptide), the PAR-4 agonist AYPGKF or epinephrine.

Results: Overall, 107 ACLD patients (71% male; median age: 55.3 [IQR: 46.4–62.9] years; median HVPG: 18 [IQR: 12–21] mmHg) were included. During a median follow-up period of 25.3 (IQR: 15.7–31.2) months, 17 patients (15.8%) died. Of those deaths, 11 were considered liver-related. In univariable analysis, higher platelet surface expression of P-selectin in response to TRAP (HR per 100 MFI [median fluorescence intensity]: 0.92 [95%CI: 0.86–0.97]; p = 0.006) or AYPGKF (HR per 10 MFI: 0.93 [95%CI: 0.87–0.99]; p = 0.034) was significantly linked to a lower risk of all-cause mortality. In addition, a higher surface expression of P-selectin in response to TRAP was also associated with a reduced risk of liver-related mortality within the univariable analysis (HR per 100 MFI: 0.92 [95%CI: 0.85–0.99]; p = 0.026). Importantly, the predictive role of TRAP-inducible P-selectin expression with regard to all-cause mortality remained significant in a multivariable model adjusted for MELD (model for end-stage liver disease) and HVPG (aHR: per 100 MFI: 0.93 [95%CI: 0.87–0.99]; p = 0.019). Six patients presented with de novo portal vein thrombosis (PVT) during follow-up. Interestingly, higher P-selectin expression in response to epinephrine stimulation was significantly linked to a higher risk of developing PVT (HR per 10 MFI: 1.08 [95%CI: 1.03–1.14]; p = 0.004), while no connection was found for other platelet activation parameters.

Conclusion: The assessment of platelet responsiveness provides additional prognostic information in ACLD patients on top of liver disease and PH severity. While higher PAR-1 and PAR-4 mediated platelet activation was linked to a decreased risk of liver-related and all-cause mortality, an increase in epinephrin-inducible platelet activation was associated with de novo PVT development.

WED-339 Thromboelastography-guided coagulopathy correction in cirrhotic patients decreases blood product transfusion: a systematic review and analysis

Hamed Komeylian1, Carmen Ching2, Julie Zhu3, 1 Dalhousie University, Gastroenterology, Canada, 2 Dalhousie University, Faculty of Medicine, Canada, 3 Dalhousie University, Gastronetrology, Canada

Email: h.komeylian@gmail.com

Background and aims: Patients with cirrhosis are a risk factor for coagulopathy and bleeding complications. Thromboelastography (TEG) guided therapy is available to rapidly assess and guide blood product transfusion in this population. This study aims to determine if TEG-guided therapy is able to decrease the administration of blood products and reduce adverse events such as bleeding and mortality compared to standard coagulation testing (SCT).

Method: We performed a systematic review and meta-analysis of literature in PubMed, EMBASE, and The Cochrane Library and pooled six randomized-controlled trials comparing thromboelastography versus standard coagulation testing in patients with cirrhosis. A total of six studies were pooled (n = 386). Primary outcomes were mean platelet transfusion units and fresh frozen plasma (FFP) transfusion units. Secondary outcomes were mortality and bleeding events.

Results: Compared to SCT, there was a significant standard mean decrease in platelet (p < 0.00001) and FFP (p < 0.00001) administration compared to TEG perioperatively prior to a liver transplant. However, there was no significant difference in the pooled odds ratio between TEG and SCT in patients receiving both platelets and FFP (OR 1.40 [95% CI 0.61–3.23, P = 0.42]). Recurrent variceal bleeding was significantly reduced in the TEG group compared to SCT for platelet transfusion (OR 0.05 [95% CI 0.01–0.20, P = 0.0001]) or FFP transfusions (OR 0.18 [95% CI 0.05–0.63, P = 0.007]). With regards to the 5-
day, 28-day, 42-day, and 90-day mortality, there was no significant difference between the pooled odds ratio between the TEG and SCT groups (OR 0.69 [95% CI 0.47 – 1.02, P = 0.06]). The 24-hour, 48-hour, 5-day, and 42-day rebleeding rates were significantly lower in TEG versus SCT groups (OR 0.50 [95% CI 0.29 – 0.85, p = 0.01]).

Conclusion: The use of TEG-guided therapy favors a reduction in platelet and FFP transfusion compared to SCT in patients with cirrhosis. Additionally, TEG-guided therapy is able to improve patient care by reducing the rebleeding rate of patients with cirrhosis compared to SCT. However, this same effect was not seen for mortality.

WED-340
An overview on microbial population in liver cirrhosis : changing paradigm in the known bacteriology of spontaneous bacterial peritonitis
Shirin Demma1, Bruno Mariani2, Valerio Giannelli1, Claudia Teleesa1, Roberto Villani1, Adriano Pellicelli1, 1Azienda Ospedaliera San Camillo Forlanini, Dipartimento Interaziendale Trapianti POF, Italy, 2Azienda Ospedaliera San Camillo Forlanini, Microbiology, Italy
Email: s.demma@ucl.ac.uk

Background and aims: Liver cirrhosis is a leading cause of death worldwide. Patients with cirrhosis have several biological and immunological alterations that predispose to the development of infections. The spread of multidrug resistant (MDR) infections has been blamed as responsible for the increase in mortality risk in cirrhosis. Therefore, improvement in the management of bacterial infections represents an absolute priority for patients with cirrhosis. We aimed to examine the epidemiology and resistance phenotypes in cirrhotic patients admitted to our liver unit in order to analyse our microbial population and the prevalence of MDR bacteria.

Method: Ascitic fluid cultures from consecutive cirrhotic patients admitted to our liver unit in a tertiary centre in Rome (Italy) over a 4-year period (2018–2022) were analyzed to identify and explore the microbial population and the prevalence of MDR bacteria. Data on organisms culture and proportions of antibiotic resistance were collected. We then compared the results with the results of the ascitic fluid cultures collected over the previous 4-year period (2013–2017) to analyse the trend.

Results: In total 1219 ascitic fluid samples were identified. Organisms were cultured in 256 samples with Enterococcus Faecium as the most represented (14.06%), followed by Escherichia Coli (10.94%) and Enterococcus Faecalis (9.77%). In terms of resistance phenotypes, among the enterococci population, 14.75% were vancomycin resistant enterococci (VRE) and 1.63% were resistant to linezolid (LZD); 27.78% Enterobacteriaceae were extended-spectrum beta-lactamase (ESBL) and 11.11% were carbapenem resistant (CBPEN). All the Acinetobacter Baumannii identified were MDR and CLS-S. Comparing to the previous 4-year period, Candida albicans is less represented while the prevalence of Acinetobacter Baumannii is increasing. Enterococci was confirmed to be the most represented microbial population in our area.
Background and aims: Reducing early (<30 days) hospital readmissions is a policy priority to improve the healthcare quality in liver diseases. Thus, we aimed to: a) determine risk factors associated with 30-day hospital readmission in patients with liver cirrhosis; b) identify a subset of patients at risk of 90-day readmission and mortality; c) explore the usefulness of the model in the management of cirrhotic patients in the outpatient clinic.

Method: Multicenter and retrospective study including 885 patients with cirrhosis admitted to the Liver Unit and followed up 90 days after hospital discharge. We collected readmissions and all-cause mortality up to 90 days after discharge. In addition, LACE index was calculated, which comprises Charlson comorbidity index, the number of times in the Emergency Room 6 months before the admission, urgent versus scheduled admission, and length of the hospitalization.

Results: Finally, 818 patients were included in the study, of which 23.2% (190/818) and 42.4% (347/818) required a hospital readmission at 30 and 90 days, respectively, and 13.6% (111/818) died. The main reason for hospitalization was ascites (36%) followed by variceal bleeding (23%), while the leading cause of 30-day readmission was hepatic encephalopathy (35%), LACE index (OR 1.11 (IC95% 1.03–1.20); p = 0.006), MELD on discharge (OR 1.05 (IC95% 1.02–1.08); p = 0.003), and a history of a destabilized event (IC95% 0.99–2.00); p = 0.056) were independently associated with 30-day readmission. Further, according to 90% sensitivity and 90% specificity, this model predicted three risk groups of readmission and survival during the follow-up (Figure). Despite the time to the scheduled outpatient clinic after admission was similar between groups (45 ± 38 vs. 46 ± 40 vs. 50 ± 42 days; p = 0.593), 33% (30/91) of patients belonging to the high-risk group required a hospital readmission before going to the clinic versus 25.7% (148/575) and 14.7% (20/136) (p = 0.002) of intermediate- and low-risk groups, respectively.

Conclusion: The combination of LACE index, MELD on discharge, and a previous history of decompensation identified different groups at risk of 30-day and 90-day readmission and mortality in patients with liver cirrhosis. This model should be considered for scheduling the outpatient clinic after hospitalization.

WED-342
Factors associated with inpatient albumin administration and center-level variation in a national cohort

Marina Serper1, Tamar Taddei2, David Kaplan3, Thomas Ardiles3, Elisabet Viaña4, Nadim Mahmud5. 1University of Pennsylvania, United States, 2Yale University, United States, 3Grifols, United States

Background and aims: Guidelines recommend albumin administration in patients with cirrhosis complications including hepatorenal syndrome (HRS), spontaneous bacterial peritonitis (SBP), and in the evaluation and management of acute kidney injury. However, variation in albumin use is not well-characterized. We investigated
inpatient albumin use, factors associated, and center-level variation in a cirrhosis cohort in the Veterans Affairs (VA) system across all 50 United States.

**Method:** We performed a retrospective cohort study using a well-characterized cohort of patients in the VA with cirrhosis. We identified all inpatient hospitalizations between 2008 and 2022 and ascertained all inpatient albumin use through via inpatient files. Hospitalizations were excluded for patients with a history of liver transplantation or if the length of stay (LOS) was ≤2 days. Patient baseline characteristics were collected immediately prior hospitalization. Hospitalizations were categorized as due to HRS, SBP, or other. To identify variables associated with inpatient albumin administration we used multivariable logistic regression with *a priori* modeling approaches. To explore variation in the probability of albumin administration across 90 VA centers we used mixed-effects logistic regression.

**Results:** The cohort included 49,611 hospitalizations among 11,149 patients. Albumin was administered in 14,882 (30.0%) hospitalizations; with a variation in days of albumin administered for different LOS in patients with HRS or SBP (Figure panel A). In multivariable logistic regression, higher odds of albumin use was associated with increased age (OR 1.02 per year, 95% CI 1.01–1.02, p < 0.001), HRS (OR 4.30, 95% CI 3.84–4.81, p < 0.001), SBP (OR 4.13, 95% CI 3.74–4.56, p < 0.001), prior decompensation (OR 1.34, 95% CI 1.27–1.40, p < 0.001), and increased LOS (OR 1.01 per day, 95% CI 1.01–1.01, p < 0.001). Heart failure was associated with a reduced odds of albumin use (OR 0.65, 95% CI 0.61–0.68, p < 0.001). There was a significant interaction between MELD-Na and etiology of liver disease (p < 0.001), those with alcohol or hepatitis C-related cirrhosis were more likely to receive albumin at higher MELD-Na scores as compared to other etiologies (Figure panel B). In a mixed-effects logistic regression model adjusted for all variables included in the prior model and accounting for VA center as a random intercept, there was significant adjusted center-level variation in the probability of albumin use (p < 0.001; Figure panel C) which ranged from 31% to 69% holding all other clinical factors equal. Larger volume centers were more likely to use inpatient albumin.

**Conclusion:** In a large VA cohort of patients with cirrhosis, we identify key variables associated with inpatient albumin administration. Substantial center-level variation in albumin use suggests gaps in guideline-recommended care that warrants future studies.

Figure: (abstract: WED-342).
Serum PDL1 levels are associated with increased risk of bacterial infections in non-hospitalised patients with cirrhosis

Adria Juanola1,2,3, Gabriel Mezzano1, Simone Incicco4, Elisa Pose1,2,3, Delia Blaya2, Cristina Solé1, Natalia Jimenez-Esquivel1, Joaquin Andrés Castillo1, Jordi Ribera2,3,5, Xénia Almodovar2, Martina Perez1,2,3, Ana Belen Rubio Garcia1,2,3, Marta Cervera2,3, Marta Carol2,3, Ruth Nadal1,3, Anna Soria1,2,3, Núria Fabrellas2,3,6, Paolo Angeli4, Manuel Morales-Ruiz2,3,5,6, Mar Coll2,3, Isabel Graupera1,2,3, Salvatore Piano4, Elsa Solà7, Pere Gines1,2,3,6. 1Liver Unit, Hospital Clínic De Barcelona, Barcelona, Catalonia, Spain, Spain, 2Institut d’Investigaciones Biomédiques August Pi i Sunyer (IDIBAPS), Barcelona, Catalonia, Spain, Spain, 3Centro de Investigación Biomédica en Red Enfermedades Hepáticas y Digestivas (CIBEREHD), Madrid, Spain, Spain, 4Unit of Internal Medicine and Hepatology (UIMH), Department of Medicine-DIMED, University of Padova, Padova, Italy, Spain, 5Biochemistry and Molecular Genetics Department, Hospital Clinic of Barcelona, Barcelona, Catalonia, Spain, Spain, 6Faculty of Medicine and Health Sciences, Universitat de Barcelona (UB), Barcelona, Catalonia, Spain., Spain, 7Institute for Immunity, Transplantation and Infection, Stanford University School of Medicine. Stanford, California, USA, United States

Email: juanola@clinic.cat

Background and aims: Infections, often recurrent, are a very common complication of cirrhosis and represent a frequent cause of hospitalization, renal failure, ACLF and death. Pathogenic factors responsible for bacterial infections remain largely unknown. Previous data in patients hospitalized for complications of cirrhosis showed that high serum PDL-1 levels are associated with an increased risk of bacterial infections. However, it is not known whether serum PDL-1 levels also correlate with the risk of bacterial infections in decompensated but stable patients with cirrhosis that are not hospitalized. The present study was aimed at assessing the serum levels of PDL1 in stable outpatients with decompensated cirrhosis and its relationship with development of bacterial infections.

Method: Prospective cohort study of 110 patients with cirrhosis (76% men, 53% alcohol etiology, median MELD sodium 11). The serum levels of PDL1, which estimate the soluble form of PDL1 expressed in macrophages, were measured by ELISA. New bacterial infections were recorded during a follow-up period of one year.

Results: During follow-up, 36 patients (33%) developed at least one new episode of infection. The most frequent infections were respiratory tract infections (12, 33%), followed by SBP SBP (6, 17%), urinary infections (5, 14%), bacteraemia (5, 14%), skin and soft tissue (2, 6%), colitis (2, 6%) and other (4, 10%). The serum levels of PDL1 in patients who developed infections were higher than those in patients who did not develop infections [135 (108–206) vs. 92 (81–145) pg/ml, respectively; p = 0.030]. In a multivariate analysis, the independent predictive factors of infection development were: MELD score and PDL1 levels [sHR 1.007 (1.001–1.012), p = 0.017].

Conclusion: In decompensated stable patients with cirrhosis, increased serum levels of PDL1 correlate with development of infections. These results, along with those previously reported, suggest that the activation of the PD1-PDL1 system represents a relevant factor in the pathogenesis of bacterial infections in cirrhosis.
Background and aims: The gold standard test for polymorphonuclear (PMN) cell count in ascitic fluid is manual counting by optical microscopy (OM). A few studies have found a good correlation between OM and the automatic counting based on impedance (Imp) and flow cytometry (FC). Our objective was to evaluate the accuracy of these techniques in PMN cell counting in ascitic fluid and in the diagnosis of spontaneous bacterial peritonitis (SBP) (>250/mm3 PMN).

Methods: Prospective single-center study that included patients who underwent paracentesis between January 2020 and August 2022. Cell counts were performed in a Neubauer chamber (MO), DxH 900 Beckman Coulter (Imp), and AQUIOS CI (FC). The concordance between the techniques with OM was evaluated using the intraclass correlation coefficient (ICC) and the Bland-Altman (BA) and Passing-Bablok (PB) methods. The gold standard for the diagnosis of SBP was OM, obtaining the area under the curve (AUC) and the positive (PPV) and negative (NPV) predictive values.

Results: 330 paracenteses of 98 patients were included, 213 (64.5%) of them for diagnostic purposes. The origin of ascites was cirrhosis in 290 (87.9%). The ICC was 0.78 (95% CI, 0.70–0.83; p < 0.001) for Imp and 0.92 (0.88–0.94; p < 0.001) for FC. The BA diagram showed broader limits of agreement for Imp (Figures A and B) and the PB method showed systematic and proportional differences for Imp (i.e. Imp and MO are not comparable techniques), and only proportional differences for FC (Figures C and D) (i.e. need for calibration adjustment). 33 (10%) patients had SBP. The AUC, PPV and NPV for Imp were 0.96, 79.4% and 97.7%, and for FC 0.98, 100% and 94.8%, respectively.

Conclusion: Compared with impedance, flow cytometry showed greater concordance and reliability for the diagnosis of SBP, but its implementation in clinical practice requires evaluating whether a calibration adjustment is needed.

Figure: MHE prevalence in patients with cirrhosis without a history of OHE stratified by Child-Pugh stage (A) and MELD (B).

Conclusion: Roughly one-third of patients with cirrhosis were affected by MHE, but prevalence varied significantly by disease stage. These data may pave the way for more individualized MHE screening approaches.
**Background and aims:** Vitamin D deficiency and gut dysbiosis are common problems in patients with liver cirrhosis and both would associate with poorer clinical outcomes. The impacts of vitamin D on gut barrier and microbiota have been demonstrated in cirrhotic rats, but few clinical studies have been reported. In this study, we aimed to investigate the association between vitamin D deficiency and gut microbiota, and the risk of infectious complications in patients with liver cirrhosis.

**Method:** From September 2018 to December 2020, 80 cirrhotic patients were prospectively enrolled in Taipei Veterans General Hospital. Serum level of 25-hydroxyvitamin D [25 (OH)D], cytokines, fecal microbiota and clinical characteristics were measured and analyzed. The associations between vitamin D deficiency and gut microbiota as well as the development of 1-year cirrhotic infectious complications were investigated.

**Results:** During the follow-up period of one year, total 41 infectious events and 91 hospitalizations were recorded. Decreased serum level of 25 (OH)D less than 15 ng/ml acceptably predicted development of 1-year infectious complications in these cirrhotic patients (AUROC: 0.818, 95% CI. 0.716–0.915, p = 0.001). A significantly higher Child-Pugh score, neutrophil-to-lymphocyte ratio, prothrombin time, serum levels of lipopolysaccharides (LPS) and TNF-alpha, as well as lower serum albumin level were noted in patients with vitamin D deficiency. Besides, the richness and evenness of fecal microbiota were significantly reduced in vitamin D-deficient cirrhotic patients. A significant microbial dissimilarity could also be identified by un-weighted UniFrac analysis according to the presence of vitamin D deficiency. In the feces of vitamin D-deficient cirrhotic patients, a significant prominence of genera Streptococcus and Ruminococcus gnavus were observed. In contrast, Bacteroides was significantly more prominent in patients with higher serum vitamin D. Moreover, the fecal abundance of Streptococcus was significantly positively correlated with serum LPS level, whereas, a significant negative correlation was noted between LPS and Bacteroides. Patients with vitamin D deficiency developed more infectious complications (60.7% vs. 11.5%, p < 0.001) and more numbers of hospitalization (67 vs. 24, p < 0.001) than cirrhotic patients with higher vitamin D. Furthermore, a higher serum 25 (OH)D >15 ng/ml independently decreased the risk of 1-year infectious complications in cirrhotic patients.

**Conclusion:** Vitamin D deficiency was associated with significant gut dysbiosis, endotoxemia and significant increased risks of infectious complications in patients with liver cirrhosis. These findings potentiate to improve the outcomes of these patients by vitamin D supplementation and also gut microbial modification.

**WED-347**

**Comparison of coagulation parameters as prognostic markers of decompensation and liver-related death in advanced chronic liver disease**

Maria Pallozzi1, Lucia Giuli1, Francesco Santopalo1, Antonio Gasbarrini1, Raimondo De Cristofaro2, Maurizio Pompli1, Francesca Romana Ponziani1. 1Fondazione Policlinico Universitario Agostino Gemelli IRCCS, Internal Medicine and Gastroenterology- Hepatology Unit, Rome, Italy, 2Fondazione Policlinico Universitario Agostino Gemelli IRCCS, Translational Medicine and Surgery Department, Rome, Italy

**Background and aims:** Liver cirrhosis has long been considered an acquired bleeding disorder but recent studies have demonstrated that the coagulation balance is associated with disease progression. In patients with advanced chronic liver disease (ACLD) plasma levels of many procoagulant factors (factor VIII [FVIII], von Willebrand Factor [VWF]) are reduced but also the levels of anticoagulant factors (a disintegrin and metalloprotease with thrombospondin 1 repeats number 13 [ADAMTS-13], protein C [PC]) are markedly decreased. A recent study demonstrated that FVIII/PC ratio correlates with the severity of liver disease and with worse liver outcomes [1]. We recently reported that ADAMTS13/VWF ratio is useful to predict the development of portal vein thrombosis (PVT), but little is known about its role as marker of decompensated ACLD. Based on these previous results, we investigated the prognostic role of ADAMTS13/VWF ratio on the development of dACLD and compared it with FVIII/PC ratio [2].

**Method:** Consecutive outpatients with ACLD underwent clinical evaluation and were subjected to blood sampling for the assessment of laboratory tests and coagulation parameters. Data from ultrasound
examination and upper endoscopy were also recorded. We compared the FVIII/PC ratio and ADAMTS-13/VWF ratio between patients with compensated and decompensated ACLD and their correlation with the other variables. We finally analyzed survival probability of remaining free of decompensation/liver-related death, stratifying patients according to FVIII/PC ratio or ADAMTS-13/VWF ratio by using the median value of each index in decompensated patients as cut-off.

Results: We included 86 patients with ACLD (median age 66 (59–72.70) years; 65.47% male; etiology viral/nonviral 50%/50%; Child Pugh A/B/C 80.2%/15.1%/4.7% and median model for end-stage liver disease (MELD) 8 [7–9.20]), 20 (23.25%) developed dACLD after a median follow-up of 48.8 (48–57.30) months. Those patients showed a significantly higher FVIII/PC ratio and a lower ADAMTS-13/VWF ratio compared to their counterparts maintaining cACLD (FVIII/PC 2.62 [1.87–3.81] vs 1.44 [1.13–1.77], p < 0.0001 Figure 1A); ADAMTS-13/VWF 0.26 [0.22–0.41] vs 0.52 [0.16–0.62], p < 0.0001 Figure 1B). Both the indices correlated with liver disease severity according to Child Pugh score and MELD score (Figure 1C). FVIII/PC ratio showed the strongest correlation with clinical and coagulation parameters. Both FVIII/PC ratio or ADAMTS-13/VWF ratio had a good prognostic ability for ACLD decompensation/liver-related death (p < 0.0001, Figure 1D–E); however, when ADAMTS-13/VWF ratio was used the survival curves crossed after 40 months, underlining a limitation in the identification of patients with early events. Finally, the four patients who developed PVT during follow-up showed a lower ADAMTS-13/VWF ratio (0.23 [0.22–0.25] vs 0.58 [0.45–0.73], p = 0.004) or a higher FVIII/PC ratio (2.62 [2.45–2.82] vs 1.57 [1.2–2.09], p = 0.02) compared to their counterparts who did not experience PVT.

Conclusion: Coagulation parameters, historically used only for assessing bleeding risk in patients with ACLD, are instead harbingers of important prognostic information. Indeed, ADAMTS13/VWF ratio and FVIII/PC ratio correlate with liver disease severity and can predict liver-related death or decomposition in patients with ACLD.

WED-348
Development and external validation of a model to predict multidrug resistant bacterial infections in patients with cirrhosis
Sebastián Marciano1, Salvatore Piano2, Virendra Singh3, Paolo Caraceni1, Rákki Maiwaii2, Carlo Alessandria4, Javier Fernandez5, Dong Joon Kim6, Sung-Eun Kim7, Elza Soares10, Mónica Marino11, Julio Vorobiof12, Manuela Merli13, Laure Elkrief14, Víctor Manuel Vargas Blasco15, Aleksander Krag16, Shivaram Singh17, Diego Giunta1, Martin Elizondo18, Maria Margarita Anders19, melisa dircwolf20, Manuel Mendizábal21, Rinaldi Lesmana22, Claudio Toledo23, Florence Wong24, François Durand25
Adrian Gadano1, Paolo Angeli2. 1Hospital Italiano de Buenos Aires, Buenos Aires, Argentina, 2University of Padova, Italy, 3Postgraduate Institute of Medical Education and Research, India, 4University of Bologna, Italy, 5Institute of Liver and Biliary Sciences, India, 6University of Turin, Italy, 7Hospital Clinic, Spain, 8Hallym University College of Medicine, Korea, Rep. of South, 9Hallym Sacred Heart Hospital, Korea, Rep. of South, 10University of Campinas (UNICAMP), Brazil, 11Hospital Dr. Carlos B. Udaondo, Armenia, 12Rosario University Medical School, Argentina, 13Sapienza University of Rome, Italy, 14Tour's University Hospital, France, 15Hospital Vall d’Hebron, Spain, 16Odense University Hospital, Denmark, 17S.C.B. Medical College, India, 18Unidad Bi-Institucional de Trasplante Hepático, Hospital de Clínicas-Hospital Militar, Uruguay, 19Hospital Alemda, Argentina, 20Hospital Privado de Rosario, Argentina, 21Hospital Universitario Austral, Argentina, 22Dr. Cipto Mangunkusumo National General Hospital, Indonesia, 23Hospital Valdivia, Chile, 24University of Toronto, Canada, 25Hospital Beaujon, France
Email: sebastian.marciano@hospitalitaliano.org.ar

Background and aims: Empirical antibiotic treatment for suspected infections in cirrhosis is crucial. We aimed to develop and validate a model to predict the individual probability of infections by multi-drug resistant organisms (MDRO) at the bedside in patients with cirrhosis to support the selection of appropriate empirical antibiotic treatment.
Method: Cross-sectional study (NCT05641025) of consecutive inpatients with bacterial infections from two prospective studies. The Global transcontinental study was used for model development and internal validation (n = 1,302), and a study from Argentina and Uruguay (n = 472) was used for external validation. Infection by MDROs was defined as an infection caused by at least one bacteria with acquired resistance to at least one antibiotic of three different families. Multivariable logistic regression with backward stepwise selection of predictors of MDROs was used for model development. Bootstrapping was used for internal validation to adjust for optimism. The optimism-adjusted model was then applied to the external validation dataset. The model’s performance diagnosis was explored by applying different cut-off points.

Results: The prevalence of infection by MDROs was 19% in the development and 22% in the external validation dataset. The most frequent etiologies of cirrhosis were alcohol and viral-related, and the most frequent infections were spontaneous bacterial peritonitis (SBP) and urinary tract infection (UTI). Half of the infections were community-acquired, and half were equally distributed among healthcare-associated and nosocomial origin. The model predictors are shown in the figure. Very good calibration was achieved in internal and external validation (Figure). Discrimination was adequate, as shown by the area under the receiver operating characteristic curve (AUROC) of 0.73 (95% CI: 0.69–0.76) in internal validation and 0.67 (95% CI: 0.62–0.74) in external validation. Regarding the clinical utility, when applying a probability cut-off point of 5% or 10%, a negative predictive value (NPV) of 98% (95% CI: 94%–98%) and 89% (95% CI: 91%–96%) was observed in the development dataset, respectively. In the external validation dataset, NPV values for the exact cut-off points were 93% (95% CI: 84%–98%) and 89%, respectively.

Conclusion: This easy-to-implement model achieved adequate performance for predicting infection by MDROs in patients with cirrhosis, offering costless bedside individualized risk estimates that might improve the selection of empiric antibiotics. Its high NPV suggests that it could be used as a rule-out tool, particularly in patients at higher risk of infection by MDROs, to reduce the use of broad-spectrum antibiotics.

WED-349
Factors related to a shorter survival in patients with liver disease and followed by a specialized palliative care clinic
Fernando Xavier e Silva1, Hemant A Shah2, David Wong3, Elizabeth Lee3, Breffni Hannon3, Kirsten Wentlandt1, Ebru Kaya1. 1University of Toronto, Department of Supportive Care-Palliative Care, Toronto, Canada, 2University of Toronto, Toronto Centre for Liver Disease (TCLD), Toronto, Canada, 3University of Toronto, Department of Supportive Care-Palliative Care-Princess Margaret Cancer Centre, Toronto, Canada
Email: silva.fernandoxavier@gmail.com

Background and aims: Regardless of advances in tools to predict the survival among patients with advanced liver disease and increasing access to palliative care (PC) by this population, literature about their prognosis after referral to PC remains scarce. Considering the risk of rapid clinical deterioration for this population, better predictors of survival may enable more timely access to specialist PC services. This study aims to identify demographic and clinical factors presented at the time of referral to a PC clinic that are related to shorter survival.

Method: We retrospectively reviewed the charts of adult patients with advanced liver disease referred between May 2019 and May 2022 to a specialized PC clinic at a tertiary teaching hospital in Canada. Data collected included demographics, clinical presentation, and length of survival after referral to the clinic. Clinical factors included primary liver disease etiology; functional status (measured using the Palliative Performance Scale (PPS), a discrete numerical scale from 0% to 100%); the intensity of symptoms (using the Edmonton Symptoms Assessment System (ESAS), a discrete numerical scale from 0 to 10 used to grade intensity of common symptoms); candidacy for liver transplant; history of hepatic encephalopathy (HE); and comorbidities. The study was approved by our institutional
research ethics board. Multivariable regression analysis was used to identify variables associated with shorter survival.

**Results:** Fifty-four patients were included, 24 (44.4%) were female, the median age was 70 (mean 67.6) years, 6 patients (11.1%) were under 50 years and 30 (55.6%) were born outside of Canada. Primary liver disease aetiologies included the following: viral hepatitis (18, 33.3%); alcohol (17, 31.5%), non-alcoholic fatty liver disease (NAFLD; 8, 14.8%), and other (8, 14.8%). 53 (98.1%) patients had cirrhosis and 24 (44.4%) had hepatocellular carcinoma (HCC). 44 patients (81.5%) had more than 2 comorbidities and 20 patients (37%) had extrahepatic organ failure. 22 patients (40.7%) had a history of HE. Regarding functional status, none of the patients had a PPS of 30% or lower, 6 (11.1%) had a PPS of 40%; and 24 patients (44.4%) of 60% or more. The mean sum of ESAS scores for the 12 measured symptoms was 41 (median 35) out of a maximum of 120 points and fatigue was the symptom with the highest isolated score (6.4, median 7). The average survival from the first PC visit was 41.4 weeks (median of 28 weeks or 6.5 months) and 36 patients (66.7%) died within the study timeframe. On multivariable regression, male gender was the only factor statistically associated with shorter survival, with an average of 32.1 months (95% CI 24.3 – 40.8) for male vs. female patients. In addition, male patients were more likely to die sooner than female patients in our study of patients with advanced liver disease followed in a PC clinic. Clarity on other prognostic factors for these patients is still needed and new prognostic markers should be explored. Given the size of this study, larger multicenter studies are needed to confirm the findings.

**Conclusion:** Male patients were more likely to die sooner than female patients in our study of patients with advanced liver disease followed in a PC clinic. Clarity on other prognostic factors for these patients is still needed and new prognostic markers should be explored. Given the size of this study, larger multicenter studies are needed to confirm the findings.

**WED-350**

**Validation of thigh ultrasound for measurement of sarcopenia and fat mass in patient with cirrhosis: correlation with body composition analysis. Higher fat mass, lower muscle mass and reduced functional muscle**

Reza Saeidi1,2, Neasa McGettigan1,2, Marion Hanley2, Martina Morrin1,2, John Ryan1,2, Karen Boland1,2.1 RCSI Smurfit Building, Dublin, Ireland, 2 Beaumont Hospital, Dublin, Ireland. Email: reza_saeidi@hotmail.com

**Background and aims:** Sarcopenia (low muscle mass, strength, and function) is associated with adverse outcomes in cirrhosis, including hepatic encephalopathy, ascites, infection, and increased hospitalisation. Sarcopenia is measured using cross-sectional CT scanning. Thigh ultrasound (TUS) may be a low-cost tool to identify sarcopenia in cirrhosis. We aim to validate anterior TUS for measurement of total muscle thickness (TMT) and superficial fat thickness (SF) in cirrhosis using bioelectrical impedance analysis (BIA) as a standard.

**Method:** Patients with cirrhosis were recruited from a tertiary hepatology clinic for this prospective cross-sectional study approved by the local ethics committee. Using thigh ultrasound, muscle mass using B-mode US was recorded. The right thigh muscle thickness was measured using bedside ultrasound. Point at one-half of the total distance from the top of the patella to the iliac crest were marked. Two readings were obtained by feather-weight technique where the probe was held without pressure on the thigh. Mean of measured anterior thigh muscle and superficial fat thickness were calculated. BIA was performed as the validation standard (SECA mBCA 525) using Sergi sarcopenia equation (PMID: 25103351). Validated functional muscle metrics (handgrip and sit-to-stand) and liver-frailty-indices (PMID: 28422306) were calculated. Descriptive statistics and comparisons between controls and patients was analysed in Stata with t-test/Whitney-Mann-test and Pearson-correlation. Using regression analysis, we constructed ROC curves for analysis of TUS.

**Results:** 69 patients (58% (40) alcohol liver disease, 25% (17) non-alcoholic steatohepatitis, 5% (4) viral, 4% (3) autoimmune and 7% (5) mixed aetiologies) were included. Additionally, 44 healthy controls (HC) were included. Most patients were male (n = 39, 56%), with mean age 58yrs (SD 10), mean Child-Pugh score 6 (IQR = 5–7) and MELD 10 (IQR = 7–12). 14 patients (20%) of patients had clinical ascites at recruitment and 38% (n = 19) were actively drinking alcohol. 23 (33%) male and 1 (3%) female patients with cirrhosis had sarcopenia based on BIA (SECA mBCA).

Using TUS, height-adjusted anterior muscle thickness was lower in cirrhotic cohort compared to HC (female: 1.33 vs 1.52 mm/m2, SD 0.3 and 0.4 respectively, p = 0.03 and male: 1.31 vs 1.53 mm/m2, SD 0.4 and 0.3 respectively, p = 0.03). BIA height-adjusted skeletal muscle mass positively correlated with TUS-measured TMT (male r = 0.71 and female r = 0.43, P < 0.001 and p = 0.001 respectively). TMT > 2.95 mm in men would exclude sarcopenia (sensitivity = 85%, specificity = 64%) with likelihood ratio of 2.4. Intra-rater reliability for TMT was good (p < 0.001). We report lower functional muscle strength and function in cirrhotic patients. Using functional testing, sit-to-stand time was lower in HCs (14.53 vs 9.08 secs, p = 0.001) and hand-grip strength higher in HC (p < 0.001) compared with patients. 13% (n = 5) of male and 30% (n = 9) of female were frail and frailty scores negatively correlated with TMT (r = −0.4, p = 0.003).

**Conclusion:** TUS is a rapid and valid point-of-care test which can identify high-risk patients with systemic sarcopenia in cirrhosis. Furthermore, lower TMT is associated with increased frailty and reduced muscle function in cirrhosis. Further prospective studies are required to determine if this can be used with other biomarkers to identify patients who would benefit from intensive nutrition intervention.

**WED-351**

**Goals of care and end-of-life for patients with advanced liver disease followed by a specialized palliative care clinic**

Fernando Xavier e Silva1, Elizabeth Lee2, Hemant A Shah2, David Wong3, Breffni Hannon4, Kirsten Wentlandt1, Ebru Kaya1.1 University of Toronto, Department of Supportive Care-Palliative Care, Toronto, Canada, 2 University of Toronto, Toronto Centre for Liver Disease (TCLD), Toronto, Canada, 3 University of Toronto, Department of Supportive Care-Palliative Care-Princess Margaret Cancer Centre, Toronto, Canada. Email: silva.fernandoxavier@gmail.com

**Background and aims:** Considering the life-limiting nature of advanced liver diseases and the suffering frequently experienced by patients diagnosed with these illnesses, palliative care (PC) has played an important role in their support, including the assessment of preferences regarding their care and during their end-of-life (EOL) period. This study aims to understand the frequency and possible
barriers to goals-of-care discussions (GOCd), the content of these preferences and how they are reflected on the dying process of these patients.

Method: The authors retrospectively reviewed the charts of adult individuals referred between May 2019 and May 2022 to a specialized PC clinic for patients with liver diseases at a tertiary teaching hospital in Canada and collected data regarding demographics, reason for referral, clinical characteristics including history of hepatic encephalopathy-HE and functional status (measured with Palliative Performance Scale-PPS, a discrete numerical scale from 0% to 100%), frequency and content of goals-of-care discussions (GOCd) during the first 3 appointments with PC, outcome from clinic, mortality and place of death. All personal identifiers were excluded and the study was approved by the research ethical board of the University of Toronto. Descriptive statistics was used to analyze data.

Results: 54 patients were included in the study, 30 (55.6%) were male, median age was 70 years and 24 (44.4%) had a preferred language other than English. GOCd were included in the motivations to refer 46 (85.2%) patients. History of HE was described in 22 (40.7%) patients. No patients had a PPS lower than 40% and 39 (72.2%) had a PPS between 40–60%. GOCd were not performed in the first visit of 11 (20.4%) patients and continued to be missed for 7 patients (13.0%) by the third visit. History of HE was the only barrier significantly related to the absence of GOCd at the first visit (OR 0.18, p = 0.02) but not at the third meeting (p = 0.34). Full medical management was preferred by 23 patients (42.6%) and 6 (11.7%) decided to exclusively receive comfort measures. Sixteen patients (29.6%) changed their preferences between the first and third visits, mostly (11, 92%) towards a more conservative choice. Most patients (30, 55.6%) decided for a DNR status and 20 patients (37.0%) would want full medical management and these preferences tended to change towards place and data was missing for 10 (41.7%) of them.

Conclusion: GOCd and palliative planning were common reasons to refer patients to PC and HE was a significant initial barrier to this role. Most patients decided for a DNR status and for full medical management and these preferences tended to change towards comfort measures with time. Most patients would rather die at home when discussing the topic. Expanding the understanding about patients’ preferences may help to increase the rates of goals-concordant care.

WED-352

Gender differences in the patient-reported outcomes and perception of ascites burden amongst outpatients with decompensated cirrhosis and ascites

Florence Wong 1, K. Rajender Reddy 2, Puneeta Tandon 3, Jennifer Lai 4, Guadalupe Garcia-Tsao 5, Jacqueline O’Leary 5, Scott W Biggins 7, Hugo Vargas 8, Leroy Thacker 9, Jasmohan S Bajaj 10, 1University of Toronto, Medicine, Toronto, Canada, 2University of Pennsylvania, Medicine, Philadelphia, United States, 3University of Alberta, Medicine, Edmonton, Canada, 4University of California- San Francisco, Medicine, San Francisco, United States, 5Yale University, Medicine, New Haven, United States, 6Dallas VA Medical Center, Medicine, Dallas, United States, 7University of Washington, Medicine, Seattle, United States, 8Mayo Clinic, Scottsdale, Medicine, Phoenix, United States, 9Virginia Commonwealth University, Biostatistics, Richmond, United States, 10Virginia Commonwealth University, Internal Medicine, Richmond, United States

Email: florence.wong@utoronto.ca

Background and aims: The presence of ascites is a health burden to patients with decompensated cirrhosis. They have a poor quality of life (QOL), due to pain from abdominal distension, hernias and attendant frailty with need for repeat large volume paracentesis (LVP). Perception of these issues may be different between the genders. The aim of the study was to assess gender differences in the perception of ascites burden in patients with recurrent or refractory ascites.

Method: The North American Consortium for the Study of End-stage Liver Disease-3 (NACSELD3) prospectively enrolled outpatients with cirrhosis and large ascites who needed repeat LVPs. Data collected were demographics, laboratory results, co-morbidities, medications and frailty measurements. Self-reported questionnaires related to functional status (Duke Status Activity index), physical activities (Gordin Leisure Activity Index), overall QOL (SF36, mental and physical), and ascites burden (ascites Q) were compared between genders.

Results: 241 men (60.4 ± 9.9 yrs) and 115 women (58.8 ± 10.7 yrs) of similar MELD (mean = 13) and Child-Pugh (mean = 7) scores were enrolled. Men had significantly more alcoholic cirrhosis (49% vs. 38%), while women had more NASH (29% vs. 23%) and autoimmune diseases (13% vs. 2%) (p < 0.0001). Both genders had similar co-morbidities and complications of cirrhosis. Both groups also had a history of median duration of ascites of 3 months (p = 0.826), as were the median number of LVPs (p = 0.587) and volume of their LVPs in the past 3 months (p = 0.891). Despite this, women felt a lot worse about their ascites (Figure) and had a significantly higher total Ascites Q score (67 ± 22 vs. 58 ± 22, p = 0.0001) (higher value = feeling worse about their ascites), possibly related to their significantly higher median frailty index of 4.16 versus that of 3.95 in men (p = 0.023). 37% of women felt depressed compared to 25% (p = 0.029) and women scored lower on their emotional well-being (p = 0.019) and social functioning (p = 0.032) on SF36 questionnaire, even with 51% of men vs. 34% of women taking chronic beta blockers (p = 0.003). Despite this, women were able to conduct their daily activities as adequately as men as indicated by their equal scores on Duke Status Activity index (p = 0.89) and their Gordin Leisure Activity Index (p = 0.35).

Conclusion: The gender difference in the perception of ascites burden is not related to severity of physical illness. Although women felt worse about their ascites-related QOL and emotional health, and were more frail than men, this was not associated with impaired daily function or leisure activity. This may be related to other issues such as cultural/social conditioning, which should be considered when eliciting patient reported outcomes and managing the psychological aspects of ascites care for women.
WED-353
The role of renal impairment on rotational thromboelastometry (ROTEM) parameters in hospitalised patients with cirrhosis—a prospective cohort study
Louis Wang1, Tianyu Qiu1, Chin Kim Tan1, Eugene Wong1, Kenneth Lin1, Andrew Kwek1, James, Weiquan Li1, Tiing Leong Ang1, Roshni Sahashiv2, Louis Ng3, Prasanna Tirukonda4, Rahul Kumar1.
1Changi General Hospital, SingHealth, Gastroenterology, Singapore, 2Changi General Hospital, SingHealth, General Medicine, Singapore, 3Changi General Hospital, SingHealth, Anaesthesia, Singapore, 4Changi General Hospital, SingHealth, Diagnostic Radiology, Singapore
Email: rahul.kumar@singhealth.com.sg

Background and aims: The use of ROTEM has allowed for better understanding of complex haemostatic processes involved in patients with cirrhosis compared to conventional clotting tests (CCT). Renal dysfunction (RD) is a common comorbidity in patients with cirrhosis, but its effect on ROTEM parameters in cirrhosis remains unknown. We conducted a novel study on how ROTEM parameters may be altered by the presence of RD among patients with cirrhosis.

Method: A total of 76 consecutively admitted patients with cirrhosis were prospectively recruited in this study. Patients were classified into 2 groups based on their estimated glomerular filtration rate (eGFR) by the CKD-EPI equation: no-RD (eGFR ≥ 90, n = 36) and RD (eGFR <90, n = 40). ROTEM parameters (INTEM, EXTEM, FIBTEM and APTEM), CCT (prothrombin time (PT), activated partial thromboplastin time (aPTT), fibrinogen, platelet) and Child-Pugh score were compared between the groups. Standard statistical tools were applied for group comparisons using Student’s t-test and Mann-Whitney U test for parametric and non-parametric data, respectively.

Results: The mean age was 60.6 ± 10.0 years and 77.6% were male patients. For severity of liver cirrhosis, MELD scores were significantly higher in the RD group (RD 17.7 ± 7.2 vs non-RD 14.3 ± 6.7, p = 0.04) compared between the groups. Standard statistical tools were applied for group comparisons using Student’s t-test and Mann-Whitney U test for parametric and non-parametric data, respectively.

Conclusion: The analysis of our data shows that kidney impairment is an important contributor towards the haemostatic processes in cirrhosis and results in an overall hypercoagulable state, as measured using ROTEM parameters. This was not apparent based on traditional clotting tests alone. This is a novel finding as there may be direct implications for patients undergoing procedures where decisions for prophylactic blood product transfusions were previously based on only traditional clotting parameters. By being in a more hypercoagulable state, patients with cirrhosis and renal dysfunction may require less transfusions and experience fewer transfusion-related complications. Further research is needed to elucidate the effect of platelet dysfunction from renal impairment on ROTEM parameters in cirrhosis, and how it contributes towards the complex interplay of various haemostatic mechanisms.

WED-354
Whole body clearance and production of ammonia quantified by constant ammonia infusion—the effects of cirrhosis and ammonia targeting treatments
Peter Lykke Eriksen1, Lars Djerres2, Hendrik Vilstrup1, Peter Ott1.
1Aarhus University Hospital, Department of Hepatology and Gastroenterology, Aarhus, Denmark, 2Aarhus University Hospital, Department of Anaesthesiology and Intensive Care, Aarhus, Denmark
Email: ple@clin.au.dk

Background and aims: Hyperammonaemia is a key pathological feature of liver disease and the most important driver of hepatic encephalopathy (HE). However, the relative role of increased ammonia production and reduced clearance is poorly understood, as is the action of ammonia targeting drugs to treat HE. To quantify whole body ammonia metabolism in healthy persons and cirrhosis patients and to validate the method by examination of the effects of glycerol phenylbutyrate and lactulose + rifaximin treatment.

Method: Ten healthy men and 10 male cirrhosis patients were investigated by a 90-minute constant ammonia infusion to achieve plasma ammonia steady-state. Whole body ammonia clearance was calculated as infusion rate divided by steady-state concentration plasma ammonia steady-state. Whole body ammonia metabolism in healthy persons and cirrhosis patients and to validate the method by examination of the effects of glycerol phenylbutyrate and lactulose + rifaximin treatment.

Conclusion: The use of ROTEM has allowed for better understanding of complex haemostatic processes involved in patients with cirrhosis compared to conventional clotting tests (CCT). Renal dysfunction (RD) is a common comorbidity in patients with cirrhosis, but its effect on ROTEM parameters in cirrhosis remains unknown. We conducted a novel study on how ROTEM parameters may be altered by the presence of RD among patients with cirrhosis.

Method: A total of 76 consecutively admitted patients with cirrhosis were prospectively recruited in this study. Patients were classified into 2 groups based on their estimated glomerular filtration rate (eGFR) by the CKD-EPI equation: no-RD (eGFR ≥ 90, n = 36) and RD (eGFR <90, n = 40). ROTEM parameters (INTEM, EXTEM, FIBTEM and APTEM), CCT (prothrombin time (PT), activated partial thromboplastin time (aPTT), fibrinogen, platelet) and Child-Pugh score were compared between the groups. Standard statistical tools were applied for group comparisons using Student’s t-test and Mann-Whitney U test for parametric and non-parametric data, respectively.

Results: The mean age was 60.6 ± 10.0 years and 77.6% were male patients. For severity of liver cirrhosis, MELD scores were significantly higher in the RD group (RD 17.7 ± 7.2 vs non-RD 14.3 ± 6.7, p = 0.04) likely owing to higher serum creatinine levels, while Child-Pugh score were similar (RD 9.4 ± 2.2 vs non-RD 9.0 ± 2.4, p = 0.4). In figure 1, ROTEM parameters in the RD-group showed significantly higher clot amplitudes at A5, A10, A20 and A30 and lower clot formation time (CFT) across INTEM, EXTEM and APTEM analyses (p < 0.05). The RD-group also had a significantly higher maximal clot firmness (MCF) for INTEM, EXTEM, APTEM and FIBTEM (p < 0.05). Difference in clotting time (CT) was not statistically significant between the groups.

Conclusion: The analysis of our data shows that kidney impairment is an important contributor towards the haemostatic processes in cirrhosis and results in an overall hypercoagulable state, as measured using ROTEM parameters. This was not apparent based on traditional clotting tests alone. This is a novel finding as there may be direct implications for patients undergoing procedures where decisions for prophylactic blood product transfusions were previously based on only traditional clotting parameters. By being in a more hypercoagulable state, patients with cirrhosis and renal dysfunction may require less transfusions and experience fewer transfusion-related complications. Further research is needed to elucidate the effect of platelet dysfunction from renal impairment on ROTEM parameters in cirrhosis, and how it contributes towards the complex interplay of various haemostatic mechanisms.
ammonia concentration. Participants were re-investigated after the ammonia targeting interventions.

**Results:** In healthy persons, ammonia clearance was 3.5 (3.1–3.9) L/min and production 49 (35–63) μmol/min. Phenylbutyrate increased clearance by 11% (4–19, p = 0.009). Cirrhosis patients had a 20% decreased ammonia clearance of 2.7 (2.1–3.3) L/min (p = 0.02) and a nearly tripled production of 131 (102–159) μmol/min (p < 0.0001). Lactulose + rifaximin reduced production by 20% (2–37%, p = 0.03). The infusion was generally well-tolerated save one hyperammonemic cirrhosis patient with possible bleeding who developed clinical HE that reverted upon infusion stop.

**Conclusion:** Whole body ammonia clearance and production can be separately measured by the technique. The method identified lower clearance and higher production in cirrhosis patients, and showed that phenylbutyrate increases clearance while lactulose + rifaximin decreases production. The method can be used to examine a range of questions on normo-/pathophysiology and ammonia targeting treatment mechanisms.

**WED-355**
Prognostic significance of individual decompensating events in stable decompensated outpatients with cirrhosis using a multicenter cohort
Jasmohan S Bajaj1, Guadalupe Garcia-Tsao2, Puneeta Tandon3, Jennifer Lai4, Jacqueline O’Leary5, Hugo Vargas6, Scott Biggins7, Patrick S. Kamath8, Florence Wong9, Jawaid Shaw1, Chimezie Mbachi10, Jade Ikahihifo-Bender10, Leroy Thacker1, K. Rajender Reddy10.

**Background and aims:** The type/prognostic significance of decompensating events in cirrhosis may be changing given changes in treatment mechanisms.

**Method:** NACSELD3 (North American Consortium for the Study of End-stage Liver Disease) is an ongoing study that enrolls outpatients with cirrhosis and follows them every 3 months (mos) for decompensation.

**Results:** 437 pts were included: MELD-Na 13.0 (6–33) 71% men, age 59.4 (10.22) with various etiologies (58% alcohol, 20% NASH, 10% HCV, 13% other); 56 were in group 1, 181 in group 2 and 200 in group 3. Only MELD-Na, pre-enrollment hospitalization and WBC count differed at baseline among groups. At 3 and 6 mos, we had data on total 397 pts and 332 pts respectively.

**3-mo outcomes:** Mortality rates (group 1 14%, group 2 3%, and group 3 3%, p = 0.89) and transplant rates (0% vs 2% vs 4%, p = 1.0) were not different among groups but significant differences in 3 and 6-mo hospitalization rates were noted (Figure). Most (81%) 3-mo hospitalizations were liver-related (21% GI bleed, 19% HE, 12% renal) and were not different among groups. 6-mo outcomes: Mortality rates (group 1, 17%, group 2, 19%, and group 3, 11%, p = 0.38) and transplant rates (0% vs 6% vs 8%, p = 0.32) were not different among groups. As per 3-mo outcomes, 6-mo hospitalizations were different among groups (Figure): 62% were liver-related (17% HE, 10% GI bleed and 19% renal) and were not different among groups. None of the subjects had alcohol misuse during the follow-up.

**Conclusion:** In a multicenter cohort of North American outpatients with “stable” decompensated cirrhosis, a single decompensating event, regardless of type (ascites, HE or VB) has a better prognosis with respect to hospitalizations at 3 and 6 months compared to those with a combination of decompensating events.
**Background and aims:** Prevention of bleeding complications following invasive procedures in patients with cirrhosis is challenging. A first step in preventing such bleedings is to properly assess the risk of bleeding by considering the patient’s history, the risk of the procedure itself and the results of laboratory tests. Several classifications of the bleeding risk have been proposed in recent international guidelines. Several (AGA 2021, AASLD 2021, ISTH 2021, EASL 2022) used the same approach based on the frequency of major bleeding.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Low risk</th>
<th>High risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percutaneous liver biopsy</td>
<td>33%</td>
<td>67%</td>
</tr>
<tr>
<td>Transjugular liver biopsy</td>
<td>83%</td>
<td>17%</td>
</tr>
<tr>
<td>Laparoscopic liver biopsy</td>
<td>46%</td>
<td>54%</td>
</tr>
<tr>
<td>Portal recanalization</td>
<td>40%</td>
<td>60%</td>
</tr>
<tr>
<td>Transjugular intrahepatic portosystemic shunt</td>
<td>38%</td>
<td>62%</td>
</tr>
<tr>
<td>Transcatheter arterial chemoembolization or radioembolization</td>
<td>62%</td>
<td>38%</td>
</tr>
<tr>
<td>Percutaneous ablation of liver cancer</td>
<td>40%</td>
<td>60%</td>
</tr>
<tr>
<td>Endoscopic or percutaneous biliary drain placement</td>
<td>22%</td>
<td>78%</td>
</tr>
<tr>
<td>Diagnostic paracentesis</td>
<td>98%</td>
<td>2%</td>
</tr>
<tr>
<td>Therapeutic paracentesis</td>
<td>96%</td>
<td>4%</td>
</tr>
<tr>
<td>Tissue biopsy drain placement</td>
<td>59%</td>
<td>41%</td>
</tr>
<tr>
<td>Thoracotomy</td>
<td>76%</td>
<td>22%</td>
</tr>
<tr>
<td>Bronchoscopy without biopsy</td>
<td>96%</td>
<td>4%</td>
</tr>
<tr>
<td>Bronchoscopy with biopsy</td>
<td>29%</td>
<td>71%</td>
</tr>
<tr>
<td>Therapeutic bronchoscopy</td>
<td>26%</td>
<td>74%</td>
</tr>
<tr>
<td>Intrahepatic organ biopsy</td>
<td>9%</td>
<td>91%</td>
</tr>
<tr>
<td>Tissue biopsy pleural drain placement</td>
<td>44%</td>
<td>56%</td>
</tr>
<tr>
<td>Pediatric biopsy</td>
<td>25%</td>
<td>75%</td>
</tr>
<tr>
<td>Cytoscopy</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>Ureteroscopy</td>
<td>98%</td>
<td>2%</td>
</tr>
<tr>
<td>Lithotomy (knee, bladder, ureter)</td>
<td>59%</td>
<td>41%</td>
</tr>
<tr>
<td>Percutaneous kidney biopsy</td>
<td>86%</td>
<td>14%</td>
</tr>
<tr>
<td>Transjugular kidney biopsy</td>
<td>61%</td>
<td>39%</td>
</tr>
<tr>
<td>Neophotolysis tube placement</td>
<td>24%</td>
<td>76%</td>
</tr>
<tr>
<td>Lumbar puncture</td>
<td>41%</td>
<td>59%</td>
</tr>
<tr>
<td>Epidural catheter placement</td>
<td>22%</td>
<td>77%</td>
</tr>
<tr>
<td>Central nervous system procedure</td>
<td>2%</td>
<td>98%</td>
</tr>
<tr>
<td>Colonoscopy with cervical biopsy</td>
<td>79%</td>
<td>21%</td>
</tr>
<tr>
<td>Diagnostic hysteroscopy</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>Hysteroscopy with biopsy</td>
<td>64%</td>
<td>36%</td>
</tr>
<tr>
<td>Amniocentesis</td>
<td>38%</td>
<td>62%</td>
</tr>
<tr>
<td>Dental cleaning</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>Dental extraction</td>
<td>45%</td>
<td>55%</td>
</tr>
<tr>
<td>Intra-articular puncture</td>
<td>65%</td>
<td>35%</td>
</tr>
<tr>
<td>Intra-articular injection</td>
<td>77%</td>
<td>23%</td>
</tr>
<tr>
<td>Sphen node percutaneous biopsy</td>
<td>83%</td>
<td>17%</td>
</tr>
<tr>
<td>Bronchial resectional radiocancer therapy</td>
<td>15%</td>
<td>85%</td>
</tr>
<tr>
<td>Skin biopsy</td>
<td>98%</td>
<td>2%</td>
</tr>
<tr>
<td>Drainage catheter exchange</td>
<td>98%</td>
<td>2%</td>
</tr>
</tbody>
</table>

---

**Consensus for a procedure to be at "low bleeding risk"**

**Consensus for a procedure to be at "high bleeding risk"**

**No consensus**

Figure: (abstract: WED-356).
events following invasive procedures (threshold at 1.5%). Yet, these guidelines arrived at different conclusions highlighting the need for a broad consensus on this topic. The aim of this study was thus to establish a consensus of experts on the bleeding risk associated with invasive procedure in patients with cirrhosis.

**Method:** All international experts involved in recent guidelines on the management of invasive procedures in patients with cirrhosis were contacted, namely authors of the AASLD 2021, AASLD 2023, ACG 2020, AGA 2019, AGA 2021, AGA 2021, British Society of Gastroenterology 2020, and the ISTH 2022 guidelines, as well as panel and Delphi panel members of the EASL 2022 guidelines. All were invited to classify 80 procedures frequently performed in patients with cirrhosis as at “high risk” or “low risk” of bleeding. Procedures were considered at high-risk when the estimated bleeding risk is ≥1.5% or when even minor bleeding may lead to severe consequences or death. The predetermined threshold considered as a consensus was 75%.

**Results:** Out of a total of 72 experts, 52 participated in the study (72%): 35 from Europe, 16 from the USA, 1 from Asia. Of those who specifically declined to respond, 1 was more laboratory oriented, 1 was no longer clinically active and 18 simply declined to respond. Out of the 80 procedures, a consensus could be reached for 51 procedures (64%): 16 procedures were classified as at “high risk,” 35 as at “low risk”; a consensus could not be reached for 29 procedures (Figure).

**Conclusion:** A consensus was reached among clinically experienced experts who have published in the field of procedural bleeding risk in cirrhosis for 51 procedures: 16 procedures were classified as “high risk” and 35 as “low risk” for bleeding based also this “collective clinical experience. While truly randomized and prospective studies that include various potential interventions would be necessary to be more definitive, this experience-based classification will be helpful to homogenize future study interpretation and in clinical decision making on invasive procedures in patients with cirrhosis.

**WED-357**
The role of prolonged albumin replacement therapy in correction of its structure and functional properties and management of ascites

Anastasia Turkina1, Marina Maevskaya2, Maria Zharkova2, Vladimir Ivashkin1. 1Sechenov First Moscow University (Sechenov University), Department of Propaedeutics of Internal Disease, Gastroenterology and Hepatology, Russian Federation, 2Sechenov First Moscow University (Sechenov University), Vasilieka Clinic of Internal Diseases, Gastroenterology and Hepatology, Russian Federation

**Background and aims:** Human serum albumin (Alb) undergoes posttranslational changes due to oxidative stress in cirrhotic patients (pts). It leads to “effective albumin” reduction. Alb infusions are widely used not only in short course but also in long-term therapy. There is no information about the influence of prolonged Alb therapy on albumin structure and functions. Aim was to access the influence of 3 months albumin replacement therapy on albumin structure and functional properties and management of ascites.

**Method:** We included 50 eligible pts with decompenated cirrhosis and ascites. Pts were divided into 2 groups: albumin and control-age, gender and clinical presentation matched. Along with standard medical treatment (SMT), Alb group received albumin replacement therapy for 3 months (20%-200 ml per week). Control group-only SMT. On admission and after 3 months of therapy, we performed a standard examination and additionally assessed Alb properties by means of electronic paramagnetic resonance tests. We analyzed the following parameters: DR-an indicator of native albumin conformation, BE-binding efficiency of albumin, RTQ-transport efficiency and DTE-detoxifying ability.

**Results:** The mean pts’s age varied from 31 to 74 years; 2/3 of the patients were female. The main cause of cirrhosis was alcohol-62%. All patients initially had ascites. Only 48% (n = 24) of pts had hypoalbuminemia (<32 g/l). Albumin structure (DR) and functions (BE, RTQ, DTE) were impaired totally in both groups. Those changes didn’t depend on albumin serum level (p < 0.001). After 3 months of treatment in the Alb group, ascites resolved in 48.4% of pts (n = 15) vs. 7% (n = 1) in the control group (p = 0.042), Alb structure and functions also significantly improved in the Alb group vs. controls: DR 42.4% vs. 0%, BE 60.6% vs. 14.3%, RTQ 63.6% vs. 14.3%, DTE 60.6% vs. 28.6% (p < 0.001).

**Conclusion:** Albumin replacement therapy for 3 months induces reduction of ascites, improvement of Alb structure and functional properties. Native conformation and Alb functional properties can be an additional marker for the replacement therapy initiation and withdrawal.

**WED-358**
A multimodal treatment candidate for sarcopenia in men with decompensated cirrhosis: a randomized, placebo-controlled trial evaluating LPCN 1148

Benjamin Bruno1, Josh Weavil1, Jonathan Ogle1, George Nomikos1, Anthony DelConte1,2, Nachaiappan Chidambaram1, Mahesh Patel1, Jennifer Lai1,2, Ben Bruno1, Josh Weavil1, Jonathan Ogle1, George Nomikos1, Virginia Commonwealth University, Division of Gastroenterology, Hepatology and Nutrition, Richmond, United States

**Background and aims:** Sarcopenia affects 30–70% of patients with liver cirrhosis and has been shown to negatively impact outcomes in cirrhosis, including increased hospitalizations, decompensation events (e.g. hepatic encephalopathy [HE] and infections), and deaths. Testosterone (T), a multimodal hormone influencing many organ systems, is low in the majority of cirrhotic men and is an independent predictor of mortality and decompensation events, including ascites, and HE. The aim of this study is to evaluate LPCN 1148, a novel, multimodal, orally available prodrug of T, for treatment of sarcopenia and decompensated cirrhosis. This abstract will present preliminary baseline characteristics for the study population.

**Method:** Men with cirrhosis and sarcopenia (confirmed by CT scan), who are waiting for a liver transplant, were eligible for this two-stage, randomized (1:1), blinded, placebo-controlled, proof-of-concept clinical trial. In the first stage, participants were assigned to receive either oral LPCN 1148 or placebo twice daily for 24 weeks. At week 24, the second stage open-label extension (OLE) portion of the study begins, where all participants receive LPCN 1148 from weeks 24–52. The primary end point is the change in skeletal muscle index (SMI) at week 24 with additional biochemical, clinical, functional, and PRO end points at 24 and 52 weeks.

**Results:** Enrollment is complete; at baseline participants (N = 30, mean ± SD for age: 58.8 ± 8.4 yrs, BMI: 29.0 ± 6.9 kg/m2) were sarcopenic (inclusion criterion, L3-SMI 46.4 ± 7.7 cm2/m2) with elevated markers of liver disease (MELD score 16.8 ± 4.2; ALP 147.6 ± 80.6 U/L, AST 45.1 ± 21.5 U/L; AST/ALT 1.69 ± 0.49). Etiology of cirrhosis was ALD (50.0%), followed by NASH (23.3%), hepatitis C (17.3%), PSC (6.7%), and ALD/hepatitis C (3.3%). Major decompensation events present at baseline were HE (72.4%), ascites (53.3%), and HE. The mean pts’s age varied from 31 to 74 years; 2/3 of the patients were female. The main cause of cirrhosis was alcohol-62%. All patients initially had ascites. Only 48% (n = 24) of pts had hypoalbuminemia (<32 g/l). Albumin structure (DR) and functions (BE, RTQ, DTE) were impaired totally in both groups. Those changes didn’t depend on albumin serum level (p < 0.001). After 3 months of treatment in the Alb group, ascites resolved in 48.4% of pts (n = 15) vs. 7% (n = 1) in the control group (p = 0.042), Alb structure and functions also significantly improved in the Alb group vs. controls: DR 42.4% vs. 0%, BE 60.6% vs. 14.3%, RTQ 63.6% vs. 14.3%, DTE 60.6% vs. 28.6% (p < 0.001).

**Conclusion:** Albumin replacement therapy for 3 months induces reduction of ascites, improvement of Alb structure and functional properties. Native conformation and Alb functional properties can be an additional marker for the replacement therapy initiation and withdrawal.
Additionally, a large portion of participants were above the upper limits of normal for total bile acids (93%), SHBG (63.3%), luteinizing hormone (43.3%), B12 (70.0%), and ammonia (63.3%).

**Conclusion:** There are trends within this sarcopenic, decompensated cirrhotic population indicating dysfunction in other key physiologic areas, including hematologic, thrombotic, androgenic, metabolic, immunity, and frailty. Potentially related to the failing liver and reduced muscular mass, systemic ammonia levels are high in the majority of the study population which predisposes participants to episodes of overt HE.

**WED-359**

**Clinical effectiveness of human albumin in liver cirrhosis: a meta-analysis update**

Huijuan Zhou1, Ziqiang Li1, Yuhan Liu2, Daer Dili2, Qing Xie1. 1Ruijin Hospital, Shanghai Jiao Tong University School of Medicine, China, 2Takeda (China) International Trading Co., Ltd, China

**Email:** xieqingrjh@163.com

**Background and aims:** Hyponatremia is a poor prognosis marker and independent predictor of mortality for patients with liver cirrhosis. Albumin infusions from volume expander (VE) treatment group are regarded as an effective strategy for the management of hyponatremia in cirrhosis. Hence, we examined the clinical effectiveness of albumin infusion to resolve hyponatremia and other complications as well as compare the effectiveness of diverse treatment groups in liver cirrhotic patients.

**Method:** A systematic literature search of PubMed and EMBASE for articles reporting clinical effectiveness of albumin infusion in cirrhotic patients was performed from inception till date. The key primary efficacy outcome was hyponatremia, and the key safety outcomes were peripheral edema, adverse events, and in-hospital mortality. For the main meta-analysis, the studies were pooled, and albumin infusion was compared with control (including VEs, vasoconstrictors, and inactive/standard medical therapy (I/SMT). For subgroup meta-analysis, comparison was performed between albumin infusion and other treatment groups. The odds ratio (OR) and mean difference (MD) estimated the outcome with a 95% confidence interval (CI). The study protocol was prospectively registered at PROSPERO (CRD42022372709).

**Results:** Twenty-two studies were included in the analysis. Pooled data showed an overall significant low incidence of hyponatremia (OR, 0.33; 95% CI [0.26–0.41]), severe infection (OR, 0.52 [0.29–0.94]), and post paracentesis circulatory dysfunction (PICD) (OR, 0.36 [0.21–0.61]) among albumin treated group compared to control. Among subgroup analysis, statistically significant improvement was observed with albumin infusion vs I/SMT (OR, 0.28 [0.22–0.36]), while favorable improvement was observed with VE (OR, 0.66 [0.38–1.17]) or vasoconstrictor (OR, 0.45 [0.05–3.75]). For PICD, improvement with albumin was significant compared to other VEs (OR, 0.31 [0.15–0.63]), but did not reach statistical significance with vasoconstrictor (OR, 0.63 [0.21–1.91]). Overall subgroup analysis showed albumin infusion lowered the odds of hyponatremia (OR, 0.33 [0.26 to 0.41]) and PICD (OR, 0.38 [0.21 to 0.69]) significantly. Pooled data showed comparable incidences of peripheral edema (OR, 0.97 [0.55, 1.70]) and overall adverse events (OR, 0.98 [0.92, 1.03]) between albumin and control groups. Comparable in-hospital mortality was observed with albumin vs other VE (OR, 1.02 [0.42 to 2.44]) and a favorable improvement when compared to the I/SMT group (OR, 0.58 [0.20 to 1.67]).

**Conclusion:** Albumin infusion may be beneficial for resolving hyponatremia, PICD and severe infection among cirrhotic patients. However, larger, multi-centered and double-blinded randomized controlled trials with longer follow-up periods are needed to generate more robust data.
**WED-360**

Effect of kidney injury and hemodynamic effect after moderate abdominal paracentesis: a randomized control study

Sakkarin Chirapongsathorn1, Sanpolpai Khaoprasert1, Anuchit Suksaensam1, Amnart Chaiuprasert1, Phramongkutklao Hospital, Division of Gastroenterology and Hepatology, Department of Medicine, Bangkok, Thailand. 2Phramongkutklao Hospital, Division of Nephrology, Department of Medicine, Thailand

Email: sakkarin33@gmail.com

**Background and aims:** Patients with cirrhosis undergoing therapeutic paracentesis are at risk to develop kidney injury but not well evaluated in non-large volume paracentesis setting. The aims of this study are to determine the risk and consequence of acute kidney injury (AKI) and its progression in patients with decompensated cirrhosis after moderate paracentesis by use of a urine test measuring tissue inhibitor of metalloproteinases-2 (TIMP-2) and insulin-like growth factor-binding protein 7 (IGFBP7), both inducers of G1 cell cycle arrest and represent a key mechanism implicated in AKI and could predict AKI after paracentesis.

**Method:** A randomized, prospective cohort study was performed during December 2020 to December 2021. All outpatient decompensated cirrhosis with ascites were enrolled and randomized into 3 liters and 5 liters of paracentesis groups. Serial urine samples were analysed for [TIMP-2][IGFBP7] concentration before and after paracentesis. The primary outcome measure was kidney injury as defined by raising of Urine [TIMP2][IGFBP7] >2 (ng/ml)/1000 after moderate paracentesis (<5 liters ascites removal).

**Results:** A total of 90 patients with decompensated cirrhosis with ascites were consecutive enrolled during study period. After screening, 54 patients analyzed, 29 patients underwent in 3 liters paracentesis group and 25 patients underwent in 5 liters paracentesis group. The mean of MELD score was 8 ± 1.2. Of the 17 (31%) patients develop kidney injury after moderate paracentesis. Urine TIMP2. IGFBP7>2, rising urine TIMP2 and rising urine TIMP2/urine Cr were significant higher in patients within 5 liters paracentesis group. Mean arterial pressure were statistically significant decline at 2 hours after paracentesis in both groups. The Urine [TIMP-2][IGFBP7] predicted hemodynamic event with an area under the curve [95% confidence interval (CI)] of 0.82 [0.72–0.99], an optimal cut-off value of 3.4 (ng/ml)/1000, a sensitivity 75%, and a specificity of 89%. For predicting severe AKI, hospital admission and death, Urine [TIMP-2][IGFBP7] was not significantly discriminant. Five of these patients died within 90 days of follow-up.

**Table 1: Primary outcome, secondary outcome and urine Biomarker data**

<table>
<thead>
<tr>
<th>Variables</th>
<th>3 L group (n = 29)</th>
<th>5 L group (n = 25)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rising Urine TIMP2</td>
<td>3 (10.3%)</td>
<td>8 (32%)</td>
<td>0.049*</td>
</tr>
<tr>
<td>Rising Urine IGFBP7</td>
<td>8 (27.6%)</td>
<td>8 (32%)</td>
<td>0.723</td>
</tr>
<tr>
<td>Rising Urine TIMP2.IGFBP7</td>
<td>5 (17.2%)</td>
<td>7 (28%)</td>
<td>0.343</td>
</tr>
<tr>
<td>Rising Urine TIMP2/Urine Cr</td>
<td>12 (41.4%)</td>
<td>19 (76%)</td>
<td>0.010*</td>
</tr>
<tr>
<td>Rising Urine IGFBP7/Urine Cr</td>
<td>12 (41.4%)</td>
<td>13 (52%)</td>
<td>0.435</td>
</tr>
<tr>
<td>Rising Urine TIMP2.IGFBP7/Urine Cr</td>
<td>9 (31%)</td>
<td>12 (48%)</td>
<td>0.202</td>
</tr>
<tr>
<td>Urine Cr</td>
<td>5 (17.2%)</td>
<td>12 (48%)</td>
<td>0.015*</td>
</tr>
<tr>
<td>Hemodynamic event</td>
<td>3 (10.3%)</td>
<td>5 (20%)</td>
<td>0.319</td>
</tr>
<tr>
<td>ΔMAP (120–0 mmHg)</td>
<td>–3.1 ± 3.7</td>
<td>–5.2 ± 4.3</td>
<td>0.065</td>
</tr>
<tr>
<td>Ascites release times (mins)</td>
<td>4 (3.6)</td>
<td>6 (4.6)</td>
<td>0.032*</td>
</tr>
<tr>
<td>Rapid decline of GFR</td>
<td>16 (55.2%)</td>
<td>14 (56%)</td>
<td>0.951</td>
</tr>
<tr>
<td>Admission within 3 months</td>
<td>7 (24.1%)</td>
<td>8 (32%)</td>
<td>0.520</td>
</tr>
<tr>
<td>Death within 3 months</td>
<td>3 (10.3%)</td>
<td>2 (8%)</td>
<td>0.767</td>
</tr>
</tbody>
</table>

*Value presented as n (%). P value corresponds to Independent t test or Pearson Chi-square test.

**Conclusion:** Urine [TIMP-2][IGFBP7] effectively identify patients with risk of kidney injury after moderate paracentesis but could not predict severe AKI. Below a cut-off of 3.4 (ng/ml)/1000, the risk of kidney injury is low. Kidney injury could occur even less than 5 liters of ascites release in decompensated cirrhosis was performed. Future studies should include a larger sample size to confirm these findings. The nation clinical registration number was TCTR20191116003.

---

**WED-361**

Clostridioides difficile infection in patients with liver cirrhosis

Olga Adriana Caliman-Sturdza1, 1Stefan cel Mare University, Faculty of Medicine and Biological Science, Suceava, Romania

Email: sturdza_olga@yahoo.com

**Background and aims:** Clostridioides difficile is is an infectious agent associated with significant morbidity and mortality in patients with cirrhosis. Our aim is to identify variables that are predictive of poor outcomes and the risk of mortality in this patient population.

**Method:** We investigated the patients hospitalized in our department in 2022 with the diagnosis of Clostridioides difficile infection (CDI) and liver cirrhosis.

**Results:** Out of a total of 174 patients diagnosed with enterocolitis with Clostridioides difficile, 28 patients were known to have liver cirrhosis, 4 of viral B and C etiology and 24 of toxic etiology. 21.4% of cirrhotic patients received antibiotics before being diagnosed with CDI and 46.4% were under treatment with proton pump inhibitors. Decompensation of liver disease occurred in 71.4% patients, manifested by confusion, drowsiness, psychomotor agitation (32.1%), jaundice and ascites (39.3%), CDI had an unfavorable evolution towards sepsis with multiple organ failure in a percentage of 17.8% of patients with cirrhosis compared to 2.7% of non-cirrhotic patients, 7.15% developed upper digestive hemorrhage, 11.2% phenomena of hepatic encephalopathy with evolution towards coma. Cirrhotic patients who developed sepsis with Clostridioides difficile had hypoalbuminemia and severe anemia at admission. Mortality was 10.7% in patients with cirrhosis and CDI and only 1.3% in the group of non-cirrhotic patients. Recurrences occurred in 21.4% of cirrhotic patients, compared to 4.2% of non-cirrhotic ones. Diarrhea subsided after 6 days of oral treatment with vancomycin, while in non-cirrhotic patients normalization of intestinal transit was achieved after 3 days of treatment.

**Conclusion:** Patients with both Clostridioides difficile infection and liver cirrhosis have worse outcomes than patients without cirrhosis, included morbidity complications, death and higher rates of hospital readmission. The incidence of CDI in cirrhotic patients is increasing and has become more common in the community. Risk factors of treatment with proton pump inhibitors and antibiotic exposure were associated with the diagnosis of CDI in cirrhosis patients. Hypoalbuminemia and anemia were found to be predictors of increased mortality in cirrhosis patients with CDI.

---

**WED-362**

The prevalence and prognostic impact of myosteatosis with and without sarcopenia and its association with age and severity of liver cirrhosis

Eleni Geladari1, Theodoros Alexopoulos2, Meropi Kontogianni3, Larisa Vasilieva4, Ilianna Mami5, Roxani Tenta6, Sofia Manioudaki6, Vasilis Sevastianos6, Alexandros-Pantelis Tsigkas7, Ioannis Vlachogiannakos6, Alexander Alexopoulos8, 1Evangelismos General Hospital, 3rd Department of Internal Medicine and Liver Outpatient Clinic, Athens, Greece. 2Laiko General Hospital, Gastroenterology Department, Athens, Greece. 3School of Health Sciences and Education Harokopio University, Nutrition and Dietetics, Athens, Greece. 4Alexandra General Hospital, Gastroenterology, Athens, Greece. 52nd Department of Internal Medicine and Research Laboratory, National and Kapodistrian University of Athens, Medical School, Hippokration General Hospital, Athens, Greece. 6Intensive Care Unit, Sismanoglio General Hospital of Athens, Greece

Email: alexandra61@med.uoa.gr

**Background and aims:** Myosteatosis (MS) is defined as increased fat infiltration in skeletal muscle and implies impaired muscle quality.
MS is different from sarcopenia but part of sarcopenia definition. MS may be considered as a precursor of sarcopenia. The aim of the study was to investigate the prevalence of MS either alone or with sarcopenia and its association with age and severity of liver disease.

**Method:** Skeletal muscle index (SMI) and MS measured by computed tomography at third lumbar vertebra, muscle strength evaluated by hand dynamometer and functionality by short physical performance battery (SPPB) were used to diagnose sarcopenia according to latest EWGSOP-2 criteria. MS was defined as muscle radiodensity <41 HU for dry body mass index <24, 9 kg/m² and <33 HU for EWGSOP-2 criteria. MS was defined as muscle radiodensity <41 HU.

**Results:** 194 consecutive patients were included [age 61 (IQR 52–68); 66.5% male; MELD 10.5 (7.7–16); 60.3% with compensated LC; 43.8%, 22.7% and 33.5% with alcoholic, viral and other etiology, respectively]. Patients were classified in four groups according to presence of MS and sarcopenia. Neither MS nor sarcopenia was diagnosed in 25.3% (group A), MS without sarcopenia in 30.9% (group B), sarcopenia according to handgrip and MS in 17.5% (group C) and sarcopenia according to handgrip, MS and low SMI in 26.3% (group D). MS was present in all but 3 cases with sarcopenia. There was a significant ascending order across the groups A, B, C and D in age [56 (50–63.5), 57.5 (51.2–66), 62.5 (57–69.5) and 67 (59–72.5) years, respectively, p < 0.001] and severity of LC as it was documented by the increasing rate of decompensated cirrhosis [32.7%, 58.3%, 73.5% and 80.4%, respectively, p < 0.001] and similarly by MELD (p < 0.001) and Child Pugh values (p < 0.001). In contrast, there was a significant descending order across the groups in SMI (p < 0.001) and SPPB (p < 0.001) values. Considering the Kaplan-Meier curve at 360 days, between groups B, C and D (no patient died in A), patients in group D had a higher mortality rate compared to B (log Rank P = 0.001) but not C (log Rank P = 0.068) (log Rank P = 0.002 in overall). In multivariable analysis adjusted for age and sex, mortality was 3.5 times higher in group D compared to B (as reference group) [HR 3.5 (95%CI 1.6–7.3), P = 0.002]. No difference was evident between groups B and C (p = 0.530).

**Conclusion:** In patients with LC, MS alone is present in earlier stage of LC and younger age and may imply a prodromal phase of muscle degeneration before the development of sarcopenia. MS is present in all but 3 patients with sarcopenia. Furthermore, sarcopenic patients with low SMI are older and have more advanced liver disease compared to sarcopenic with MS but normal SMI, implying that MS predates the decline of muscle strength and performance. Longitudinal data are required to draw solid conclusions about the significance of MS in patients with LC.

**WED-363**

Comparison of prognostic value of sarcopenia and MELD score in assessing 28 days and 3 months mortality in patients with cirrhosis of liver

Shivam Gupta 1,2, 1Kalinga Institute of Medical Sciences, Gastroenterology and Hepatology, Bhubaneswar, India

Email: iamdrshivam@gmail.com

**Background and aims:** Sarcopenia in patients with cirrhosis of liver has been associated with increased mortality, sepsis, hyperammonemia, heart failure, increased length of stay and has been seen to be predictive of waiting list mortality, independent of the Model for End Stage Liver Disease (MELD) score and other possible confounders such as gender and refractory ascites. Sarcopenia and MELD are proven independent prognostic factors for cirrhosis of liver. However, MELD does not take into consideration nutritional and functional status of the patient and has inferior performance in predicting mortality in subgroup with lower MELD scores (≤15). Therefore, a prospective observational study is being carried out to compare sarcopenia and MELD score in assessing 28 days and 3 months mortality in patients with cirrhosis of liver and to study prevalence of sarcopenia in different etiologies of cirrhosis of liver. This study will help in early and better prediction of mortality and therefore better listing of patients in need for liver transplant.

**Method:** This is an ongoing study on outpatients and inpatients ≥18 years of age and diagnosed with cirrhosis of liver. Patients with underlying co morbidities affecting nutrition such as human immunodeficiency virus, systemic malignancies, chronic kidney disease, neuromuscular disorders causing muscle wasting have been excluded. Also, patients with hepatic encephalopathy or hepatorenal syndrome where complete workup of sarcopenia was not possible have been excluded from this study. Evaluation of sarcopenia was based on combination of strength, assistance with walking, rising from a chair, climbing stairs and falls (SARC-F) questionnaire, hand grip strength test by dynamometer, transverse psoas muscle thickness evaluation for muscle quality and quantity by computerised tomography scan and physical performance by gait speed test. These patients with cirrhosis of liver and sarcopenia are then being followed up at 28 days and 3 months to record mortality.

**Results:** Out of 256 patients planned for recruitment in this study, 108 patients have been included in this interim analysis. Mortality is seen to be higher in patients with sarcopenia (21%) compared to cirrhotic patients without sarcopenia (11.1%). On assessing 28 days and 3-months mortality, sarcopenia was seen more in patients with lower MELD score (≤15) with higher mortality of 21%. Underlying etiology contributed significantly to development of sarcopenia with maximum sarcopenia seen in patients with Non-alcoholic fatty liver disease (NAFLD) followed by ethanol use related cirrhosis of liver.

**Conclusion:** This interim analysis shows high prevalence of sarcopenia in cirrhosis with impact of sarcopenia on mortality seen to be more in patients with lower MELD score (≤15) and thus, sarcopenia is seen to be a better predictor of 28 days and 3 months mortality at lower MELD scores in patients with cirrhosis of liver. Interestingly, sarcopenia was seen to be more in patients with NAFLD than those with ethanol use related cirrhosis of liver.

**WED-364**

Activation of the kynurenine pathway potentially underlies neurodegeneration in patients with covert hepatic encephalopathy

Georgia Zeng 1,2, Shivi KrishnaMurthy 3, Ananda Staats Pieter 3, Anna Galler 4, Nway Tun 4, Joga Chaganti 1, Ian Lockett 4, Sara Montagnese 5, Bruce Brew 6, Gilles Guillemin 7, Mark Danta 8, Benjamin Heng 9, 1St Vincent’s Clinical School, Faculty of Medicine, Australia, 2St Vincent’s Hospital, Gastroenterology, Australia, 3Macquarie University, Macquarie Medicine School, Australia, 4St Vincent’s Hospital, Medical Imaging, Australia, 5University of Padua, Medicine, Italy, 6St Vincent’s Hospital, Neurology and Immunology, Australia

Email: georgiazeng@icloud.com

**Background and aims:** Hepatic encephalopathy (HE) is a neuro-psychiatric complication of liver disease, characterised by elevated systemic concentrations of ammonia and pro-inflammatory cytokines. These neurotoxins can cross the blood brain barrier and act synergistically to cause neuroinflammation, which can activate the kynurenine pathway (KP). This results in depletions of local tryptophan (TRP) reserves and the production of neuroactive KP metabolites. Specifically, 3-hydroxykynurenine (3-HK) and 3-hydroxyanthranilic acid (3-OHAA) can be toxic to brain cells and contribute to neurodegeneration in patients with covert hepatic encephalopathy.
quinoiinic acid (QUIN) cause astrocyte and neuronal death, while kynurenic acid (KYN) is a NMDA receptor antagonist with neuroprotective effects. The aim of our study was to compare systemic KP activity between patients with covert HE (CHE), non-encephalopathic cirrhosis patients (NHE) and healthy controls.

**Method:** This was a single-centre prospective cohort study conducted between 2018–2021 at St Vincent’s Hospital in Sydney. Overall, there were 13 CHE patients, 10 NHE patients and 12 healthy controls. Patients with cirrhosis were diagnosed with CHE if they scored ≤−4 on the validated Psychometric Hepatic Encephalopathy Score. Plasma samples were obtained to determine the expression levels of KP enzymes, calculated by a ratio of metabolite product divided by its substrate. TRP, alongside upstream KP metabolites such as kynurenic (KYN), anthranilic acid (AA), KYNA, 3-HK and 3-hydroxyanthranilic acid (3-HAA) were quantified using high-performance liquid chromatography (HPLC) and ultra-HPLC. Downstream KP metabolites, QUIN and picolinic acid (PIC) were quantified using gas-chromatography/mass spectrometry.

**Results:** KP was highly activated in cirrhosis patients, especially those with CHE, in comparison to healthy controls, as demonstrated by higher KYN/TRP ratios representing elevation of the rate-limiting enzymes, indoleamine-2,3-dioxygenase (IDO-1) and tryptophan-2,3-dioxygenase (TDO). Following catabolism of TRP to KYN, the subsequent monoxygenase (KMO) enzyme demonstrated elevated levels in CHE patients only, skewing the pathway towards production of 3-HK. Levels of KYNA were higher in CHE patients compared to NHE patients and healthy controls. The activation of downstream KP pathways was evident through the higher production of QUIN and PIC metabolites at the final node of the pathway in cirrhosis patients, especially those with CHE.

**Conclusion:** The activation of KP in patients with cirrhosis results in the dysregulated production of neurotoxic metabolites. The higher levels in the CHE cohort suggest this is potentially contributing to neurodegeneration and clinical course. Dysregulation of the KP pathway appears to already be underway in cirrhosis patients who do not yet show any clinical signs of neurocognitive impairment. Therapeutic agents that modulate KP activity may be able to alleviate symptoms of patients with CHE.

**WED-365**
A virtual reality-driving test to predict car accidents in patients with cirrhosis

Simon Johannes Gairing1,2, Eva Maria Schleicher1,2, Leonard Kaps1,2, Sophia Schulte-Beerbuehl1,2, Kristina Steiner1,2, Joachim Labenz2, Jörn Schattenberg3,4, Peter Galle1,2, Marcus-Alexander Wörns3,4,6, Christian Labenz1,2, 1Department of Internal Medicine I, University Medical Center of the Johannes Gutenberg-University, Mainz, Germany, 2Cirrhosis Center Mainz (CCM), University Medical Center of the Johannes Gutenberg-University, Mainz, Germany, 3Department of Medicine, Diakonie Hospital Jung-Stilling, Siegen, Germany, 4University Medical Center of the Johannes Gutenberg-University, Department of Internal Medicine I, Mainz, Germany, 5University Medical Center of the Johannes Gutenberg-University, Metabolic Liver Research Program, I. Department of Medicine, Mainz, Germany, 6Department of Gastroenterology, Hematology, Oncology and Endocrinology, Klinikum Dortmund, Germany, Germany Email: sgairing@uni-mainz.de

**Background and aims:** Patients with cirrhosis and especially those with hepatic encephalopathy (HE) may have impaired driving skills and may be prone to car accidents. Currently, no sufficient tool is available to predict car accidents in these patients. This study aimed to evaluate the usefulness of a virtual reality-based application as a point-of-care tool to predict car accidents.

**Method:** A driving test using a virtual reality head-mounted-display (HTC Vive Pro eye) was developed to simulate five hazardous situations (e.g., a cyclist suddenly rides on the road). In this test, the car drives automatically on a straight street and events are triggered when an invisible hit box is passed. The patient has to react when he/she recognizes the hazardous situation. The time from triggering the event to pressing the handbrake is recorded as reaction time. Total reaction time (TRT) is defined as the combined reaction time to all five events. Car accidents were assessed retrospectively (previous 12 months) by interview at the day of enrollment. Minimal HE (MHE) was diagnosed using PHES. Patients were recruited in the outpatient clinic.

**Results:** In total, 112 patients with cirrhosis and 52 controls without cirrhosis were prospectively enrolled. Patients with cirrhosis were in median 61 years and median MELD was 10 (Child-Pugh A/B/C: 74/24/2%). MHE was detected in 14% (n = 15). Regarding safety, no participant had to abort the test; mild forms of motion sickness were present in 16% (n = 27). Patients with cirrhosis showed a worse median TRT compared to controls without cirrhosis (5.15 vs. 4.56 sec, p < 0.001). In patients with MHE, median TRT was significantly longer compared to patients without MHE (5.67 vs. 5.02 sec, p = 0.01). Seven patients reported a history of car accidents during the twelve months prior to study inclusion. Median TRT tended to be higher in patients with reported car accidents (p = 0.099). When patients who stopped driving for HE-related reasons or insecurity (n = 14) were added to the group of patients with accidents (modelled end point), then a longer TRT was significantly associated with the modelled end point in univariable (p < 0.001) and multivariable analysis (OR 2.83, p < 0.001) after adjusting for age, MELD and PHES.

**Figure:** (abstract: WED-364): Comparison of KP metabolites between CHE patients, non-encephalopathic cirrhosis patients and healthy controls.
Background and aims: Current guidelines caution against use of angiotensin converting enzyme inhibitors (ACEi) and angiotensin receptor blockers (ARB) in patients with decompensated cirrhosis. However, recent literature suggests ACEi/ARB may reduce fibrosis and mortality in patients with chronic liver disease or compensated cirrhosis. We explored the real-world association between ACEi/ARB and cirrhosis-related outcomes in a Veterans Affairs cohort.

Method: We performed a retrospective cohort study using an active comparator new user design of patients with cirrhosis newly initiated on ACEi/ARB or calcium channel blockers (CCB, comparator). Kaplan-Meier analysis was used to evaluate unadjusted associations with outcomes of mortality and—in a compensated cirrhosis subgroup—cirrhosis decompensation and hepatocellular carcinoma (HCC). Inverse probability treatment weighting (IPTW) was used to balance key confounders in Cox regression analysis. For the mortality outcome, subgroup analyses explored the impact of baseline Child-Turcotte-Pugh (CTP) class, diabetes, heart failure, and chronic kidney disease (CKD) stage on the primary association. Finally, cause-specific competing risk models were created to evaluate liver-related versus non-liver-related mortality.

Results: The cohort included 1,208 ACEi/ARB and 376 CCB new initiators. ACEi/ARB users were more likely to have higher body mass index (median 29.2 vs. 27.6, p < 0.001), non-alcoholic fatty liver disease (28.5% vs. 19.9%, p = 0.03), and metabolic comorbidities. In
unadjusted Kaplan-Meier analysis, ACEi/ARB exposure was not associated with reduction in mortality, cirrhosis decompensation, or incident HCC (each p > 0.05; Figure A/B/C). In IPTW Cox regression, ACEi/ARB exposure was associated with lower mortality (hazard ratio [HR] 0.74, 95% confidence interval [CI] 0.65–0.85, p < 0.001), increased hazard of cirrhosis decompensation (HR 1.29, 95% CI 1.01–1.65, p = 0.04), and no association with HCC (HR 0.88, 95% CI 0.57–1.37, p = 0.58). In subgroup analyses, the possible mortality benefit with ACEi/ARB exposure was isolated to patients with CTP class A, early-stage CKD, and an absence of heart failure (Figure D). In cause-specific competing risk models, ACEi/ARB exposure was associated with reduction in non-liver-related mortality (cause-specific hazard ratio [cSHR] 0.58, 95% CI 0.47–0.71, p < 0.001) but not with liver-related mortality (cSHR 0.90, 95% CI 0.75–1.05, p = 0.29).

**Conclusion:** ACEi/ARB exposure was associated with reduced mortality in patients with cirrhosis; however, this effect may be limited to CTP class A patients and those with early-stage CKD and no heart failure. Furthermore, this benefit may be mediated through mitigation of non-liver-related mortality. Future research is needed to identify cirrhosis patient subgroups for whom the benefits of ACEi/ARB exposure exceed the risks.

**WED-367**

*Liver nutrition clinic improves nutritional outcomes in patients with advanced cirrhosis*

Kylie Matthews-Rensch1, Elise Treleaven1, Sharon Forbes1, Dwayne Garcia1, Joanne Mina1, Olivia Cullen2, Melanie Halford2, Lucinda Vaux2, Richard Skoien3, Barbara Leggett4, Enoka Gonsalkoral5, Royal Brisbane and Women’s Hospital, Dietetics and Food Services, Herston, Australia, Royal Brisbane and Women’s Hospital, Gastroenterology and Hepatology, Herston, Australia.

Email: enokag@yahoo.com

**Background and aims:** Malnutrition and sarcopenia are recognised complications of cirrhosis and are associated with adverse patient outcomes. Current guidelines recommend nutrition assessments for all patients with advanced liver disease. The hepatology service at Royal Brisbane and Women’s Hospital (RBWH) service a large catchment area spread over 170,000 km² in Queensland, Australia. The Liver Nutrition Clinic (LiNC) was developed to address nutrition requirements of patients with cirrhosis complications attending outpatient or inpatient hepatology services at RBWH. Here we describe the baseline characteristics and longitudinal nutritional outcomes of patients attending this specialist clinic.

**Method:** All patients attending LiNC were prospectively entered into a secure database and clinical, including nutritional and frailty, data were collected as part of routine clinical care. Descriptive statistics were used to describe demographics and interpret outcomes for patients attending LiNC between April 2021 to January 2023.

**Results:** Eighty-four patients (67% male, n = 56), median age 59 years (range 22–78 years) were included in this analysis. Indication (s) for referral were ascites (55%, n = 46), clinically significant weight loss (38%, n = 32), peripheral oedema (24%, n = 20), hepatic encephalopathy (14%, n = 12), and/or planned for liver transplant (12%, n = 10). About half (55%, n = 46) had more than one indication for referral. Chronic liver disease aetiology was alcohol (65%, n = 55), metabolic associated fatty liver disease (26%, n = 22), viral hepatitis (24%, n = 20) and other (12%, n = 10). Twenty-one patients had more than one aetiology (25%). Fifty-eight percent (n = 49) had ascites and 27% (n = 23) had peripheral oedema at baseline. Median values (range) for serology results were albumin 30 g/L (15–55), bilirubin 32 μmol/L (3–422), and international normalised ratio 1.3 (0.4–4.8). The median MELD score was 12 (range 6–33). Liver frailty index (LFI) was available for 41 participants (49%) at baseline with 17% (n = 7) robust, 76% (n = 31) pre-frail and 7% (n = 3) considered frail. Baseline LFI was not available for 43 patients due to attendance via virtual appointment (n = 21), inadequate time or administrative issues (n = 13) or being too unwell or unsafe to complete the assessments (n = 7). Only 29% (n = 24) of patients were assessed as having adequate nutritional intake and 51% (n = 43) were well-nourished (per Subjective Global Assessment) at baseline, and this improved at 3- and 6-month follow-up per figure 1.

**Conclusion:** Poor nutritional status (malnutrition) was a common finding in our cohort. Geographic spread and pandemic restrictions affected the ability to complete frailty assessment. This dedicated dietetic service for patients with cirrhosis complications improved dietary intake and nutritional status.

**WED-368**

*Impact of allelic HLA divergence on the risk of bacterial infections in cirrhotic patients awaiting liver transplantation*

Clementine Roger1, Alessandra Mazzola2, Romain Lhotte2, Maxime Mallet2, Dominique Thabut3, Jean Luc Taupin3, Filomena Conti2, 1Hôpital Paul-Brousse Ap-Hp, Villejuif, France, 2University Hospitals Pité Salpêtrière-Charles Foix, Paris, France, 3Saint-Louis Hospital, Paris, France.

Email: clementine49roger@gmail.com

**Background and aims:** Bacterial infections are frequent in cirrhotic patients and are associated with an increased risk of cirrhosis decompensation and death. The underlying immunologic mechanisms are not well known and the effect of allelic HLA divergence (AHLAD) on the risk of bacterial infections in humans has never been studied. However, higher AHLAD could bestow greater immunocompetence.

**Method:** We conducted an observational, retrospective, monocentric study. Cirrhotic patients awaiting liver transplantation (LT) in our center from 01/2019 to 02/2022 were included. The primary aim was to assess the impact of class I and class II AHLAD on the risk of bacterial infections. The secondary aim was the evaluation of the impact of AHLAD on the risk of cirrhosis complications.

**Results:** 269 cirrhotic patients listed for LT were included. The mean age was 56 years old (± 11) and the median MELD score was 14 (IQR 9–19). Overall, 153 bacterial infections were diagnosed in 98 patients. The cumulated incidence of bacterial infections was 36.4%. After multivariate analysis, a greater class II AHLAD was associated with reduced bacterial infections (beta coefficient −0.0057; IC 95% −0.011 to −0.0001; p = 0.034) while there was no effect of class I AHLAD (beta coefficient 0.0126; p = 0.074). Independent risk factors of bacterial infections (multivariate analysis) included the realization of invasive procedures (beta coefficient 0.1426; p < 0.001), hospitalization in an intensive care unit (beta coefficient 0.5141; p < 0.001), antibiotic therapy within three months preceding the listing (beta coefficient 0.2014; p = 0.046), rifaximin intake (beta coefficient 0.2066; p = 0.043) and the occurrence of cirrhosis complications (beta coefficient 0.3266; p = 0.002). There was no effect of class I or II AHLAD on the risk of cirrhosis complications (OR 0.97; p = 0.14 and OR 1; p = 0.63 respectively).
Conclusion: This is the first time that the effect of AHLAD on the risk of bacterial infections was studied in humans. High class II AHLAD could thus be considered as one of the immunological mechanisms underlying the risk of bacterial infections in this population.

WED-369
The impact of a massive transfusion protocol on the outcomes of patients with acute variceal bleeding: propensity score-matched analysis
Aryoung Kim1, Byeong Geun Song1, Myungji Goh1, Dong Hyun Sinn1, Wonseok Kang1, Geum-Yon Gwak1, Yong-Han Paik1, Moon Seok Choi1, Joon Hyeok Lee1. 1Department of Medicine, Samsung Medical Center, Sungkyunkwan University School of Medicine, Korea, Rep. of South Email: dh.sinn@samsung.com

Background and aims: A goal-directed massive transfusion protocol (MTP) improved mortality and morbidity in trauma patients with hemorrhagic shock. However, whether MTP can improve outcomes for acute variceal bleeding is not known.

Method: A retrospective cohort of 218 consecutive patients with acute variceal bleeding who visited the emergency room between July 2014 and June 2022 were analyzed. Of those, 19 patients receiving MTP (8.7%). The 42-days mortality rate and treatment failures (death within 5 days, a 3 g/dL drop in hemoglobin within any 24 hours, and failure of endoscopic hemostasis within the first 24 hours) were compared by MTP use in overall cohort, subgroup stratified by systolic blood pressure (SBP) and the Model for End-Stage Liver Disease (MELD) score, and in 1:4 propensity score matched cohort. Matching variables were age, gender, initial SBP and the MELD score.

Results: In overall cohort, the 42-days mortality rate (42.1% vs 1.5%, p < 0.001), death within 5 days (26.3% vs 0%, p < 0.001), 3 g/dL hemoglobin drop within any 24 hours (21.1% vs 0.5%, p < 0.001), and failure of endoscopic hemostasis within the first 24 hours (15.8% vs 0%, p < 0.001) were higher in MTP group. MTP was associated with increased risk of mortality at 42-days (adjusted hazard ratio: 21.2, 95% confidence interval: 3.0–148.4). When stratified by initial SBP, the 42-days mortality rate was higher in MTP group in patients with SBP < 100 mmHg (46.2% vs 3.7%, p < 0.001), and in patients with SBP ≥ 100 mmHg (33.3% vs 0.7%, p < 0.001). When stratified by MELD score, the 42-days mortality rate was higher in MTP group in patients with MELD score ≥ 13 (47.1% vs 3.5%, p < 0.001). In 1:4 propensity matched cohort (n = 56; MTP = 14), the 42-days mortality rate was also higher in MTP group (42.9% vs 2.4%, p < 0.001).

Conclusion: In patients with acute variceal bleeding, goal-directed MTP was associated with poorer clinical outcomes, including mortality and treatment failure rates. MTP use may not improve, or may even worsen, clinical outcomes in patients with acute variceal bleeding.

WED-370
Acute kidney injury related to metamizole in advanced chronic liver disease patients undergoing major orthopedic surgery
Lidia Canillas1,2,3, Amalia Pelegrina1,2,3, Elena Colominas1, Aina Salis3, César Jessé Enriquez-Rodriguez2,3, Antonia Caro1, Marc Puigvehí1,2, Teresa Broquetas1,2, Susana Coll1,2, NURIA Cahete1,2, Montserrat García-Retortillo1,2, Xavier Bessa1,2,3, Juan Carlos Álvarez5, Jose A. Carrión1,2,3, 4Hepatology section, Gastroenterology Department, Hospital del Mar, Barcelona, Spain, 5IMIM (Institut de Hospital del Mar d’Investigacions Mèdiques), Barcelona, Spain, 6Departament de Medicina i Ciències de la Vida, Universitat Pompeu Fabra, Spain, 7General Surgery and Digestive Department Hospital del Mar, Barcelona, Spain, 8Pharmacy Department, Hospital del Mar, Barcelona, Spain
Email: lidia.canillas.alaves@gmail.com

Background and aims: The use of metamizole and non-steroidal anti-inflammatory drugs (NSAIDs) is common after major orthopedic surgery, but they can lead to acute kidney injury (AKI) in patients with advanced chronic liver disease (ACLD).

Our objectives were to evaluate 1) the prevalence of patients treated with metamizole/NSAIDs and 2) the association with the development of complications (AKI or infections) during hospitalization.

Method: Retrospective, single-center study in patients with ACLD who underwent major orthopedic surgery (large joints and amputations) between 2010 and 2019. We recorded data about ACLD, comorbidities, analgesia, infection and type, development of AKI, hospital stay, and mortality. We defined severe infection if it required ICU admission, and multidrug-resistant microorganism (MDRM) if it presented resistance to ≥ 2 groups of antibiotics. Differences were compared with Chi-square or U-Mann Whitney tests, and the multivariate analysis was performed using binary logistic regression. Survival curves were contrasted with the Mantel-Cox test.

Results: Of 123 patients with ACLD who underwent major orthopedic surgery, 13 (11%) were excluded due to missing data. The median age (IQR) was 73 (62–82) years, 55% (61/110) were women, and 59% (75) Child-Pugh A. The ACLD etiology was viral in 52 (47%) and alcohol in 40 (36%) patients. The hospital stay was 11 (5–18) days. Metamizole and/or NSAIDs were administered in 84 (76.4%) patients: 62 (56.4%) metamizole and 39 (35.5%) NSAIDs. Infection was observed in 43 (35%) patients: urinary tract (25/122; 21%), skin/prosthesis (16/122; 13%), and respiratory (14/122; 12%). Severe and MDRM infections were present in 12% (5/43) and 35% (15/43), respectively. Patients who developed infection were older (79 vs. 68 years; p < 0.01) and predominantly women (70% vs. 50%; p = 0.04). During admission, AKI was found in 25 (23%) patients: 20 (80%) AKI-I, 4 (16%) AKI-II, and 1 (4%) AKI-III. AKI was not associated with hypertension, diabetes, chronic kidney disease, Child-Pugh, or portal hypertension (p = ns). Patients with AKI were older (83 vs. 70 years; p < 0.01), had lower albumin values (3.6 vs. 4.1 g/dl; p = 0.03), higher prevalence of infection (60% vs. 31%; p < 0.01) and higher metamizole administration (88% vs. 42%; p < 0.01). In the multivariate analysis, the prevalence of AKI was related to age > 75 years [aOR 5.6 (1.7–17.9) p < 0.01] and metamizole [aOR 7.0 (1.8–27.2) p < 0.01]. Postoperative mortality at 30 days was higher in patients with AKI (20% vs. 6%, Log-Rank = 0.03).

Conclusion: In our cohort of patients with ACLD, the use of metamizole after major orthopedic surgery was very frequent and
was associated with the development of acute renal failure during admission. These data suggest the need to optimize perioperative management of patients with ACLD.

**WED-371**

**Racial disparities in COVID-19 clinical outcomes among patients with cirrhosis in North America and Europe—an international registry study**

Umar Hayat\(^1\), Saba Afroz\(^2\), Faisal Kamal\(^3\), Muhammad Haseeb\(^4\), Faisal Inayat\(^5\), Muhammad Kamal\(^6\), Andrew Moon\(^7\), Geisinger Health, Internal medicine, division of gastroenterology, Wilkes-Barre, United States, Geisinger Health, Internal medicine, Wilkes-Barre, United States, Thomas Jefferson University hospital, Internal medicine, division of gastroenterology, Philadelphia, United States, Beth Israel Deaconess medical center, Internal medicine, Boston, United States, Jinnah hospital Lahore, Internal medicine, Lahore, Pakistan, Essen Health Care, Internal medicine, New York, United States, University of North Carolina, Division of Gastroenterology and Hepatology, Chapel Hill, United States

Email: umarhayat216@gmail.com

**Background and aims:** Patients with decompensated cirrhosis have a higher risk of hospitalization, ICU admission, and death from COVID-19. The degree to which these outcomes vary with race and ethnicity is unclear.

**Method:** We used the SECURE-Liver and COVID-19 databases to explore disparities in COVID-19 outcomes among patients with cirrhosis. Patients were stratified by continent (North America and Europe). We defined race/ethnicity as white/non-Hispanic, black/non-Hispanic, and Hispanic for patients from North America. We stratified black patients in our European cohort, we defined race/ethnicity as white/non-Hispanic and non-white/non-Hispanic for Europe. Bivariate and multivariable logistic regression analyses were performed to determine the association between race/ethnicity and hospitalization, ICU admission, and death. Variables in the multivariable model included age, sex, CTP class, and comorbidity index (CI) (sum of obesity, hypertension, DM, CKD).

**Results:** Our cohort included 718 patients with cirrhosis and COVID-19 from North America (n = 290) and Europe (n = 428). In the North American subgroup, 51% of patients were white/non-Hispanic, 32% were black/non-Hispanic, and 17% were Hispanic. Black patients had a higher prevalence of comorbidities than white patients (CI 1.86 vs. 1.83, \(p = 0.007\)). Compared to white patients, a higher proportion of black patients were hospitalized (77% vs. 85%, \(p = 0.01\)), admitted to the ICU (27% vs. 40%, \(p = 0.05\)), and died (18% vs. 28%, \(p = 0.07\)) (Figure 1). Hispanic patients had the lowest proportions of clinical outcomes in all three groups. In the multivariable analysis, there were no statistically significant differences in the odds of clinical outcomes between white, black, and Hispanic patients. In the European cohort, 82% of patients were white/non-Hispanic, and 17% were non-white/non-Hispanic. White patients had a higher prevalence of comorbidities than non-white patients (CI 1.63 vs. 1.31, \(p = 0.02\)). However, compared to white patients, a higher proportion of non-white patients were hospitalized (82% vs. 67%, \(p = 0.01\)) and admitted to the ICU (15% vs. 18%, \(p = 0.04\)), but fewer patients died (28% vs. 34%, \(p = 0.01\)) (Figure 1). In multivariable analyses, there were no statistically significant differences in the odds of clinical outcomes between the two groups.

**Conclusion:** In conclusion, black patients in North America had a higher risk of hospitalization, ICU admission, and death than white patients. Similar findings were shown in the Europe subgroup; however, white patients had a higher risk of death than non-whites. There were no statistically significant differences for any outcomes after adjusting for potential confounders. The increased likelihood of poor outcomes in non-white patients, particularly in North America, may be driven by non-liver-related comorbidities.
esophageal variceal bleeding, 0.9% (n = 1) presented bleeding due to portal hypertension gastropathy and 3.2% patients (n = 3) presented minor bleeding in other locations. No patient died due to hemorrhagic complications.

**Conclusion:** In our study, patients with liver cirrhosis and non-tumor splenic-portal thrombosis responded to anticoagulant treatment effectively. This treatment has achieved global thrombosis recanalization in more than half of cases, with an acceptable safety profile. Finally, in our analysis, we do not find some predictive factors of response to anticoagulation therapy.

**WED-373**

**Normalisation of the psychometric hepatic encephalopathy score in a Nigerian population**

Mansur Mohammed1, Musa Muhammed Borodo2,
Shettima Kagu Mustapha3, 1University Hospitals of Leicester NHS Trust, Leicester, United Kingdom, 2Aminu Kano Teaching Hospital, Medicine, Kano, Nigeria, 3Ahmadu Bello University Teaching Hospital, Medicine, Zaria, Nigeria

Email: mansurfm@gmail.com

**Background and aims:** Minimal hepatic encephalopathy (MHE) is part of the spectrum of hepatic encephalopathy (HE) with subtle cognitive and motor deficits, often not detected by routine clinical examination. The psychometric hepatic encephalopathy score (PHES) has been recommended as gold standard for the diagnosis of MHE, to allow for early diagnosis and treatment, and prevent progression to overt HE. Normalisation studies have been carried out in different countries to determine local norms and cut off values for diagnosis. This study aimed to construct normograms for the PHES test in the Nigerian population, calculate the cut off value for diagnosing MHE, and determine the prevalence of MHE among patients with liver cirrhosis.

**Method:** Two hundred apparently healthy subjects and 85 patients with liver cirrhosis but without overt hepatic encephalopathy were recruited. They all undertook the PHES test which include Number Connection Test-A (NCT-A), Number Connection Test-B (NCT-B), Digit Symbol Test (DST), Serial Dotting Test (SDT) and Line Tracing Test (LTT). The time taken for each subtest was converted to scores and summed up to give the final score of PHES. The cut off for abnormal PHES score was determined using results from the healthy subjects. Normal range of scores was taken as within mean ± 2 SD. Abnormal PHES was set at PHES score less than -2 SD from the mean. Pearson’s correlation coefficient was used to identify variables that confounded the PHES scores. These were then entered into multiple linear regression to construct formulas to remove the effect of these confounders and predict the PHES scores in the cirrhotic group. Using these formulas, PHES score was calculated in the cirrhotic patients and prevalence of MHE was determined. Chi square test was used to test for association between MHE and categorical variables and prevalence of MHE was determined. Chi square test was used to test for association between MHE and categorical variables and prevalence of MHE was determined. Chi square test was used to test for association between MHE and categorical variables and prevalence of MHE was determined. Chi square test was used to test for association between MHE and categorical variables and prevalence of MHE was determined.

**Table 1:** Formulas for Predicting the PHES Score

<table>
<thead>
<tr>
<th>PHES Test</th>
<th>Equation</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCT-A</td>
<td>42.37 + (0.565 × Age) - (1.454 × Education Years)</td>
<td>6.400</td>
</tr>
<tr>
<td>NCT-B</td>
<td>100 + (0.677 × Age) - (2.212 × Education Years)</td>
<td>10.635</td>
</tr>
<tr>
<td>DST</td>
<td>35 - (0.187 × Age) + (0.457 × Education Years)</td>
<td>3.156</td>
</tr>
<tr>
<td>SDT</td>
<td>100 + (0.716 × Age) - (1.162 × Education Years)</td>
<td>9.610</td>
</tr>
<tr>
<td>LTT</td>
<td>187 + (1.023 × Age) - (1.918 × Education Years)</td>
<td>19.932</td>
</tr>
</tbody>
</table>

**Conclusion:** This study constructed the Nigerian PHES normograms and determined a local cut-off value for MHE in Nigeria. It identified a high prevalence of MHE, underscoring the need for routine screening in patients with liver cirrhosis. Development of easily accessible online calculators using these normograms will aid easy and accurate diagnosis of MHE in clinical settings.

**WED-374**

**Nutritional status of patients with advanced chronic liver disease: descriptive baseline of a prospective study**

Estela Soria López1, Laura Rey Fernández2, Jorge Alberto Costa Fernandez3, Francisco Rivas Ruiz4, Jose Miguel Rosales Zabal1, 1Hospital Costa del Sol, Gastroenterology and Hepatology, Marbella (Málaga), Spain, 2Hospital Costa del Sol, Hospital Pharmacy and Nutrition Unit, Spain, 3Hospital Costa del Sol, Radiology Unit, Spain, 4Hospital Costa del Sol, Investigation Unit, Spain

Email: estelasoria89@gmail.com

**Background and aims:** Malnutrition in patients with advanced chronic liver disease is a prognostic factor, however, often forgotten in clinical practice. We analyzed the nutritional status of a prospective cohort in our healthcare area.

**Method:** Baseline descriptive analysis of a prospective study to assess nutritional status and evolution after starting oral supplementation. We included patients from day hospital (ascites unit) and hepatology consultation, identified as at risk or malnourished, with prior informed consent. After nutritional screening with Subjective Global Assessment (SGA), Malnutrition Universal Screening Tool (MUST) and Royal Free Hospital-Nutritional Prioritizing Tool (RFH-NPT), we performed anthropometry, dynamometry (hand pressure strength), blood tests, critical flicker frequency test (CFF), SF-36 health questionnaire and determination of the musculoskeletal index by measuring muscle mass at the L3 level by CT scan.

**Results:** 37 patients, 81% male. Median time in cirrhosis 2 years. Place of nutritional assessment: 27 day hospital, 9 nutrition consultation, 1 inpatient. Etiology: 1 HBV and 36 alcohol (6 mixed: 4 viral, 1 metabolic, 1 lymphoma). Portal hypertension data: 67.6% portal dilatation, 62.2% splenomegaly, 70% variceous veins. Decompensations: 85% ascites, 24% encephalopathy, 5.4% variceal upper gastrointestinal haemorrhage, 16% spontaneous bacterial peritonitis, 8% hepatorenal syndrome. Functional status: Child-Pugh (9A, 20B, 6C, 2 not listed for anticoagulation), median MELD 13, median MELD-Na 17.
Background and aims: Despite the significant global increase in liver disease over the last few decades and the high symptom burden for affected patients, access to palliative care (PC) is historically low and referrals happen late in the disease trajectory. Furthermore, the literature on PC in this area is sparse compared to other chronic diseases. This study aims to add to the evidence surrounding the utilization of PC services by this population, and to analyze the underlying reasons for referral as well as the morbidity and outcomes of referred patients.

Method: This study retrospectively reviewed charts of adult patients (18 years or older) with advanced-stage liver disease referred to a specialized PC clinic between May 2019 and May 2022. Data collected included type of primary liver disease, functional status (measured using the Palliative Performance Scale (PPS), a discrete numerical scale from 0% to 100%), and intensity of symptoms at the time of the first visit (using the Edmonton Symptoms Assessment System (ESAS), a discrete numerical scale from 0 to 10 used by patients to grade the intensity of common symptoms), candidacy for liver transplant, comorbidities, outcomes from the clinic (discharge, transfer for other modality of PC, continued care in the clinic, loss of follow-up or death during follow-up) and time and place of death. The study was approved by the research ethics board at University Health Network (UHN). Descriptive statistics were used to analyze data.

Results: Fifty-four patients were included, 30 (55.6%) were male and 70 years was the median age. Cirrhosis secondary to viral hepatitis was the most common diagnosis (18 patients, 33.3%) followed by alcohol-associated liver disease (17, 31.5%). A significant number of patients (24, 44.4%) also had hepatocellular carcinoma and 44 (81.5%) had more than two comorbidities. Forty (64.1%) patients were referred for both symptom management and palliative planning, and 5 patients (9.3%), for symptom management alone. Seven patients (13.0%) were candidates for a liver transplant, of whom 4 (57.1% of candidates) underwent transplantation. Regarding function, 33 patients (61.1%) had a PPS between 50–60% and none had a PPS of 30% or lower. Regarding their symptoms, the overall mean score per symptom on ESAS was 3.6 (median 3) (out of 10) and fatigue had the highest score (6.4, median 7), followed by lack of well-being (average 4.2, median 4) and lack of appetite (3.7, median 4). Patients were followed in the PC clinic for an average of 15.7 weeks (median of 10 weeks) with a mean of 4.6 (median of 3) visits. Outcomes from the clinic were related to clinical deterioration for 36 patients (66.7%) and 19 (35.4%) had their care transferred to home-visiting PC physicians (19, 35.4%) while 8 (14.8%) were referred to PC units. 36 patients (66.7%) died, with a mean survival of 31.2 weeks (median of 24 weeks).

Conclusion: Despite being referred for PC when presenting with an intermediate functional capacity and low symptom burden, patients

Figure:

**Conclusion:** Using several tools increases the reliability of nutritional risk assessment. RFH-NPT overestimates the risk of malnutrition in decompensated patients, compared to SGA and MUST, which are comparable. There are no differences in the distribution of malnutrition according to Child-Pugh. Micronutrient deficiency and frailty determined by dynamometry are frequent; sarcopenia is not, but there is a good correlation between dynamometry and CT. Malnutrition does not seem to influence CFF. Currently evaluating the impact of the implementation of a nutritional treatment.

**WED-375**

Experiences from a palliative care clinic specialized in liver diseases-utilisation, clinical characteristics of patients and outcomes

Fernando Xavier e Silva¹, Elizabeth Lee², Hemant A Shah², David Wong², Breffni Hannon³, Kirsten Wentlandt¹, Ebru Kaya¹

¹University of Toronto, Department of Supportive Care-Palliative Care, Toronto, Canada, ²University of Toronto, Toronto Centre for Liver Disease (TCLD), Toronto, Canada, ³University of Toronto, Department of Supportive Care-Palliative Care-Princess Margaret Cancer Centre, Toronto, Canada

Email: silva.fernandoxavier@gmail.com
had high mortality and short follow-up and survival. More flexible
criteria for PC referrals may be considered, possibly through a better
understanding of prognostic factors for this population, to promote
earlier referrals and better and longer support for patients and their
families.

WED-376
Booster SARS-CoV-2 vaccination elicits robust antibody response
to wild type but not Omicron subvariants BA.4/5 in patients with
cirrhosis
Qian Zhu1, Lu Wang1, Xiaoxiao Hu1, Dejuan Xiang1, Ming-Li Peng1,
Dachuan Cai1, Xiaofeng Shi1, Hong Ren1. 1Institute for Viral Hepatitis,
The Second Affiliated Hospital, Chongqing Medical University, China
Email: renhong0531@cqmu.edu.cn

Background and aims: Our aim is to determine immune efficacy of
booster SARS-CoV-2 vaccination in cirrhotic patients who had
received the 2-dose inactivated vaccines.

Method: We performed a longitudinal assessment in 48 patients
with cirrhosis to continuously track the dynamics of SARS-CoV-2
specific antibodies and memory B cells after receiving the primary 2-
dose series and booster dose. Neutralizing antibodies (NAbs) in
serum samples were evaluated by capture chemiluminescence
immunoassays. Neutralizing activity against Omicron subvariants
BA.2.12.1, BA.4 and BA.5 was examined by pseudovirus neutralization
assay.

Results: Serum neutralizing antibodies levels in cirrhotic patients
were elevated in the early 15–45 days after primary series before
rapidly declining and reaching a valley at around 165–195 days. After
receiving the booster dose, the NAbs level was re-increased
significantly (0.1 μg/ml vs. 0.8 μg/ml, p = 0.001). 1 month after a
booster dose, the serum geometric mean titer (GMT) against Omicron
subvariants BA.2.12.1 and BA.4 (BA.2.12.1, 1.9-fold; BA.4, 2.4-fold), and even exhibited a
significant lower GMT against the Omicron subvariants BA.5 (3.3-
fold, p = 0.042).

Conclusion: Booster SARS-CoV-2 vaccination elicits robust antibody
response to wild type but not Omicron subvariants BA.4/5 in patients
with cirrhosis. Repeated vaccination of inactivated SARS-CoV-2
vaccine might dampen neutralization activity against newly circu-
lating strains.

WED-377
Poorer results in the clinical frailty scale are associated with
coverd and overt hepatic encephalopathy in patients with
cirrhosis
Eva Maria Schleicher1,2, Leonard Kaps1,2, Jörn Schattenberg1,2,
Peter Galle1,2, Marcus-Alexander Wörns3, Simon J. Gairing1,2,
Christian Labenz1,2, 1University Medical Center of the Johannes
Gutenberg-University, Department of Internal Medicine I, Mainz,
Germany, 2University Medical Center of the Johannes Gutenberg-
University, Cirrhosis Center Mainz (CCM), Mainz, Germany, 3Klinikum
Dortmund, Department of Gastroenterology, Hematology, Oncology and
Endocrinology, Germany
Email: eva.schleicher@unimedizin-mainz.de

Figure: (abstract: WED-376).
Background and aims: Hepatic encephalopathy (HE) is associated with impaired quality of life, poor prognosis, and frequent hospitalizations in patients with liver cirrhosis. Frailty increases the vulnerability to internal and external stressors and may therefore be an indicator of a higher frequency of cirrhosis complications. We aimed to investigate the association of the rapidly applicable Clinical Frailty Scale (CFS) with overt HE (CHE) and overt HE (OHE) development in patients with cirrhosis.

Method: This study analyzed data from 228 outpatients or electively hospitalized patients with cirrhosis recruited at the Cirrhosis Center Mainz, Germany. Frailty was assessed using the CFS. Patients were examined for the presence of CHE at study inclusion using the West-Haven-Criteria (HE1) and the psychometric hepatic encephalopathy score (PHES). All patients were prospectively followed regarding the development of OHE.

Results: Patients had a median age of 60 years, and the predominant etiology of liver cirrhosis was alcoholism (32.5%), followed by viral hepatitis (19.7%). Median CFS was 3 (IQR 2; 3) in 26 (11.4%) patients were at least pre-frail (CFS >3) according to CFS. The majority of the patients were in a compensated state of cirrhosis (Child–Pugh A/B/C: 60.5%/30.3%/9.2%), and the median MELD at baseline was 10 (IQR 8; 14). CHE was detected in 71 patients (31.1%), and 33 (14.5%) had a history of OHE. In a multivariable logistic regression analysis that included the subcohort of patients without a history of OHE (n = 195), a higher CFS was independently associated with the presence of CHE at baseline (OR 1.7, 95% CI 1.1–2.6, p = 0.027), whereas age, MELD, sodium, albumin or a history of ascites were not. During a median follow-up of 436 days (IQR 191; 712), 42 (18.4%) patients developed an episode of OHE. In multivariable Cox regression analyses, a higher CFS was independently associated with the development of OHE in the total cohort (HR 2.1, 95% CI 1.5–2.9, p < 0.001) and the subcohort of patients without a history of OHE (HR 1.7, 95% CI 1.2–2.8, p = 0.008) after adjusting for age, MELD, sodium, albumin, CHE or a history of OHE (only in the model including the total cohort).

Conclusion: Frailty, as defined by the CFS, is associated with CHE and OHE development. The CFS appears to be a reliable tool to identify patients at higher risk of HE in whom intensified treatment and monitoring may be justified.

WED-378 Anemia in cirrhotic patients is a risk factor for esophageogastric variceal bleeding and mortality
Elena Santos Perez1, Elba Ilop1, Marta López-Gómez2, Marta Hernández Conde1, Carlos Fernández-Carrillo1, Esther Maderuelo1, Jiacheng Cao1, Natalia Fernández Puga1, José Luis Martínez Ponzas1, Javier Abad Guerra1, Christie Pereló1, Maria Trapero1, Enrique Fraga1, José Luis Calleja Panero1, Hospital Universitario Puerta de Hierro, Majadahonda (Madrid), Spain
Email: elenasantosperez@gmail.com

Background and aims: In liver cirrhosis (LC), anemia has been related to a worsening of the hyperdynamic state associated with portal hypertension, its clinical impact being unknown. There is a lack of longitudinal studies analyzing anemia as a risk factor for relevant outcomes in LC, such as esophageogastric variceal bleeding (EGVB) and mortality.

Method: Cases and controls. A retrospective series of consecutive cases with LC and EGVB (January 2017–December 2021) with laboratory tests in the first year prior to the episode and a historical cohort of control patients with LC without EGVB during their prospective follow-up were included. Demographic, baseline laboratory and clinical data up to death were analyzed.

Results: 556 patients (61 cases, 495 controls) were selected. The mean follow-up time for cases was 24 months (SD 21.7) and for controls 92.3 months (SD 23.1). Given the known influence of age, sex and liver function (Child-Pugh) on variceal bleeding, a 3:1 matching was performed according to these variables, finally including 252 patients (51 cases, 151 controls). In multivariate analysis of the paired data, the only independent factor associated with variceal bleeding was baseline haemoglobin (OR 2.57; p = 0.01). The prevalence of death in the overall cohort was 111 (20.2%). Cox proportional hazards analysis confirmed anemia (Hb <12g/dL) as a baseline variable independently related to mortality (HR 2.0; CI 1.3–3.0; p = 0.002), as well as age (HR 1.03; CI 1.02–1.05; p < 0.001), liver function (Child Pugh B/C) (HR 1.8; CI 1.2–2.7; p = 0.03) and variceal bleeding (HR 6.7; CI 3.9–11.6; p < 0.001).

Conclusion: Anemia in cirrhotic patients should be considered as a risk factor for variceal bleeding, is globally associated with higher mortality and it is necessary to study whether it corresponds to a worse hyperdynamic state and to perform close monitoring when it appears.

WED-379 Prucalopride : a novel and safe usage for reducing incidence of hepatic encephalopathy in decompensated cirrhosis
Manasa Alla1, Vinod Aroa2, Shantan Venishetty1, Imran Khan1, Shiv Kumar Sarin1, 1Institute of Liver and Biliary Sciences, New Delhi, India
Email: shivsarin@gmail.com

Background and aims: Prevention of recurring episodes of hepatic encephalopathy in cirrhotics is vital for improving morbidity and mortality. Previous studies have shown efficacy of lactulose and conflicting results with rifaximin in preventing breakthrough episodes in those with recurrent HE. Prucalopride remains a promising addition and study has been conducted to evaluate its safety and efficacy as a part of secondary prophylaxis in cirrhotic patients.

Method: It was a retrospective data analysis with follow-up done at Institute of Liver and Biliary Sciences, New Delhi from Jan 2021–July 2022. Of 144 cirrhotics screened with HE, 78 cirrhotics with ≥ 2 prior episodes of overt HE despite receiving standard dosage of rifaximin (15–20 mg/kg/day) and lactulose in previous 6 months were analyzed. Patient then received prucalopride (1 mg/day) along with the standard therapy to maintain at least 3 soft stools/day. Number of overt HE episodes and adverse events over 6 months follow-up were recorded.

Results: 78 patients with the mean age 58.42 ± 12.32 years were analyzed. 20/78 (25.6%); 34/78 (43.6%); 24/78 (39.8%) were in CTP A, B and C class respectively. Mean CTP and MELD were 9.42 ± 1.56 and 19.86 ± 4.83 respectively. Alcohol (28/78 (35.9%)) was the most common aetiology of liver cirrhosis followed by NASH (25/78 (32.05%)). Median number of HE episodes (6 months) was 2 (0, 3) episodes and stool frequency (/day) at baseline was 1 (0, 2) respectively. 19/78 (24.3%) had presence of porto-systemic shunt. Mean duration of treatment for prucalopride was 90.23 ± 21.65 days. Median number of HE episodes; HE requiring hospitalization (/6 months) and stool frequency (/24 hours) with prucalopride was 1 (0, 2); 1 (1, 3), 3 (2, 5) respectively. Mean reduction in HE episode (/6 month) with prucalopride was –0.8 ± 0.3, similarly mean increase in stool frequency (/Day) was noted (+1.2 ± 0.6). HE episode requiring ICU hospitalization was 1 (0, 2), >1 episode and >2 episode HE was seen in 17/78 (21.8%); 9/78 (11.5%) patients. Mortality at 6 months was found to be 12/78 (15.4%); 11/78 (14.1%) patients experienced bloating, abdominal discomfort and diarrhea (>6 episodes/d) was noted in 9/78 (11.5%) patients. 3/78 (3.8%) had worsening liver functions. No adverse events requiring discontinuation were noted. Limitation of the study was intestinal transit time could not be measured.

Conclusion: Our study showed that the addition of prucalopride reduced the incidence of hepatic encephalopathy in addition to lactulose and rifaxamine and can be safely used in advanced cirrhotics.
WED-380
Surgical subtype predicts adverse outcomes and costs among non-alcoholic cirrhotic patients
Christopher Tail1, Carolyn Catalano2, Ankoo Patel2, Carlos Minacapelli1, Yiu Li1, Vinod Rustgi1, 1Rutgers Robert Wood Johnson Medical School, New Brunswick, United States, 2Rutgers Robert Wood Johnson Medical School, United States
Email: ctt612@rwjms.rutgers.edu

Background and aims: Patients with cirrhosis are at increased risk of complications following surgery from multiple factors including portal hypertension and alterations in hemostasis. Gaps remain in our understanding of the cost and morbidity of cirrhotic patients who undergo surgery, particularly with respect to surgical subtype.

Method: We conducted a case-control study using the IBM Electronic health Record (EHR) MarketScan Commercial Claims (MSCC) databases from January 1st 2007 to December 31st 2017. Non-alcoholic cirrhotic patients who underwent surgery were identified based on ICD-9/ICD-10 codes for multiple surgical categories and matched with controls with cirrhosis who did not undergo surgery. Outcomes in the 6-month period following surgery were analyzed between matched groups and a cost analysis was performed. Cirrhotic patients were analyzed for adverse outcomes and cost for 9 different surgical subtypes.

Results: Mortality was increased in the cirrhotic patients undergoing surgery compared with the nonsurgical group (4.68% vs 2.38%, P < 0.001). Among surgical subtypes, mortality was highest in gastrectomy (6.33%) and colectomy (6.00%), while lowest for total hip replacement (THR) (0%) and cholecystectomy (1.43%). The surgical cirrhotics had higher rates of adverse hepatic outcomes than the nonsurgical cirrhotics, including hepatic encephalopathy (HE) (5.00% vs 2.50%, P < 0.0001), spontaneous bacterial peritonitis (SBP) (0.64% vs 0.25%, P < 0.0001), and higher rates of adverse hepatic outcomes. Among cirrhotics by surgical subtype (Figure 1), high rates of adverse hepatic outcomes were noted for colectomy and gastrectomy, with lower rates for total knee replacement (THR) and appendectomy. Healthcare utilization analysis revealed significantly increased costs in the surgical cohort ($58,246 vs $26,842, P < 0.0001), largely due to increased inpatient costs ($34,446 vs $10,789, P < 0.0001).

Stratifying by surgical subtype, colectomy and gastrectomy had highest total costs ($131,983 and $109,796), with relative high costs due to increased inpatient costs ($34,446 vs $10,789, P < 0.0001), largely from THR ($98,742) and TKR ($98,873).

Conclusion: Non-alcoholic cirrhotics undergoing surgery experienced worse mortality and adverse hepatic and nonhepatic outcomes. Gastrectomy and colectomy had the highest adverse event rates relative to other surgical subtypes. Claims and costs analysis showed significantly increased costs in the surgical group, largely due to the cost of more frequent and longer inpatient admissions.

Table (abstract: WED-380).

<table>
<thead>
<tr>
<th>Patient Outcome</th>
<th>Cholecystectomy</th>
<th>Appendectomy</th>
<th>Total knee replacement</th>
<th>Gastrectomy</th>
<th>Colectomy</th>
<th>Hernia repair</th>
<th>Total hip replacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death [n (%)]</td>
<td>(n = 3,994)</td>
<td>(n = 1,984)</td>
<td>(n = 1,013)</td>
<td>(n = 1,058)</td>
<td>(n = 517)</td>
<td>(n = 264)</td>
<td>(n = 61)</td>
</tr>
<tr>
<td></td>
<td>57 (1.43)</td>
<td>51 (2.57)</td>
<td>24 (2.37)</td>
<td>67 (6.33)</td>
<td>31 (6.00)</td>
<td>8 (3.03)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>(3.03)</td>
<td>(7.20)</td>
<td>(9.65)</td>
<td>(17.41)</td>
<td>(5.38)</td>
<td>(1.64)</td>
<td></td>
</tr>
<tr>
<td>Ascites [n (%)]</td>
<td>232 (5.81)</td>
<td>61 (3.07)</td>
<td>10 (0.99)</td>
<td>111 (10.49)</td>
<td>90 (17.41)</td>
<td>19 (4.60)</td>
<td>4 (6.56)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>137 (12.95)</td>
<td>(6.56)</td>
<td>(1.51)</td>
<td>(1.64)</td>
<td></td>
</tr>
<tr>
<td>Hepatic Encephalopathy [n (%)]</td>
<td>52 (1.30)</td>
<td>21 (1.06)</td>
<td>13 (1.28)</td>
<td>137 (12.95)</td>
<td>26 (5.03)</td>
<td>2 (0.76)</td>
<td></td>
</tr>
<tr>
<td>Average Healthcare Costs (USD/patient)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Cost</td>
<td>33,483</td>
<td>25,059</td>
<td>63,235</td>
<td>68,523</td>
<td>98,057</td>
<td>34,325</td>
<td>99,807</td>
</tr>
<tr>
<td>Inpatient Cost</td>
<td>14,361</td>
<td>8,961</td>
<td>43,872</td>
<td>42,772</td>
<td>66,746</td>
<td>8,365</td>
<td>75,768</td>
</tr>
<tr>
<td>Average Length of Stay [days]</td>
<td>2.11</td>
<td>1.43</td>
<td>5.01</td>
<td>9.86</td>
<td>10.47</td>
<td>1.43</td>
<td>9.97</td>
</tr>
<tr>
<td>Outpatient Cost</td>
<td>14,973</td>
<td>10,475</td>
<td>14,148</td>
<td>19,174</td>
<td>26,302</td>
<td>20,874</td>
<td>17,342</td>
</tr>
</tbody>
</table>

WED-381
Analysis of surgical risk in patients with advanced chronic liver disease and major orthopedic surgery from a gender perspective
Lidia Canillas1,2,3, Amalia Pelegrina2,3,4, Elena Colominas5, Aina Salis3, César Jesús Enriquez-Rodríguez2,3, Antonia Caro1, Marc Puigvehí1,2, Teresa Broquetas1,2, Susana Coll1,2, NURIA Cañete1,2, Montserrat García-Rettortillo1,2, Xavier Bessa1,2,3, Juan Carlos Álvarez2, Jose A. Carrión1,2,3, 1Hepatology section, Gastroenterology Department, Hospital del Mar, Barcelona, Spain, 2IMIM (Institut Hospital del Mar d’Investigacions Mèdiques), Barcelona, Spain, 3Departament de Medicina i Ciències de la Vida, Universitat Pompeu Fabra, Spain, 4General Surgery and Digestive Department Hospital del Mar, Barcelona, Spain, 5Pharmacy Department, Hospital del Mar, Barcelona, Spain, 6Anesthesiology Department, Hospital del Mar, Barcelona, Spain
Email: lidia.canillas.alaves@gmail.com

Background and aims: Improvements in medical care and increased life expectancy have raised the need for major orthopedic surgery in patients with advanced chronic liver disease (ACLD). However, the prevalence of women is underrepresented in the cohort of patients used to create the VOCAL-Penn surgical risk score. Our objective was to assess differences in the risk of surgery, postoperative complications, and mortality in patients with ACLD who underwent major orthopedic surgery from a gender perspective.

Method: Retrospective, single-center study in patients with ACLD who underwent major orthopedic surgery (large joints and amputations) between 2010 and 2019. Comorbidities, data on ACLD, estimated surgical risk, analgesic use with metamizole/non-steroidal anti-inflammatory drugs (NSAIDs), postoperative complications such as acute kidney injury (defined by Kidney Disease Improving Global Guidelines) and infections, hospital stay, and mortality were collected. Differences between gender were compared using the Fisher, Chi-square, or U-Mann Whitney tests, as appropriate. Survival curves were contrasted with the Mantel-Cox test.

Results: Of 123 patients, 13 (11%) were excluded from the analysis due to missing data. Women represented 55% (61/110) of the cohort. The median age (IQR) of women was 76 (66–83) years and of men 68 (58–79) [p = 0.02]. No differences were found in body mass index, diabetes, and chronic kidney disease. However, women had a higher prevalence of hypertension (61% vs. 39%; p = 0.03) and a lower prevalence of chronic obstructive pulmonary disease (5% vs 18%; p = 0.03). The predominant etiology of ACLD was viral (57%) in women and alcohol (55%) in men [p = 0.001]. No difference was found between gender in liver function (Child-Pugh A 41% vs. 39%), bilirubin, ASA scale, emergency of surgery, and estimated VOCAL-Penn surgical risk at 30, 90, and 180 days; while women showed lower values of albumin (3.8 vs. 4.1 g/dl; p = 0.03) and platelets (108 vs. 143 × 109/L; p = 0.02). There were no differences in the...
administration of metamizole/NSAIDs or the development of AKI at postoperative admission. But, women developed more infections (48% vs. 25%, p = 0.02), especially in the urinary tract (24% vs. 6%, p < 0.001). No differences were found in the percentage of severe or nosocomial infections, neither related to multiresistant microorganisms. However, postoperative mortality at 30 days (13% vs. 4%; Log-Rank = 0.09) and 180 days (28% vs. 12%; Log-Rank = 0.04) was higher in women than in men.

**Conclusion:** Age and comorbidities differ in women with ACLD who underwent major orthopedic surgery. Although the VOCAL-Penn surgical risk score does not show significant differences in expected mortality between gender, the percentage of infections and observed mortality was higher in women. These data suggest the need to optimize perioperative management of patients with ACLD from a gender perspective.

**WED-382**

**Availability and affordability of services affects outcome in hospitalized patients with cirrhosis-results from CLEARED consortium**

Ashok Choudhury1, Qing Xie2, Patrick S. Kamath3, Mark Topazian4, Shiv Kumar Sarin5, Peter Hayes6, Aldo Torre7, Haiemichael Desalqen8, Ramzan Ildiman9, Zhujun Cao10, Shiva Kumar11, Adrian Gadano11, Alexander Prudence12, Patricia Zetelli13, Chimay Bera14, Monica Dahiya15, Ponan Ponan Claude Regis Lah16, Marco Arrese17, Jordan Wu18, Yingling Wang19, Man Su20, Xinrui Wang21, Feng Peng22, Wei Wang23, Dendong Yin24, Yijing Cai25, Xuchen dong26, Wei Wang27, Liyan Zhang28, Yanyun Zhang29, Huan Deng30, Nabil Debzi31, Sean Yin32, Cheng Dong33, Mustapha Bacha University Hospital, Algiers, Algeria,34NIHR Nottingham Biomedical Research Centre, Nottingham University Hospitals, United Kingdom,35Queen Elizabeth University Hospitals, Birmingham, United Kingdom,36Glasgow Royal Infirmary, United Kingdom,37Royal Berkshire Hospital, United Kingdom,38Department of Medicine, School of Clinical Medicine, The University of Hong Kong, Hong Kong,39Tel-Aviv Sourasky Medical Center, Tel Aviv, Israel, Israel,40Asian institute of Gastroenterology, Hyderabad, India,41Dept. of Gastroenterology and Human Nutrition, AIIMS, New Delhi, India,42Dept. of Liver Transplant Surgery, Dr. Rela Institute and Medical Centre, Chennai, India,43Sir Ganga Ram Hospital, Delhi, India,44CMC Vellore, India,45Sanjay Gandhi Postgraduate Institute of Medical Research, Lucknow, India,46KIMS BHUBANESWAR, India,47Centro Médico ISSEMYM, Mexico, Mexico,48Hospital General de Mexico “Dr. Eduardo Liceaga”, Mexico,49Instituto Nacional de Ciencias Médicas y Nutrición “Salvador Zubirán”, Mexico City, Mexico,50Instituto de la Salud Digestiva, Guadalajara, Mexico,51Hospital Civil de Guadalajara Fray Antonio Alcalde, Guadalajara, Mexico,52University of Malaysia, Kuala Lumpur, Malaysia, Malaysia,53Jos University Teaching Hospital Jos, Nigeria, Nigeria,54National Center for Gastroenterology and Liver Disease, Kranktum, Sudan,55Singapore General Hospital, Singapore,56Chulalongkorn University and King Chulalongkorn Memorial Hospital, Bangkok, Thailand, Thailand,57University of Ankara, Turkey,58Marmara University, Istanbul, Turkey,59Gaziantep University, Turkey,60Ege University, Izmir, Turkey,61Mersin University, Mersin, Turkey,62Adeniz University, Antalya, Turkey,63Baylor Dallas (Baylor University Medical Center), United States,64University of Pennsylvania, United States,65Mayo Scottsdale, United States,66University of Washington, United States,67Mercy Medical Centre, Baltimore, United States,68University of Pittsburgh, United States,69Hospital de Clinicas de Porto Alegre, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil, Brazil,70Storr Liver Centre, The Westmead Institute for Medical Research and Westmead Hospital, University of Sydney, Sydney, Australia, Australia,71Virginia Commonwealth University and Central Virginia Veterans Healthcare System, Richmond, USA, United States

Email: doctor.ashokchoudhury@gmail.com

**Background and aims:** Treatment of inpatients with cirrhosis requires availability of several expensive interventions such as intensive care (ICU) and endoscopy, medications such as rifaximin, terlipressin and IV albumin. Also, the infrastructure and affordability of liver transplant (LT) and palliative care is needed for optimal management. These may vary in access and affordability globally.

**Aim:** evaluate, access and affordability of important resources for inpatient cirrhosismangement from Principal Investigators (PIs) from the Chronic Liver disease Evolution And Registry for Events and Important Services (CLEDVERS) consortium.

**Method:** CLEDVERS consortium enrolled in patients with cirrhosis admitted non-electively and followed them for 30-days post-discharge. All PIs were offered a survey regarding availability, access and affordability of their typical population with cirrhosis regarding important services (24 hr endoscopy, ICU care, palliative care), medications (somatostatin, octreotide, terlipressin, rifaximin and albumin). Sites across the world were compared with respect to the PI survey.

**Results:** We prospectively enrolled 3884 patients from 95 centers in all 6 continents. Of these according to the world bank definition, 34 were high-income, 39 upper middle and rest were low/low-middle income countries. Results summarized in figure. Insurance: Most insurance were national except for centers in India, USA and Mexico where >50% of patients were on private insurances. Services and

S274 Journal of Hepatology vol. 78(S1) | S100–S1212
Interventions: LT was available in most centers except in Africa. It was only accessible in remaining regions if insured. ICU was unaffordable in regions apart from North America, Australia, and some Asian and European sites. 24-hr endoscopy was available in all centers but not in Africa. Palliative care was least likely to be available in Indian, Chinese, and African sites. Medications: Rifaximin is available in most countries apart from a few in Asia and Africa but was unaffordable for majority of patients in Africa, South America, and Asia. In remaining sites, it was only affordable for 50% of patients. Somatostatin and octreotide were available at all sites except in Africa. This was largely affordable for patients in China, Australia, North America, and Asia but not the rest. Minority of patients in Indian, African, South American, and Middle Eastern sites could afford IV albumin. Terlipressin was not available in USA and Canada. In the remaining sites, Australian, Middle Eastern, Asian, and Chinese patients were more likely to afford terlipressin.

Conclusion: In a prospective global cohort of inpatients with cirrhosis, there are major differences in availability, access, and affordability of services, interventions, and medications needed for optimal inpatient cirrhosis care. In addition to cirrhosis-related variables, these factors should be considered when assessing cirrhosis outcomes.

WED-383
Serum ammonia levels do not correlate with overt hepatic encephalopathy severity and time to resolution in hospitalized patients with cirrhosis
Jasmohan S Bajaj1, Nikolaos T. Pyrsopoulos2, Robert Rahimi3, Zeev Heimanson4, Christopher Allen4, Robert Israel4, Don Rockey5.
1Virginia Commonwealth University and Central Virginia Veterans Healthcare System, United States, 2Rutgers New Jersey Medical School, United States, 3Baylor University Medical Center, United States, 4Salix Pharmaceuticals, United States, 5Medical University of South Carolina, United States
Email: jasmohan.bajaj@vcuhealth.org

Background and aims: Measuring ammonia levels is not considered a diagnostic or prognostic indicator for overt hepatic encephalopathy (OHE) and, per guidelines, OHE is a clinical diagnosis. However, ammonia testing remains a common practice for the assessment of OHE severity/resolution in some practice settings. The current aim was to examine the relationship between ammonia levels and time to OHE resolution in hospitalized patients.

Method: Adults with cirrhosis and OHE (Hepatic Encephalopathy Grading Instrument score [HEGI], 2–3) were included in a phase 2, randomized, double-blind, placebo-controlled, 5-arm multicenter trial of investigational rifaximin soluble solid dispersion (SSD) immediate-release (IR) and sustained extended-release (SER) tablets. Patients were randomly assigned to placebo + lactulose (i.e., lactulose alone) or 1 of 4 rifaximin SSD groups: 1) IR 40 mg once daily (QD) + lactulose; 2) IR 40 mg twice daily (BID) + lactulose; 3) SER 80 mg QD + lactulose; or 4) SER 80 mg BID + lactulose. The primary efficacy end point was time to OHE resolution (HEGI score <2). Serum ammonia levels were measured daily and patients with an ammonia result at Day 1 were pooled (all treatment groups) and included in the analyses. A linear regression analysis (R²) was conducted to assess the relationship between Day 1 ammonia levels and OHE severity and time to OHE resolution. The trial was terminated after a prespecified interim analysis and not restarted (COVID-19 – related issues). Published data showed that rifaximin SSD 40 mg BID + lactulose significantly reduced time to OHE resolution vs lactulose alone (21.1 h vs 62.7 h; p = 0.02; Bajaj JS, et al. doi: 10.1016/j.cgh.2022.05.042).

Results: 44 patients (median [range] age, 63 y [32–75 y]; 52.3% male) were included (6–13 per 5 groups [all of which included lactulose use]). The median baseline MELD score was 19.0, the median (range) serum ammonia level was 86.4 ug/dL (19.0–272.5 ug/dL), and 65.1% of patients had an HEGI score = 2. There was no relationship between Day 1 ammonia level and Day 1 HEGI score (R² = 0.1264) or when subgrouped by gender (male: R² = 0.1179, female: R² = 0.1264, aged <65 y: R² = 0.1264, aged ≥65 y: R² = 0.009). Furthermore, there was no relationship between Day 1 ammonia level and time to OHE resolution for the overall population (R² = 0.0064; Figure) or when subgrouped by gender (male: R² = 0.009), female (R² = 0.0052), aged <65 y (R² = 0.0780), or aged ≥65 y (R² = 0.0195). There was also no significant difference between dosing regimens in

Table: Survey of principal investigators regarding availability and affordability for care of cirrhosis patients

<table>
<thead>
<tr>
<th>Region</th>
<th>No of centre (n=95)</th>
<th>Availability of LT</th>
<th>&gt;50% of pts can afford LT</th>
<th>24 hours Endoscopy service available?</th>
<th>Rifaximin Availability</th>
<th>Terlipressin Availability</th>
<th>&gt;50% can afford Albumin</th>
<th>Palliative care available</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>24</td>
<td>15(67)</td>
<td>2(8)</td>
<td>23(96)</td>
<td>24(100)</td>
<td>23(96)</td>
<td>21(88)</td>
<td>7(26)</td>
</tr>
<tr>
<td>India</td>
<td>11</td>
<td>10(91)</td>
<td>0</td>
<td>11(100)</td>
<td>11(100)</td>
<td>11(100)</td>
<td>5(45)</td>
<td>4(36)</td>
</tr>
<tr>
<td>Middle East</td>
<td>9</td>
<td>6(67)</td>
<td>4(44)</td>
<td>9(100)</td>
<td>9(100)</td>
<td>9(100)</td>
<td>4(44)</td>
<td>6(67)</td>
</tr>
<tr>
<td>Rest of Asia</td>
<td>3</td>
<td>3(100)</td>
<td>2(67)</td>
<td>3(100)</td>
<td>3(100)</td>
<td>3(100)</td>
<td>2(67)</td>
<td>2(67)</td>
</tr>
<tr>
<td>North America</td>
<td>23</td>
<td>19(79)</td>
<td>15(65)</td>
<td>22(96)</td>
<td>23(100)</td>
<td>8(35)</td>
<td>16(70)</td>
<td>22(96)</td>
</tr>
<tr>
<td>Europe</td>
<td>6</td>
<td>3(50)</td>
<td>3(50)</td>
<td>6(100)</td>
<td>6(100)</td>
<td>6(100)</td>
<td>3(50)</td>
<td>6(100)</td>
</tr>
<tr>
<td>Australia</td>
<td>7</td>
<td>1(14)</td>
<td>6(86)</td>
<td>7(100)</td>
<td>7(100)</td>
<td>7(100)</td>
<td>5(71)</td>
<td>7(100)</td>
</tr>
<tr>
<td>Africa</td>
<td>5</td>
<td>1(20)</td>
<td>0</td>
<td>1(20)</td>
<td>3(60)</td>
<td>2(40)</td>
<td>1(20)</td>
<td>2(40)</td>
</tr>
<tr>
<td>South America</td>
<td>7</td>
<td>7(100)</td>
<td>3(42)</td>
<td>7(100)</td>
<td>7(100)</td>
<td>7(100)</td>
<td>3(42)</td>
<td>7(100)</td>
</tr>
</tbody>
</table>

*: includes USA, Canada, and Mexico. LT: Liver transplantation, ICU: Intensive care unit. Somatostatin and octreotide are medications needed for treating variceal hemorrhage. All figures in bracket indicate percentage.

Figure: (abstract: WED-382).
Background and aims: Patients with cirrhosis have a high risk for acute kidney injury (AKI). The risk of developing subsequent chronic kidney disease (CKD) is not well known. Here, we investigated the kidney-related utility of ammonia levels for the management and prognostication of inpatients with OHE.

Method: Using Swedish national health registers, we identified all persons diagnosed with cirrhosis between 1988 and 2020. Cox regression was used to assess rates of incident CKD in patients with cirrhosis and an episode of AKI, compared to patients with cirrhosis without AKI. The cumulative incidence of CKD in both groups was calculated considering non-CKD related mortality as a competing event.

Results: We identified 46,946 patients with cirrhosis, 30,082 (64.1%) were men, and the median age was 63 years. The median time to follow-up for all patients was 2.1 (IQR 0.5–5.7) years. AKI was diagnosed in 2,873 (6.1%) patients, of whom 19.6% developed CKD, compared to 5.2% of patients without AKI. The incidence rate of CKD in patients with AKI compared to those without was 133.0 vs. 12.5 per 1,000 person-years (adjusted HR = 6.5, 95%CI = 5.9–7.2) and the cumulative incidence of CKD at 90 days was 9.1% and 0.6%, respectively. Furthermore, the kidney-related mortality rate was also considerably higher (adjusted HR = 7.3, 95%CI = 6.4–8.4) in patients with AKI.

Conclusion: This analysis of inpatients with cirrhosis and OHE found no relationship between serum ammonia levels and OHE severity or time to OHE resolution. These data reinforce the limited clinical utility of ammonia levels for the management and prognostication of inpatients with OHE.

Six-fold increased rate of chronic kidney disease after acute kidney injury: a population-based cohort study of 46,946 patients with cirrhosis

Anna Cederborg, Linnea Widman, Björn Lindkvist, Ying Shang, Axel Wester, Hannes Hagström, Hanns-Ulrich Marschall.

Institute of Medicine, Sahlgrenska academy, Gothenburg university, Department of clinical and molecular medicine, Gothenburg, Sweden, Department of Medicine, Sahlgrenska University Hospital, Gothenburg, Sweden, Karolinska Institutet, Sweden, Institute for neuroscience and physiology, Sahlgrenska Academy, Gothenburg university, Sweden, Institute of Medicine, Sahlgrenska academy, Gothenburg university, Sweden

Email: anna.cederborg@vgregion.se

Background and aims: Patients with cirrhosis and AKI have a more than six-fold increased rate of CKD, as well as a higher short-term kidney-related mortality compared to cirrhosis patients without AKI.

Conclusion: Patients with cirrhosis and AKI have a more than six-fold increased rate of CKD, as well as a higher short-term kidney-related mortality compared to cirrhosis patients without AKI.

Patients with liver cirrhosis and TIPS are prone to in-hospital falls

Nada Abedin, Moritz Hein, Christoph Welsch, Jörg Bojunga, Stefan Zeuzem, Georg Dultz.

Department of Internal Medicine I, University Hospital Frankfurt, Goethe University, Frankfurt am Main, Germany

Email: nada.abedin@kgu.de

Background and aims: In-hospital falls are associated with a high mortality in patients in general and especially in patients with chronic liver disease. Therefore, identifying patients at high risk and implementing safety measures is a major goal in the treatment of hospitalized patients with liver cirrhosis.

Method: In a cohort of hospitalized patients with liver cirrhosis between 2017 and 2019 at the department for gastroenterology at the University Hospital Frankfurt clinical data, treatment courses and follow-up data were assessed retrospectively and statistically analyzed using SPSS.

Results: In the analyzed period there were a total of 1985 hospitalizations of patients with liver cirrhosis. 80 falls were documented with respective complications. Median age significantly differed between the two groups (64 vs. 61 years on admission, p < 0.001) and in-hospital mortality was significantly higher in the group of patients with documented falls (27.5% vs. 8.9%, p < 0.001). There was no association of etiology and falling incident. 19.9% of the analyzed hospitalizations (n = 396) included patients with an implanted TIPS. 63 of them fell during their hospital stay making up 78.8% of the patients with a documented falling incident. Reasons for admission in the fall-cohort were decompensation (37.5%), hepatic encephalopathy (32.5%), infection (22.5%) and others.

Conclusion: Hospitalized patients with hepatic encephalopathy on admission and patients with a TIPS are at high risk for in-hospital falls. Given the associated increase in in-hospital mortality, these patients require specific safety measurements on admission and continuous monitoring.
Background and aims: Sarcopenia is a severe complication of liver disease, associated with a poor prognosis and decreased survival. Early identification and management may improve the patients’ outcome. Sarcopenia affects muscle mass and function and may be diagnosed by measuring mid-arm circumference. Cardiac sarcopenia, reflected by electrocardiographic changes, is an important component in the pathogenesis of cirrhotic cardiomyopathy. The aim of this study is to evaluate the relationship between systemic sarcopenia estimated by mid-arm circumference and QRS amplitude and duration.

Method: We performed a cross-sectional observational study including patients with decompensated cirrhosis evaluated in our clinic between January 2022 and December 2022. Patients with cured hepatitis C virus infection or hepatitis B virus infection undergoing treatment with nucleoside analogues and undetectable viremia were considered eligible. Patients with history of cardiovascular disease, malignancies, malabsorption, alcohol-related liver disease, deposit diseases or acute decompensation were excluded from the trial. A total of 161 patients were included and divided into 2 groups, according to Child Pugh classification. We evaluated mid upper arm circumference (MUAC), serum levels of albumin, total cholesterol, INR, as well as QRS mean amplitude and duration in all limb and precordial leads. QRS hypovoltage was defined as less than 0.5 mV in one limb lead and less than 1 mV in one precordial lead.

Results: We included 108 patients with Child B cirrhosis and 53 patients with Child C cirrhosis, with a female predominance in both groups (59.2% and 66.03% respectively). There was no statistically significant difference in age between the groups (56.24 ± 21.32 years versus 59.22 ± 18.33 years, p = 0.8). We noted decreased MUAC in Child C patients, both male and female, compared to Child B patients, as well as decreased QRS amplitude and increased QRS duration within the subgroups (Table). Hypovoltage was present in 9 Child B patients (8.33%) and 41 Child C patients (77.35%). Sarcopenia defined by MUAC was noted in 28 Child B patients (25, 92%) and 49 Child C patients (77.35%). Sarcopenia is a severe complication of liver disease, associated with a poor prognosis and decreased survival. Early identification and management may improve the patients’ outcome. Sarcopenia affects muscle mass and function and may be diagnosed by measuring mid-arm circumference. Cardiac sarcopenia, reflected by electrocardiographic changes, is an important component in the pathogenesis of cirrhotic cardiomyopathy. The aim of this study is to evaluate the relationship between systemic sarcopenia estimated by mid-arm circumference and QRS amplitude and duration.

Figure: Table: Differences in clinical, biologic and electrocardiographic parameters in Child B and Child C in the male and female population

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Child B</th>
<th>Child C</th>
<th>P value</th>
<th>Child B</th>
<th>Child C</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albumin (g/dL)</td>
<td>3.01 ± 0.52</td>
<td>2.73 ± 1.12</td>
<td>&lt;0.01</td>
<td>3.22 ± 0.82</td>
<td>2.45 ± 0.98</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Total cholesterol (mg/dL)</td>
<td>167.88 ± 45.18</td>
<td>97.2 ± 62.46</td>
<td>&lt;0.01</td>
<td>154.29 ± 28.32</td>
<td>102.29 ± 38.11</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>INR</td>
<td>1.37 ± 0.53</td>
<td>1.98 ± 1.09</td>
<td>&lt;0.01</td>
<td>1.64 ± 0.28</td>
<td>2.02 ± 0.87</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>MUAC (cm)</td>
<td>25.12 ± 5.29</td>
<td>21.4 ± 4.12</td>
<td>0.03</td>
<td>26.73 ± 3.98</td>
<td>20.15 ± 4.73</td>
<td>0.02</td>
</tr>
<tr>
<td>QRS-A (mV)</td>
<td>0.92 ± 0.36</td>
<td>0.61 ± 0.41</td>
<td>0.02</td>
<td>0.89 ± 0.22</td>
<td>0.77 ± 0.35</td>
<td>0.03</td>
</tr>
<tr>
<td>QRS-A (mV)</td>
<td>2.14 ± 0.76</td>
<td>1.33 ± 0.19</td>
<td>0.04</td>
<td>1.98 ± 0.57</td>
<td>1.01 ± 0.42</td>
<td>0.03</td>
</tr>
<tr>
<td>QRS-D (mV)</td>
<td>92.27 ± 7.82</td>
<td>115.28 ± 10.01</td>
<td>0.01</td>
<td>96.35 ± 9.17</td>
<td>122.24 ± 11.85</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Conclusion: MUAC as well as QRS amplitude and duration may serve as markers for sarcopenia in decompensated cirrhosis. The accessibility of these parameters makes them easy to use in clinical practice.

WED-387

Uromodulin serum levels are associated with poorer prognosis in patients with cirrhosis and hepatorenal syndrome

Eva Maria Schleicher1,2, Simon J. Gaering1,2, Darko Castven3, Charlotte Sophie Hock1, Henrike Dobbermann2, Raphael Schütler3, Sophia Heinrich4, Leonard Kaps1,2, Peter Galle1,2

Julia Weinmann-Menkel1, Marc Nguyen-Tat1, Jens Marquardt2, Christian Labenz1,2,1, University Medical Center of the Johannes Gutenberg-University, Department of Internal Medicine I, Mainz, Germany, 2University Medical Center of the Johannes Gutenberg-University, Cirrhosis Center Mainz (CCM), Mainz, Germany, 3University Hospital Schleswig-Holstein, Lübeck, Department of Medicine I, Germany, 4Hanover Medical School, Clinic for Gastroenterology, Hepatology and Endocrinology, Germany

Email: eva.schleicher@unimedizin-mainz.de

Background and aims: Hepatorenal syndrome (HRS) is associated with a dismal prognosis in patients with cirrhosis. Biomarkers to identify patients with poor response to therapy with terlipressin and albumin are urgently needed. Uromodulin is a kidney-specific protein and a reliable, early biomarker of impaired renal function. This study aimed to evaluate the predictive value of serum levels of Uromodulin (sUMOD) in patients with cirrhosis and HRS treated with vasopressors.

Method: This study analyzed data of 81 patients with HRS treated with terlipressin and albumin, 39 patients with cirrhosis without kidney injury and 33 patients with cirrhosis with prerenal acute kidney injury (AKI) treated at the Cirrhosis Center Mainz, Germany. sUMOD were analyzed by ELISA and clinical data were collected. Patients with HRS treated with terlipressin were prospectively followed for the composite end point of hemodialysis-/liver transplantation-free survival (HD/LTx-free survival).

Results: Of the 81 patients with HRS, 40 had HRS type 1 and 41 HRS type 2. In the cohort of patients with HRS treated with terlipressin, median sUMOD were 100 ng/ml (interquartile range (IQR) 64; 144). sUMOD differed significantly between patients with HRS compared to patients with no AKI (p = 0.001), but not between patients with HRS and prerenal AKI (p = 0.872). There was a non-significant trend for lower sUMOD in patients with HRS type 2 compared to type 1 (type 2 vs. 1: 99 vs. 106 ng/ml, p = 0.094). Patients with sUMOD in the lowest quartile had significantly lower rates of complete response of HRS after treatment with terlipressin (p = 0.044). During follow-up, a total of 75 patients with HRS reached the end point of HD/LTx-free survival. In multivariable Cox regression analysis, sUMOD in the lowest quartile (<64 ng/ml) (HR 1.747, 95% CI 1.013–3.011, p = 0.045) and MELD (HR 1.081, 95% CI 1.047–1.116, p < 0.001) were independently associated with HD/Ltx-free survival during follow-up. In logistic regression analysis, sUMOD in the lowest quartile were independently associated with 90-days HD/Ltx-free survival (OR 3.957, 95% CI 1.033–15.163, p = 0.045) after adjusting for MELD (OR 1.179, 95% CI 1.081–1.286, p < 0.001).

Conclusion: sUMOD may be a valuable biomarker to identify patients with HRS treated with terlipressin and poor prognosis.

WED-388

24-Hour urinary creatinine excretion (UCE) a marker of muscle mass is associated with mortality in critically ill patients with cirrhosis

Jaya Benjamin1, Pallavi Dua1, Harshita Tripathi1, Puja Bhatia1, Varsha Shasthry1, Saniya Khan2, Rakihi Mawal2, Guresh Kumar3, Yogendrakumar Joshi3, Shiv Kumar Sarin2,1, Institute of Liver and Biliary Sciences, Clinical Nutrition and Hepatology, New Delhi, India, 2Institute of Liver and Biliary Sciences, Hepatology, New delhi, India, 3Institute of Liver and Biliary Sciences, Department of Biostatistics, New delhi, India

Email: jayabenjaminibls@gmail.com

Background and aims: Loss of muscle mass is a common feature in cirrhosis which may adversely affect the clinical outcomes in the ICU.
Assessment of muscle mass is a challenge in the critically ill cirrhosis (CIC). The 24 hour urine creatinine excretion (UCE) reflects muscle mass and is a simple method in the ICU settings. To study the relationship of UCE at ICU admission with mortality in critically ill cirrhosis Patients.

**Method:** In this prospective observational study, CIC meeting the inclusion (age 18–65 yrs, likely ICU stay >24 hours) and exclusion criteria (patients with chronic kidney disease, malignancy, acute kidney injury, anuria or on dialysis) were enrolled. Total duration of ICU stay and mortality were noted. Urinary creatinine concentration was assessed by kinetic modified Jaffe Method. UCE was determined by multiplying the urinary creatinine concentration with the 24 hour urinary volume and expressed in gm/24 hours. An average of first 3 days UCE after admission was taken for analysis. Value of UCE was divided into tertiles (T), and mortality was compared between tertiles using chi-square test. The association of UCE with mortality was analyzed using Kaplan-Meier graph and log-rank test across tertiles.

**Results:** Altogether, 104 CICs [male -76%; age -48.8 ± 10 yrs; BMI 23.6 ± 4.6 kg/m²; etiology: alcohol-60%, NASH-15%, others-16%; CTP-10.7 ± 1.5; MELD-27.6 ± 8.1; SOFA-9.5 ± 2.8; APACHE-18.2 ± 6.9; MV- 48 (46%)] were studied. The mean UCE (gm/24 hours) was 0.77 ± 0.4 (range 0.33–4.6 g/m²); MELD-27.6 ± 8.1; SOFA-9.5 ± 2.8; APACHE-18.2 ± 6.9; MV- 48 (46%)]. We used the mean UCE (gm/24 hours) was 0.77 ± 0.4 (range 0.33–2.7) and UCE categorization on the basis of tertiles was T1 -<0.57, T2 -0.58–0.82, T3 ->0.82. Overall, mortality was seen in 62 (59.6%) patients, which was significantly different between tertiles of UCE [T1:T2:T3 = 26 (41.9%) : 23 (37.1%) : 13 (20.9%); p = 0.030]. Patients in the lowest UCE tertile had an increased mortality compared to those in the highest UCE tertile as depicted in Kaplan Meier graph (fig1).

**Conclusion:** In critically ill patients with cirrhosis low urinary creatinine excretion is associated with higher mortality, thereby underscoring the role of muscle mass as a risk factor for mortality and UCE as a relevant marker.

**WED-389**

Rotational Thromboelastometry (ROTEM) reduces need for pre-emptive transfusion in low-moderate risk procedure in cirrhosis: a randomized controlled trial

Chin Kim Tong1, Louis Ng2, Eugene Wong3, Kenneth Lin3, Andrew Kwek3, James, Weiquan Li3, Tiing Leong Ang3, Louis Wang3, Tianyu Qui3, Roshni Sahasihiv4, Tirukonda Prasanna Sivanath4, Rahul Kumar3, 1Changi General Hospital, Department of Gastroenterology and Hepatology, Singapore, 2Changi General Hospital, Department of Respiratory Medicine, Singapore, 3Changi General Hospital, Department of Gastroenterology and Hepatology, Singapore, 4Changi General Hospital, Department of Radiology, Singapore, Singapore

**Background and aims:** Viscoelastic tests (VET) like Rotational Thromboelastometry (ROTEM) assess global hemostasis in cirrhosis. We aimed to assess whether ROTEM-guided blood product transfusion results in lower blood product requirement in patients with cirrhosis undergoing elective invasive procedures as compared to standard of care (SOC) based on conventional coagulation tests (CCT).

**Method:** This is a planned scheduled interim analysis of a single center randomized controlled trial. Patients with cirrhosis and coagulopathy requiring blood product transfusion based on CCT undergoing elective invasive procedure were recruited. Patients were randomized in a 1:1 ratio to receive blood products by either ROTEM-guidance or standard of care (SOC). The primary outcome was the difference in blood products (fresh frozen plasma (FFP) or platelets) transfused between the groups. The secondary outcome was procedure related bleeding or complications within 7 days of the procedure. Haybittle-Peto rule was applied for the interim analysis with p < 0.001 taken as statistically significant.

**Results:** From August 2021 to January 2023, 40 patients were recruited (20 in each group). The mean age was 57 ± 9.3 years. Most patients underwent large volume paracentesis (n = 23, 57.5%) followed by microwave ablation of liver tumor (n = 5, 12%). Other procedures were hepatic venous pressure gradient measurement (n = 4, 10%) and percutaneous liver biopsy (n = 3, 7.5%). More than half of the patients had Child Pugh C liver cirrhosis (n = 24, 64%) with a mean MELD score of 17.38 ± 6.14. Mean platelet count was 75 ± 51 × 10⁹/L, mean prothrombin time (PT) was 16.2 ± 2.9 seconds, mean INR 1.55 ± 0.31 and mean activated partial thrombin time was 39.9 ± 12.01 seconds. There was no difference in the baseline demographics, CCT (platelet count, PT, INR and APTT), ROTEM parameters, Child-Pugh and MELD score between the two groups. Overall, 8 (40%) patients in ROTEM-group required pre-emptive blood products compared to all (100%) in SOC group (p < 0.001), Figure 1. The volume of FFP (63 mls ± 160 mls vs 325 mls ± 500 mls, p < 0.001) and platelet (70 mls ± 98 mls vs 110 mls ± 137 mls p = 0.048) transfused were lower in the ROTEM group. None of the patients included in the study had clinically significant bleeding events. One patient (5%) in the SOC group developed allergic reaction but none developed transfusion associated lung injury.

**Conclusion:** ROTEM-guided transfusion strategy significantly reduces the need for FFP transfusion in patients with cirrhosis undergoing elective procedure without any increased risk of bleeding events. It has important implication as it can reduce transfusion associated adverse events. Trial registration number: NCT05698134.
WED-390
Long-term cellular immune response to COVID-19 vaccination in patients with chronic liver disease

Marina Moura Henriques1, Carolina Santos Palma2, André L. Simão3, Ana Godinho-Santos3, Miguel Cardoso1, Diogo Fernandes1, Sofia Carvalhã2, Miguel Moura2, João Gonçalves1, Helena Cortez-Pinto2,3, Rui E. Castro1. Research Institute for Medicines (iMed.ULisboa), Faculty of Pharmacy, Universidade de Lisboa, Lisbon, Portugal; 2Departamento de Gastroenterologia, Centro Hospitalar Universitário Lisboa Norte, Lisbon, Portugal; 3Clínica Universitária de Gastroenterologia, Faculdade de Medicina, Universidade de Lisboa, Lisbon, Portugal

Email: ruieduardocastro@ff.ulisboa.pt

Background and aims: Patients with chronic liver disease (CLD), particularly those with cirrhosis, typically present with immune dysregulation, which may lead to a higher risk of adverse outcomes after SARS-CoV-2 infection and a defective immune response after COVID-19 vaccination. Because patients with CLD were not included in COVID-19 vaccine licensing studies, data on effectiveness in this vulnerable population is lacking. Our aim was to evaluate cellular immune responses of CLD patients to COVID-19 vaccines.

Method: Blood from Portuguese CLD patients and healthy volunteers receiving the mRNA-1273, BNT162b2, ChAdOx1 and Ad26.COV2.S vaccines were collected prior to vaccination, six months after vaccination, and one year after vaccination (after 3rd dose). Immunophenotyping of peripheral blood mononuclear cells was performed by flow cytometry with acquisition on a four-laser spectra analyzer, using a panel composed of twenty-two surface markers and a viability dye. After gating, a total of twenty-eight different immune cell subsets were identified.

Results: Prior to and at six months after vaccination, the number of CD4+ T cells was lower in vaccinated patients compared to vaccinated healthy individuals. During the first six months following vaccination, naïve CD8+ T cells decreased more in CLD patients compared to healthy individuals, while plasmablasts increased in healthy individuals but not in CLD patients, suggesting a defective production of these antibody secreting B cells in vaccinated patients. In turn, one year after vaccination, the subsets of T and Natural Killer cells were found increased in both groups, suggesting that the booster dose is critical for inducing a strong cellular immune response. Curiously, cirrhotic patients presented with more CD27+ B cells comparing to non-cirrhotic patients. Finally, regarding COVID-19 infection, variations in the percentage of gated cells before and one year after vaccination were similar in almost all cell sub-types, except for TEMRA CD8+ T cells, which showed a more prevalent decrease in non-infected patients.

Conclusion: Patients with more advanced stages of CLD display impaired cellular immune responses to COVID-19 vaccination. Notwithstanding, impaired responses are largely recovered after the administration of a third dose of the vaccine. Studying the response of patients with CLD to recent SARS-CoV-2 variants should elucidate whether novel COVID-19 vaccines are needed.

WED-391
The relation of serum nesfatin-1 levels with disease severity and complications in patients with liver cirrhosis

Özlem Kandemir Albak1, Hasan Eruzun2, Yasemin Gökden2, Yücel Arman1, Tufan Tükek3,4. Prof. Dr. Cemil Taşçoğlu City Hospital, Internal Medicine, Istanbul, Turkey; 3Ondokuz Mayıs University, School of Medicine, Gastroenterology, Samsun, Turkey; 4Prof. Dr. Cemil Taşçoğlu City Hospital, Gastroenterology, Istanbul, Turkey; 5Istanbul University, School of Medicine, Internal Medicine, Istanbul, Turkey

Email: hasaneruzun@gmail.com

Background and aims: Nesfatin-1 is an anorectic polypeptide that has important roles in the regulation of food intake and energy homeostasis. With the hypothesis that common problems such as cachexia and malnutrition in patients with cirrhosis might be due to the increase in nesfatin-1 protein, we examined the levels of nesfatin-1 peptide in patients with cirrhosis and its relationship with the severity of the disease.

Method: Fifty-one patients with cirrhosis and thirty healthy volunteers were included in the study. Serum samples were collected from the groups and serum nesfatin-1 levels were compared using ELISA. Child-Pugh stages and multifactorial end-stage liver disease (MELD) scores of patients with cirrhosis were calculated and their relationship with nesfatin-1 was examined. In addition, the relationship between the complications of cirrhosis and nesfatin-1 was investigated.

Results: Nesfatin-1 levels were found to be significantly higher in the patients with cirrhosis than in the control group (p < 0.001). Patients with cirrhosis were grouped as compensated and decompensated and compared with the control group. It was determined that the significant difference between these three groups (p < 0.001) was due to the elevation of nesfatin-1 in the compensated cirrhosis group (p < 0.01). When patients with cirrhosis were classified according to Child-Pugh stages and MELD scores, there was no significant relationship between these groups and nesfatin-1 levels.

<table>
<thead>
<tr>
<th>Nesfatin-1 (ng/ml)</th>
<th>Control A (n = 30)</th>
<th>Compensated cirrhosis B (n = 20)</th>
<th>Decompensated cirrhosis C (n = 31)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-B-C p value</td>
<td>0.001</td>
<td>0.010</td>
<td>0.077</td>
</tr>
<tr>
<td>A-B p value</td>
<td>0.010</td>
<td>0.077</td>
<td>0.218</td>
</tr>
</tbody>
</table>

Figure:

Conclusion: Nesfatin-1 may be involved in the maintenance of compensation with its antioxidant, anti-inflammatory, and anti-apoptotic effects. The decrease in serum nesfatin-1 levels in decompensated cirrhosis compared with compensated cirrhosis may be due to the defense mechanism and insufficient production.

Cirrhosis and its complications Portal Hypertension

WEDNESDAY 21 TO SATURDAY 24 JUNE

TOP-043
Natural history of patients with NASH-associated compensated advanced chronic liver disease stratified according to severity of portal hypertension

Rafael Paternostro1, Wilhelmus Kwan2, Benedikt Hofer1, Georg Semmler1, Ali Bagdadi2, Irina Luzko1, Virginia Hernandez-Gea3, Isabel Graupera1, Juan Carlos Garcia Pagan1, Dario Saltini1, Federica Indulti1, Filippo Schepis4, Lucile Moga5, Pierre-Emmanuel Rautou5, Elba Llop6, Luis Téllez7, Agustin Alibillos7, Jose Ignacio Fortea8, Angela Puente8, Christian Jansen14, Michael Praktiknjo15, Wenyi Gu15, Elise Vuille-Lessard11,12, Annalisa Bergzgotti11, Madalina Gabriela Tara11, Vad Tara12, Bogdan Procopet13, Christian Jansen14, Michael Praktiknjo15, Weney Gu15, Jonel Trebicka16, Luis Ibáñez17, Rafael Bañares17, Jesús Rivera17, Juan Manuel Pericás17, Joan Genesca17, Edilmar Alvarado-Tapias18, Candid Villanueva18, Hélène Larrue18, Christophe Bureau18, Wim Lameman19, Alba Ardevol Ribalta19, Helena Masnou19, Thomas Vanwolleghem20, Michael Trauner1, Matthias Mandorfer1, Sven Francque2, Thomas Reiberger2, Medical University of Vienna, Austria; 3University of Antwerp, Belgium; 4University of Barcelona, Spain; 5Hopital Lariboisière, France; 6University Hospital of Valencia, Spain; 11University of Lille, France; 12University of Besançon, France; 13University Hospital of Barcelona, Spain; 14University of Heidelberg, Germany; 15University of Lille, France; 16University of Antwerp, Belgium; 17University Hospital of Barcelona, Spain; 18University of Lille, France; 19University of Barcelona, Spain; 20University Hospital of Antwerp, Belgium; 21University of Barcelona, Spain

Journal of Hepatology 2023 vol. 78(S1) | S100–S1212
S279
Background and aims: Non-alcoholic fatty liver disease (NAFLD) is a leading cause of advanced chronic liver disease (ACLD). Portal hypertension (PH) drives decompensation and is best diagnosed by hepatic venous pressure gradient (HVPG). However, in NAFLD-ACLD decompensation may occur at lower HVPG thresholds than in other ACLD etiologies. Here we investigate the clinical course of strictly compensated NAFLD-ACLD patients (NAFLD-cACLD) according to severity of PH.

Method: In this European multicentre study, NAFLD-cACLD patients were characterized by HVPG at baseline. Patients with any previous decompensation, hepatocellular carcinoma and portal vein thrombosis were excluded. First occurrence of hepatic decompensation (ascites, hepatic encephalopathy, variceal bleeding) or liver-related death defined the composite study end point. Fine and Gray competing risk regression models were used for time-to-event outcome analyses.

Results: 342 patients with NAFLD-cACLD with a median MELD of 8 (7–9) points and a median HVPG of 11 mmHg (11–15) were included; 244 (71.3%) had diabetes. NAFLD diagnosis was made via liver biopsy in 281 (82.2%) and clinical in 61 (17.8%) patients. 244 (71.3%) had diabetes. NAFLD diagnosis was made via liver biopsy including 71 patients with severe PH (HVPG ≥15 mmHg) in 281 (82.2%) and clinical in 61 (17.8%) patients. Portal hypertension (PH) was present in 210/342 patients (61.4%) including 71 patients with severe PH (HVPG ≥16 mmHg; PH16; 20.8%). Median BMI was 31.7 kg/m² (28.0–35.8), with a significantly lower BMI in the CSPH group (31.5 vs. 32.6 kg/m²; p = 0.011). During a median follow-up of 41.5 (28–66) months, 85 (24.9%) patients developed liver-related events: 36 (10.5%) ascites, 23 (6.7%) hepatic encephalopathy, 16 (4.7%) variceal bleeding and 10 (2.9%) liver-related death.

Conclusion: CSPH is strongly linked to the incidence of hepatic decompensation in NAFLD-cACLD. Decompensation, however, may also occur, albeit at low rates, at HVPG<10 mmHg, suggesting an underestimation of PH severity by HVPG. Nevertheless, HVPG represents an important risk stratification tool in NAFLD-cACLD patients.

TOP-045
The effect of precipitating factors for hepatorenal syndrome on response to terlipressin treatment: a subgroup analysis of a pooled North American database

Kevin Moore1, Zanaira Zafar2, Nikolaos T. Pyrsopoulos3, Khurram Jamil4. 1UCL Institute of Liver and Digestive Health, Royal Free Hospital, University College London, London, United Kingdom; 2St. Mary Medical Center, Langhorne, PA, United States; 4Mallinckrodt Pharmaceuticals, Hampton, NJ, United States

Background and aims: Hepatorenal syndrome (HRS) type 1 is a potentially reversible form of acute kidney injury. Terlipressin is approved for the treatment of adult patients (pts) with HRS and rapidly worsening kidney function. This study assessed the efficacy of terlipressin in patient subgroups based on their precipitating factors (PFs) for HRS in a pooled dataset.

Method: Pooled data from 3 North American placebo-controlled Phase III clinical studies (OT-0401, REVERSE, and CONFIRM) of terlipressin to treat pts with HRS type 1 (N=564), was evaluated for the effect of PFs on efficacy outcomes including renal replacement therapy (RRT) at Day 90, HRS reversal (serum creatinine [SCr] ≤1.5 mg/dL up to 24 hours after the last dose of study drug; SCr values obtained posttransplant or post-RRT were excluded), overall survival, and transplant-free survival (TFS) at Day 90. Significance was determined using a Fisher’s exact test.

Results: The most common PF for HRS was hypovolemia due to large volume paracentesis or diuretic therapy (25.2%), followed by infection (18.3%) and gastrointestinal (GI) bleeding (6.2%); no PFs were reported in 50.3% of pts. The incidence of RRT by Day 90 was numerically lower in the terlipressin group versus placebo (overall, 32.2% [109/338] vs 41.2% [93/226]), with the largest difference among those pts with GI bleeding (26.3% vs 43.8%). HRS reversal was higher in the terlipressin versus placebo group, with a significant improvement among pts with no PF or PFs of hypovolemia or infection. Overall survival at Day 90 in pts with GI bleeding was numerically higher in the terlipressin group versus placebo (47% vs 19%; p = 0.152) and was otherwise similar for the remaining PF subgroups. TFS at Day 90 was numerically higher for the terlipressin group among pts with GI bleeding and hypovolemia (Figure).

Conclusion: Treatment with terlipressin leads to greater HRS reversal and less need for RRT compared with placebo. Across subgroups, HRS reversal in response to terlipressin was significantly greater among pts with no PFs or PFs of infection or hypovolemia.

TOP-048
Predictors and management of post-banding ulcer bleeding in cirrhosis: a systematic review and meta-analysis

Maria De Brito Nunes1, Matthias Knecht2, Reiner Wiest2, Jaume Bosch1, Annalisa Berzigotti2. 1Department for BioMedical Research of University of Bern (Mu35), Bern, Switzerland; 2Department of Visceral Surgery and Medicine, Bern, Switzerland

Background and aims: Esophageal varices endoscopic band ligation (EBL) is an endoscopic procedure aimed at eradicating esophageal varices in patients with cirrhotic portal hypertension, by ligating...
them with rubber rings (bands). According to current international guidelines, EBL of esophageal varices plays an important therapeutic role in three settings: a) the prevention of a first VH as an alternative to non-selective beta-blockers (NSBB) in patients with contraindications or who cannot tolerate these drugs; b) to achieve hemostasis in combination with vasoactive drugs (somatostatin, octreotide or terlipressin) in patients with acute VH; and c) to prevent recurrent bleeding. In the latter case, patients are treated both with NSBB and EBL. Post-banding ulcer bleeding (PBUB) is an understudied complication of this procedure. The aims of this systematic review were: to review the reported incidence of PBUB in patients with cirrhosis and varices treated with EBL in primary and secondary prophylaxis or urgent treatment for acute variceal bleeding; to identify predictors of PBUB; and to ascertain strategies to prevent and manage bleeding after PBUB.

**Method:** A systematic review of articles in English published in 2006–2022 was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines. Searches were made in the following electronic databases: Google Scholar, Medline (OVID interface), Embase (OVID interface), PubMed, Cochrane Library, Cochrane Central Register of Controlled Trials (CENTRAL), clinicaltrials.gov, EU clinical Trials. An independent extraction of articles using predefined data fields and quality indicators was used. Random effects meta-analysis was used to determine the incidence, mean interval and predictors of PBUB. Treatment of PBUB were assessed with qualitative analysis due to the heterogeneity of procedures employed to control bleeding.

**Results:** Eighteen studies (9034 patients) were included. The incidence of PBUB was overall 5.5% (95% CI, 4.3–7.1%). The mean time for it to occur was 11 days (95% CI 9.94–11.97). Model for End-stage Liver Disease score (OR 1.162, 95% CI 1.047–1.291, p < 0.005) and endoscopic band ligation done in emergency setting (OR 4.09, 95% CI 2.99–8.05, p < 0.001) independently predicted PBUB. Patients were treated with a variety of drugs (vasoactive drugs such as somatostatin, octreotide or terlipressin, endovenous proton pump inhibitors) and/or endoscopic procedures (EBL, argon plasma coagulation, esophageal variceal obliteration with sclerotherapy or cyanoacrylate injection, epinephrine injection, hemoclip) and Transjugular...
Intrahepatic Portosystemic Shunt (TIPS) for severe bleeding. Refractory bleeding was treated with self-expandable metallic stents and oesophageal balloon tamponade. Treatments had a limited success, as shown by a mortality after PBUB of 22.3% (IC 95%, 14.1–33.6%) (Figure).

**Conclusion:** Patients more prone to develop PBUB are those with high MELD score, and EBL performed in an emergency context. PBUB carries a severe prognosis with a high mortality despite the variety of treatments used, which calls for prospective, specifically designed studies to improve outcomes of this severe iatrogenic complication. The best therapeutic strategy to address PBUB remains to be ascertained.

**SATURDAY 24 JUNE**

**SAT-325**

**Outcome of sucralfate vs proton pump inhibitor vs sucralfate and proton pump inhibitor combination post endoscopic esophageal variceal band ligation-A randomized controlled trial**

Arun Vaidya1, Mayur Satal1, Abu Aasim Ansari1, Shashank Pujwlar1, Gautam Jain1, Tammy Laxane1, Shruti Mehta1, Aditya Kale1, Akash Shukla1. 1Seth GS Medical college and KEM Hospital, Mumbai, Department of Gastroenterology, India

**Background and aims:** Proton pump inhibitor (PPI) and mucoprotectant like sucralfate are commonly used post variceal band ligation. However, data is sparse in literature on outcome of using them alone or in combination. Therefore, we conducted this trial with the aim to study the outcome of using combination of sucralfate and PPI vs sucralfate alone vs PPI alone vs no treatment post endoscopic variceal band ligation in terms of presence of band ulcers, chest pain, ulcer related bleeding and mortality.

**Method:** We conducted a single center, single blind randomized trial and included patients above 18 years undergoing esophageal variceal band ligation. Patients already on PPI or sucralfate, pregnant, on anticoagulation, having acute kidney injury or chronic kidney disease and pre-existing esophageal ulcers on endoscopy were excluded. Using simple randomization technique, patients were randomized in 4 arms: Sucralfate plus PPI combination, PPI alone, Sucralfate alone and no treatment. Patients were given these medications for 14 days. We repeated endoscopy after 14 days. Primary end point was post band ulcer bleed and ulcer related mortality at day 28. Secondary end point was to evaluate post band chest pain and presence of band ulcer in each arm.

**Results:** We randomized 200 patients (50 patients in each arm). Mean age was 43.93 ± 12.8 years. Males were 157 (78.5%). Post band ulcers were seen in 65 (32.5%) patients with mean of maximum ulcer size was 5 mm. Band related chest pain and ulcer bleed were present in 24 (12%) and 2 (1%) patients respectively. Ulcer bleed related mortality at day 28 was 0.5%. There was no significant difference in presence of post band ulcer, chest pain, bleeding or mortality in any trial arm. Serum albumin level was not associated with presence of band ulcer (p = 0.766).

**Figure:**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Sucralfate + PPI (n = 50)</th>
<th>Sucralfate alone (n = 50)</th>
<th>PPI alone (n = 50)</th>
<th>No treatment (n = 50)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Band ulcer</td>
<td>17 (34%)</td>
<td>15 (30%)</td>
<td>16 (32%)</td>
<td>17 (34%)</td>
<td>0.969</td>
</tr>
<tr>
<td>Chest Pain</td>
<td>5 (10%)</td>
<td>5 (10%)</td>
<td>7 (14%)</td>
<td>7 (14%)</td>
<td>0.568</td>
</tr>
<tr>
<td>Ulcer Bleed</td>
<td>1 (2%)</td>
<td>1 (2%)</td>
<td>0</td>
<td>0</td>
<td>0.356</td>
</tr>
<tr>
<td>Ulcer bleed related mortality at Day 28</td>
<td>1 (2%)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.389</td>
</tr>
</tbody>
</table>

**Conclusion:** Addition of sucralfate, PPI or sucralfate plus PPI combination post variceal band ligation did not reduce post band ulcer bleed or bleed related mortality.
SARCOGENIA-resolution in a considerable share of patients with cirrhosis after TIPS, which is linked to a clear survival benefit. Patients who do not resolve sarcopenia after TIPS remain at considerable risk of mortality and thus should be timely listed for liver transplantation.

SAT-327
Accuracy of spleen stiffness measurement for the diagnosis of clinically significant portal hypertension in patients with advanced chronic liver disease: an individual patient meta-analysis
Elton Dajti1,2, Federico Ravaiolii1-2, Romanas Zykus2, Laure Elkjief6, Pierre-Emmanuel Rautou1, Ivica Grgurevic3, Horia Stefanescu4, Massashi Hirooka8, Fraquelli Mirella9, Matteo Rosselli10, Antonio Colecchia1.

Background and aims: The identification of patients with clinically significant portal hypertension (CSPH) is of utmost prognostic and therapeutic relevance in patients with compensated advanced chronic liver disease (cACLD). Spleen stiffness measurement (SSM) has been proposed as a direct surrogate of portal hypertension and an accurate non-invasive test for CSPH diagnosis. The diagnostic performance and the cut-offs used are very heterogeneous in current literature. Our aim was to perform a systematic review with individual patient data (IPD) meta-analysis to establish the diagnostic performance of SSM and SSM-based algorithms, as measured by different elastography techniques, for the diagnosis of CSPH.

Method: We systematically searched MEDLINE, Ovid Embase, Scopus, and Cochrane Library electronic databases for any study published up to June 2020 and that reported data on hepatic venous pressure gradient (HVPG) and SSM in adult patients. After receiving IPD data, patients with liver stiffness measurement (LSM) <10 kPa, previous decompensation or missing data were excluded. The diagnostic accuracy of the Baveno VII Criteria and the combined Baveno VII-SSM criterion was assessed using a random effect bivariate model. Sensitivity analyses for cACLD definition, center, etiology, and obesity, were conducted. The methodological quality of the included studies was assessed using QUADAS-2 tool.

Results: Of the 44 eligible articles, 17 studies (14 full-texts, 3 abstracts) were included in the meta-analysis. Six hundred patients from six studies were included in the transient elastography cohort. The Baveno VII and the Baveno VII-SSM criteria with a dual cut-off of 21 and 50 kPa were validated, showing adequate (>90%) negative (NPV) and positive predictive values (PPV) in the whole cohort and in all sensitivity analyses. The combined Baveno VII-SSM criteria with a single cut-off (40 kPa) was the most performant in ruling-out CSPH with PPV >90%, while it could rule-out safely CSPH only in viral etiology. The SSM-based algorithms significantly reduced the rate of patients in the “grey zone” from 48% (Baveno VII criteria) to 32% and 9%, respectively. Similar cut-offs showed adequate performance also in the two-dimensional shear-wave elastography (SWE) cohort, compromising 225 patients from five studies. Available data was insufficient to evaluate the performance of SSM assessed by point-shear-wave-elastography.

Background and aims: The combined Baveno VII-SSM models are highly performant non-invasive algorithms to diagnose CSPH, and were validated in this large, multicenter, international study. Importantly, they significantly reduce the rate of patients in the “grey zone.” These criteria can be used in clinical practice to best identify patients that could benefit from carvedilol treatment to reduce the risk of first decompensation.

SAT-328
Effects of renin angiotensin system inhibition on renal function and the clinical course of patients with decompensated liver cirrhosis and ascites
Tammo Lambert Tergast1, Marie Griemsmann1, Heiner Wedemeyer1, Markus Cornberg3, Benjamin Maasoumy1, Hannover Medical School, Department of Gastroenterology, Hepatology and Endocrinology, Germany

Background and aims: Patients with decompensated liver cirrhosis and ascites are at a high risk of developing acute kidney injury (AKI). Studies have suggested that inhibition of the Renin-Angiotensin System (RAS) has certain nephr- and hepatoprotective effects in patients with liver fibrosis and early stages of liver cirrhosis. However, data in patients with decompensated cirrhosis are scarce. This study aimed to investigate the clinical impact of Angiotensin converting.
enzyme antagonists and Angiotensin II receptor inhibitors (RAS-Inhibitors) in individuals with decompensated liver cirrhosis. The prevalence of metabolic syndrome and type 2 diabetes mellitus. Competing risk analysis was used to analyze longitudinal end points

**Results:** After PPSM, 117 patients remained in the No RAS-Inhibitor group and were compared with 39 patients with RAS-Inhibitor intake. Baseline characteristics were comparable between both groups and standardized mean differences (SMD) indicated successful matching (SMDs <0.10). Within 28-days, incidence of AKI did not differ between both groups (HR: 0.92, 95%CI 0.49–1.74, P = 0.81). Furthermore, no case of severe AKI was observed in the RAS-Inhibitor group and a significantly increased incidence of severe AKI was observed in those without RAS-Inhibitor intake within 28-days (p < 0.001). Progressive AKI was numerically higher in patients without RAS-Inhibitor intake (RAS-Inhibitor: 25% vs. No RAS-Inhibitor: 46%, P = 0.14). In the long-term follow-up, need for hemodialysis in patients with RAS-Inhibitor intake was significantly decreased compared to patients without RAS-Inhibitors (HR: 0.22, 95%CI: 0.05–0.91 P = 0.03, Figure 1). Furthermore, LTx-free survival was comparable between those with and without RAS-Inhibitor intake (HR: 0.83, 95%CI: 0.48–1.45, P = 0.52). Last, incidence of hepatocellular carcinoma did not differ significantly between patients with or without RAS-Inhibitor intake (HR: 0.81, 95%CI 0.17–3.72 P = 0.71).

**Conclusion:** RAS-Inhibitor intake is associated with a decreased incidence of severe acute kidney injury and need for hemodialysis in patients with decompensated liver disease.

**SAT-329**

**Adoption of a clinical assessment service in hepatology**

Gioia Bratos1, William Ovenden2, Arjuna Singanayagam1, Daniel Forton1, Metin Yalcin1, Sarah Hughes1, Sarah Clark1, St George’s Hospital, United Kingdom

Email: sarah.clark@stgeorges.nhs.uk

**Background and aims:** The Hepatology Clinical Assessment Service (CAS) was established as a new service at St George’s Hospital in April 2020 during the COVID19 pandemic. It is a novel way to assess new patients referred to the liver outpatient clinic with a view to streamlining the patient pathway, pre-investigation patients prior to a clinic appointment, avoiding inappropriate clinic appointments, rejecting inappropriate referrals and improving the efficiency of the clinic. Hepatology CAS is a weekly consultant-led clinic supported by the Clinical Nurse Specialist (CNS) and the Patient Pathway Coordinator (PPC), the clinic happening virtually without the patient being present at the time of the triage and assessment. On average, every week 35 patients are referred to the Liver Clinic by their GPs or by other clinicians internally or externally to the hospital.

**Method:** Once the patient’s referral has been assessed, the CNS requests the investigations, communicates with the patient and dictates a clinical letter to patient and referrer, while the PPC prioritises the appointments based on their clinical needs. Following this assessment most of the patients then attend a face-to-face appointment, although some patients can be managed entirely virtually if clinically appropriate. With the introduction of the community non-alcoholic fatty liver pathways GP, at a similar time to this service, referrals are rejected if this pathway has not been followed.

**Results:** Since CAS has been introduced there have been several positive outcomes: in 2021, 18% of the referrals were appropriately repatriated to primary care with advice; 30% of the referrals were managed without needing a face to face appointment; the waiting time reduced from 8 weeks to 5 weeks for a for a clinical review, and from 16 weeks to 15 weeks for a follow-up appointment; from 2020 to 2022 the proportion of patients discharged after the first clinical review has increased from 16% to 29%

**Table 1: Comparison of patients over 6 weeks that were seen and discharged before and after the introduction of CAS.**

<table>
<thead>
<tr>
<th></th>
<th>2020</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total ‘New’ appts</strong></td>
<td>190</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total pts seen</strong></td>
<td>134</td>
<td>141</td>
</tr>
<tr>
<td><strong>Total DNNs</strong></td>
<td>56</td>
<td>29</td>
</tr>
<tr>
<td><strong>Breakdown of patients seen</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of pts seen &amp; F/U</td>
<td>113</td>
<td>100</td>
</tr>
<tr>
<td>Of pts seen &amp; D/Cd</td>
<td>21</td>
<td>41</td>
</tr>
<tr>
<td><strong>Breakdown of DNNs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total DNNs</td>
<td>56</td>
<td>100</td>
</tr>
<tr>
<td>DNA &amp; Reschedule</td>
<td>33</td>
<td>25</td>
</tr>
<tr>
<td>DNA &amp; D/Cd</td>
<td>23</td>
<td>15</td>
</tr>
</tbody>
</table>

**Conclusion:** Hepatology CAS has impacted extremely positively on our service. Following the introduction of the Hepatology CAS service specialist treatment is instigated more quickly, patients can be discharged following their first face to face visit as all information is to hand, it has eliminated unnecessary follow-up and has resulted in a clear and concise pathway to refer the patients into the service, with the diagnostic tests being performed at an earlier stage.

**SAT-330**

**Diabetes impairs the hemodynamic response to non-selective betablockers in compensated cirrhosis and predisposes for hepatic decompensation**

Rafael Paternostro1, Mathias Jachs1, Lukas Hartl1, Benedikt Simbrunner1, Bernhard Scheiner1, David Jm Bauer1, Philipp Schwabl1, Georg Semmler1, Michael Trauner1, Mattias Mandorfer1, Thomas Reiberger1, Medical University of Vienna, Austria

Email: rafael.paternostro@meduniwien.ac.at

**Background and aims:** Non-selective betablockers (NSBB) reduce the risk of hepatic decompensation in patients with compensated advanced chronic liver disease (cACLD). The prevalence of metabolic
comorbidities (MetC) in eACLD patients is increasing. We aimed to investigate the impact of MetC on (i) the hemodynamic effects of NSBB and (ii) hepatic decompensation in eACLD.

Method: eACLD patients undergoing paired hepatic venous pressure gradient (HVPG) measurements before/under NSBB-therapy were considered for this study. MetC, i.e., obesity, dyslipidemia, and diabetes (DM) were recorded. Hepatic decompensation and liver-related mortality were evaluated.

Results: Ninety-two patients were included (Child-A n = 80, 87%; Child-B n = 12, 13%). MetC were found in 34 (37%) patients: n = 19 (20.7%) had obesity, n = 14 (15.2%) dyslipidemia, and n = 23 (34.8%) DM. The median baseline-HVPG of 18 (IQR: 15–21) mmHg decreased to a median of 15 (IQR: 9–12) mmHg under NSBB. HVPG-response (decrease ≥ 10%) or to ≥ 12 mmHg) was achieved in n = 60 (65.2%) patients. Interestingly, patients with DM (OR: 0.35, p = 0.021) and higher BMI (OR: 0.89 per kg/m2, p = 0.031) were less likely to achieve HVPG-response. During a median follow-up of 2.3 (0.5–4.2) years, 18 (19.5%) patients experienced first hepatic decompensation. Child-B (adjusted subdistribution hazard ratio, aSHR: 4.3 [95%CI:1.5–12.2], p = 0.006), HVPG-response (aSHR: 0.3 [95%CI:0.1–0.9], p = 0.037), and DM (aSHR: 2.8 [95%CI:1.1–7.2], p = 0.036) were independently associated with hepatic decompensation (Table).

Table: (A) Univariate and (B) multivariate competing risk regression analysis modeling the risk for hepatic decompensation during follow-up. Diagnosis of hepatocellular carcinoma, removal of the A preoperative TIPS might be associated with reduced mortality.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Univariate regression model</th>
<th>Multivariate regression model</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTP stage B (vs. A)</td>
<td>3.420 1.330–8.80</td>
<td>4.325 1.536–12.2</td>
</tr>
<tr>
<td>HVPG-Response (vs. Non-response)</td>
<td>0.279 0.107–0.728</td>
<td>0.313 0.105–0.934</td>
</tr>
<tr>
<td>Age, per year</td>
<td>1.070 1.010–1.140</td>
<td>1.040 0.978–1.105</td>
</tr>
<tr>
<td>Diabetes mellitus, vs. no diabetes mellitus</td>
<td>5.280 1.870–14.900</td>
<td>2.772 1.071–7.175</td>
</tr>
<tr>
<td>Dyslipidemia, vs. no dyslipidemia</td>
<td>2.030 0.548–7.530</td>
<td>0.290 – –</td>
</tr>
<tr>
<td>Arterial hypertension, vs. no arterial hypertension</td>
<td>0.940 0.309–2.860</td>
<td>0.910 – –</td>
</tr>
<tr>
<td>Obesity, vs. normal weight</td>
<td>1.110 0.362–3.390</td>
<td>0.860 – –</td>
</tr>
</tbody>
</table>

Conclusion: In eACLD patients DM and a higher BMI impair the HVPG-response to NSBB. Furthermore, DM-independent from hepatic function and lack of HVPG-response-increases the risk for hepatic decompensation. Thus, DM seems to promote first hepatic decompensation by hemodynamic and non-hemodynamic mechanisms.

SAT-331
Preoperative transjugular intrahepatic portosystemic shunt and in-house mortality in patients with liver cirrhosis undergoing surgery

Felix Piecha1, Joscha Vonderlin2, Friederike Frühhaber1, Julia-Kristin Graß4, Ann-Kathrin Ozga4, Aenne Harberts3, Daniel Benten1, Peter Huebener1, Matthias Reeh3, Christoph Riedel3, Peter Bannaß4, Jakob R. Izbički3, Gerhard Adam4, Samuel Huber1, Ansgar W. Lohse1, Johannes Kluwe1, 1University Medical Center Hamburg-Eppendorf, I. Department of Medicine, Germany; 2Charité-Universitätsmedizin Berlin, Department of Hepatology and Gastroenterology, Germany; 3University Medical Center Hamburg-Eppendorf, Department of General, Visceral and Thoracic Surgery, Germany; 4University Medical Center Hamburg-Eppendorf, Institute of Medical Biometry and Epidemiology, Germany; 5University Medical Center Hamburg-Eppendorf, Department of Diagnostic and Interventional Radiology and Nuclear Medicine, Germany; Email: f.piecha@uke.de

Background and aims: Liver cirrhosis is associated with an increased surgical morbidity and mortality. Portal hypertension and the surgery type have been established as critical determinants of postoperative outcome. We aim to evaluate the hypothesis that preoperative placement of a transjugular intrahepatic portosystemic shunt (TIPS) in patients with liver cirrhosis is associated with a lower in-house mortality after surgery.

Method: A retrospective database search for the years 2010–2020 was carried out. We identified 64 patients with liver cirrhosis who underwent surgery within three months after TIPS-placement and 131 cirrhosis patients who underwent surgery without prior TIPS (control). Surgeries were categorized into low-risk and high-risk procedures. The primary end point was postoperative in-house mortality.

Results: In both the TIPS and the control cohort, most patients presented with a Child-Pugh B stage (37/64, 58% vs. 70/131, 53%) at the time of surgery, but the median MELD score was higher in the TIPS cohort (14 vs. 11 points). Low-risk and high-risk procedures amounted to 47% and 53% in both cohorts. In-house mortality was lower in the TIPS cohort (12/64, 19% vs. 53/131, 41%), also when further subdivided into low-risk (0/30, 0% vs. 11/61, 18%) and high-risk (12/34, 35% vs. 42/70, 60%) surgery. We analyzed the influence of high-risk surgery, preoperative TIPS-placement, age, sex, baseline creatinine, presence of ascites, chronic liver failure consortium-acute decompensation (CLIF-C AD), American Society of Anesthesiologists (ASA) and model for end-stage liver disease (MELD) scores on in-house mortality by multivariable Cox proportional hazards regression. Preoperative TIPS-placement was associated with a lower rate (hazard ratio 0.42, 95%-confidence interval 0.18–0.93) for postoperative in-house mortality.

Conclusion: A preoperative TIPS might be associated with reduced postoperative in-house mortality in patients with liver cirrhosis, especially after high-risk surgical procedures.
SAT-332
Indocyanine green clearance reflects various pathophysiological mechanisms and independently predicts liver-related events in ACLD
Mathias Jachs1, Lukas Hartl1, Benedikt Simbrunner1, Lorenz Balcar1, Georg Semmler1, David Jm Bauer1, Benedikt Hofer1, Michael Schwarz1, Albert Stättemayer1, Matthias Pinter1, Michael Trauner1, Thomas Reiberger1, Mattis Mandorfer1. 1Medical University of Vienna, Austria
Email: mattias.mandorfer@meduniwien.ac.at

Background and aims: Indocyanine green (ICG) clearance, determined by venous sampling, has shown a promising diagnostic/prognostic utility for clinically significant portal hypertension (CSPH)/hepatic decompensation in compensated advanced chronic liver disease (cACLD), while the prognostic utility of pulse dye densitometry (PDD)-derived values conveniently measured via a finger clip has primarily been evaluated in the context of hepatoc- omy or decompensated cirrhosis.

Method: For this retrospective evaluation, patients with ACLD (defined by LSM ≥ 10 kPa) enrolled in the prospective Vienna Cirrhosis Study (VICIS, NCT03267615) who underwent same-day measurements of the hepatic venous pressure gradient (HVPG) and ICG clearance between 2017 and 2022 were included. ICG retention rate at 15 minutes (R15) was assessed in vivo by PDD. Long-term follow-up data on first hepatic decompensation (cACLD) and the incidence of acute-on-chronic-liver failure (ACLF) or liver-related mortality (decompensated ACLD [dACLD]) was recorded and analysed by competing risk regression.

Results: Two-hundred and sixty-one patients were included: Median age: 56.0 years; 62.8% male; etiology: 55.2% ALD, 18.0% viral, 18.1% NAFLD/cryptogenic, while 10.7% other; Child-Turcotte-Pugh stage A: 49.6%, B: 36.8%, C: 13.8%. The median HVPG was 17 (IQR: 11–25) mmHg. The median ICG-R15 was 24.1 (10.4–41.3) %, among cACLD patients (n = 115, CSPH prevalence: 62.4%), ICG-R15 correlated moderately with HVPG (Spearman’s rho: 0.458, p < 0.001) and yielded a suboptimal diagnostic accuracy for CSPH (AUCROC: 0.687 [95% CI: 0.585–0.789]), while a strong correlation with the model for end-stage liver disease (MELD) score (rho: 0.701, p < 0.001) was found. ICG-R15 also correlated with biomarkers of endothelial dysfunction (von Willebrand factor antigen [VWF]) and inflammation (CRP, IL-6, procollagen [PCT]), as shown in the Figure. In dACLD (n = 146), similar correlations were found, however, ICG-R15 correlated only weakly with HVPG (rho: 0.189, p = 0.023). ICG-R15 additionally correlated with renal/mean arterial pressure, i.e., biomarkers of circulatory dysfunction. ICG-R15 was independently associated with hepatic decompensation in cACLD patients in competing risk regression (adjusted subdistribution Hazard Ratio [aSHR]: 1.045 [95%CI: 1.006–1.090] per %, p = 0.024; adjusted for liver stiffness, MELD, and albumin levels). Furthermore, ICG-R15 was an independent predictor for the composite end point ACLF/liver-related mortality in dACLD (aSHR: 1.070 [95%CI: 1.030–1.100] per %, p < 0.001; adjusted for CLIF-C ACLF-D score).

Conclusion: ICG-R15 by PDD correlated with portal hypertension and systemic inflammation as key disease-driving mechanisms in cACLD. Although its diagnostic value for CSPH is insufficient for clinical application, it predicted first hepatic decompensation, even after adjusting for other non-invasive parameters. Moreover, ICG-R15 was independently predictive of ACLF/liver-related death in dACLD.

SAT-333
A multimodal deep learning network for non-invasive prediction of the hepatic decompensation risk in compensated cirrhotic people: a multicentre cohort study (CHESS1701)
Qian Yu1, Yi Zhou2, Yuxiang Lai2, Xiaolong Qi2, Shenghong Ju1. 1Department of Radiology, Zhongda Hospital, School of Medicine, Southeast University, China; 2School of Computer Science and Engineering, Southeast University, China; 3Center of Portal Hypertension, Department of Radiology, Zhongda Hospital, School of Medicine, Southeast University, China
Email: jsh@seu.edu.cn

Background and aims: Assessing the risk of portal hypertension (PHT)-related decompensation aids the prophylactic strategy to improve prognosis of the compensated cirrhotic population. Conventional imaging methods are inadequate to assess this risk, and the usage of specialized screening tools (such as liver stiffness measurement (LSM)) is still limited. Hence, we aimed to develop a multimodal artificial intelligence decompensation prediction system (AIDE) that integrates computed tomography (CT) image-type and clinical context-type information to predict the hepatic decompensation risk non-invasively.

Method: 1,045 compensated cirrhotic patients from seven tertiary medical centres who underwent baseline contrast-enhanced CT imaging were enrolled with a median follow-up of 33 months. A total of 615 patients from the first five centres were treated as the training and validation cohorts, while 430 from other two centres comprised the external test cohort. AIDE’s performance was evaluated using concordance index (C-index) and time-dependent area under the curve (tAUC). The risk stratification performance was assessed by Kaplan-Meier analysis and compared with the Baveno VII performance. The classification ability of baseline clinically significant PHT (CSPH) was assessed in 430 persons with or without CSPH to explore the biological mechanisms of AIDE.

Results: In the external test cohort, AIDE achieved a C-index of 0.84 (95% confidence interval (CI): 0.80–0.87) and a 3-year tAUC of 0.87 (0.83–0.92), outperformed the conventional models (Figure 1). The 3-year decompensation rates were 1% (3/393), 25% (47/188), and 59% (23/39) in the low-, moderate-, and high-risk groups, respectively (p < 0.05). AIDE reduced the proportion of patients in the grey zone of Baveno VII by 63% and achieved an AUC of 0.82 (0.76–0.89) for CSPH diagnosis; the PHT progression mechanisms might be captured by the AIDE.

Conclusion: AIDE provided an accurate decompensation risk assessment in compensated cirrhotic patients. It could help guide the prophylactic strategies when HVPG/LSM are not available.

Figure:
SAT-334
TIPS under-dilation strategy with new controlled expansion endoprosthesis: a hemodynamic and imaging confirmation of its feasibility
Dario Saltini1,2, Cristian Caporali2,3, Federica Indulti1,2, Marcello Bianchini1,2, Federico Casari2,3, Francesco Prampolini2,3, Davide Felaco2,3, Tomas Guasconi2, Biagio Cuffari1, Alberto Zanetto1,4, Gian Piero Guerrini5, Nicola De Maria1,5, Erica Villa1, Antonio Colechia1, Fabrizio Di Benedetto2,5, Filippo Schepis1,2.
1Gastroenterology Unit, University of Modena and Reggio Emilia and Azienda Ospedaliero-Universitaria of Modena, Italy; 2TIPS team, Azienda Ospedaliero-Universitaria of Modena, Italy; 3Interventional Radiology Unit, Azienda Ospedaliero-Universitaria of Modena, Italy; 4Gastroenterology and Multivisceral Transplant Unit, Azienda Ospedale-Università of Padua, Italy; 5Hepato-Pancreato-Biliary Surgery and Liver Transplantation Unit, University of Modena and Reggio Emilia, Azienda Ospedaliero-Universitaria of Modena, Italy.
Email: fschepis@unimore.it

Background and aims: The use of small caliber (<8 mm) transjugular intrahepatic portosystemic shunt (TIPS) is a promising approach to reduce shunt-related complications. Its feasibility with the new controlled expansion stent-grafts (GORE® VIATORR® CX 8–10 mm or VCX) has not yet been explored. Our aim was twofold: to investigate whether VCX self-expands over time when under-dilated to <8 mm at TIPS placement; to compare VCX under-dilated to 6 mm versus first generation 8 and 10 mm VIATORR® TIPS stent-grafts (VTS).

Method: For the first aim, we prospectively enrolled consecutive patients with cirrhosis who received under-dilated TIPS between June 2020 and September 2022 at our tertiary referral Center in Modena, Italy. All patients underwent hemodynamic measurements: a) immediately before and after TIPS placement, b) 6–7 days and c) ≥1 month after the procedure. We measured average pressure values in different sites along the TIPS: portal-vein tract (PV), intra-parenchymal tract (IP), hepatic-vein tract (HV) and inferior vena cava (IVC). A subgroup of patients underwent serial CT scans within 24 h (T0), at 6–7 days (T1) and at ≥1 month after TIPS (T2). Average maximal inner diameter of endoprosthesis was measured at 5 standard sites: PV, PVW, IP, HVW and distal HV. For the second aim, we retrospectively enrolled consecutive patients with cirrhosis who received under-dilated TIPS to 6 mm between January 2015 and September 2022 and underwent a CT scan ≥1 month after TIPS. Average maximal inner diameter of stent-graft was measured at PVW, IP, and HVW and compared between VCX and VTS-8 or VTS-10. Percentage variations from the dilation diameter were also assessed.

Results: For the first aim, 64 patients underwent hemodynamic assessments: 25, 29 and 10 received TIPS under-dilated to 5, 6 and 7 mm, respectively. A significant drop of pressure was observed while crossing PVW and HVW in all under-dilated groups (Figure 1A). Forty-three of these patients underwent CT scans: 17, 19 and 7 were dilated to 5, 6 and 7 mm, respectively. PVW and HVW sites maintained under-dilation overtime (Figure 1B). No TIPS dysfunction occurred during a mean follow-up period of 363 days. For the second aim, 20 patients were enrolled in the VCX, VTS-8 and VTS-10 mm groups, respectively (N = 60). VCX maintained the dilation diameter at PVW and HVW similarly to VTS-8 but significantly better than VTS-10 mm. VCX self-expansion at IP site was significantly inferior than VTS-10 mm (Figure 1C).

Conclusion: Under-dilation TIPS strategy performed with VCX is feasible. Reduced self-expansion in comparison to first generation VTS positively impact the strategy application. Evaluation of clinical outcomes after applying this strategy are awaited.
POSTER PRESENTATIONS

Figure 1A  
Average pressure at each standard site in hemodynamic assessment time points (immediate post-TIPS, 6-7 days and ≥ 1 months after TIPS)

Figure 1B  
Average maximal inner diameters at each standard site in CFs time points (T0, T1 and T2)

Figure 1C  
Comparison between Gore® VCX and VTS stent-grafts under-dilated to 6mm

BAR-7-334

SAT-335  
Is elastography needed for diagnosing cACLD and stratifying CSPH risk?

Georg Semmler1,2, Lukas Hartl1,2, Mathias Jachs1,2, Benedikt Simbrunner1,2, Benedikt Hofer1,2, Lorenz Balcar1,2, Michael Schwarz1,2, Laurenz Fritz1,2, Anna Schedlbauer1,2, Katharina Stopfer1,2, Daniela Neumayer1,2, Jurij Maurer1,2, Robin Szymanski1,2, Bernhard Scheiner1,2, Michael Trauner1,2, Thomas Reiberger1,2, Mattias Mandorfer1,2, 1Medical University of Vienna, Division of Gastroenterology and Hepatology, Department of Internal Medicine III, Vienna, Austria; 2Medical University of Vienna, Vienna Hepatic Hemodynamic Lab, Division of Gastroenterology and Hepatology, Department of Internal Medicine III, Vienna, Austria  
Email: mattias.mandorfer@meduniwien.ac.at

Background and aims: Compensated advanced chronic liver disease (cACLD) identifies the population at risk for liver-related complications and the presence of clinically significant portal hypertension (CSPH) defines the target population for preventing hepatic decompensation. While liver stiffness measurement (LSM) by vibration-controlled transient elastography (VCTE) has enabled non-invasive identification of these conditions, its availability is mostly restricted to tertiary care. As the reliance on VCTE/referral pathways may impede the identification of cACLD/CSPH in the community, we developed a routine laboratory-based algorithm to identify cACLD patients (by FIB-4) and to subsequently rule-in/rule-out CSPH (by the von Willebrand factor/platelet count ratio [VITRO]).

Method: FIB-4/LSM cohort: To determine a FIB-4 cut-off that reflects cACLD, all patients with (suspected) compensated chronic liver disease undergoing FIB4+LSM at the Medical University Vienna from 2007 to 2022 were characterized and followed for the development of hepatic decompensation. HVPG cohort: To determine VITRO cut-offs for ruling-in/ruling-out CSPH, cACLD patients (as diagnosed by FIB-4) undergoing hepatic venous pressure gradient (HVPG) measurement were analyzed.

Results: FIB-4/LSM cohort: 5646 patients were followed for a median of 54 months during which 248 (4.4%) developed first hepatic decompensation. 1785 (32%) had a LSM ≥10 kPa, which corresponded to a FIB-4 of >1.7. Importantly, both LSM (AUC 0.894) and FIB-4 (AUC 0.900) were similarly accurate in predicting hepatic decompensation within the subsequent 2 years. FIB-4 ≥1.7 identified patients at risk for first hepatic decompensation (cumulative incidence at 5 years: 11.9%) while in those below this threshold, risk was negligible (cumulative incidence at 5 years: 0.07%, Figure-panel A). HVPG cohort: 393 cACLD patients (as defined by a FIB-4 >1.7) were included. Among patients with FIB-4 ≥1.7, CSPH prevalence was 61.8% (n = 201/325). VITRO exhibited an excellent performance for diagnosing CSPH (AUC 0.844), which was comparable to LSM (AUC 0.894; DeLong test: p = 0.746) and comparable to the ANTICIPATE model (AUC 0.894; DeLong test: p = 0.073, Figure-panel B). A VITRO <1.0 ruled-out (prevalence: 12.0%; negative predictive value [NPV] 87.2%; sensitivity 97.5%) CSPH, while it was ruled-in (prevalence: 40.9%; positive predictive value [PPV] 91.0%; specificity 90.3%) by VITRO ≥2.5. Importantly, the diagnostic indices were comparable to the Baveno VII cut-offs of LSM ≤15kPa and PLT ≥150/L (prevalence: 10.8%; NPV 94.3%; sensitivity: 99.0%) and LSM ≥25kPa (prevalence: 43.4%; PPV 90.8%; specificity: 89.5%).
Conclusion: FIB-4 >1.7 and VITRO ≥2.5 identify cACLD (defined by risk rather than stage, as endorsed by Baveno VII) and CSPH with a similar diagnostic accuracy as LSM-based criteria, questioning the need for VCTE. Simple laboratory tests which are available in primary/secondary care may broaden the access to risk stratification and early intervention.

SAT-336
Systemic inflammation remains a critical determinant of the dynamic component of portal hypertension in abstinent patients with alcohol-related cirrhosis
Benedikt Hofer¹,²,³,⁴, Benedikt Simbrunner¹,²,³,⁴, Kerstin Zinober¹,²,³, Georg Semmler¹,²,³,⁴, Philipp Königshofer¹,³,⁴, Thomas Sorz¹,³,⁴, Vlad Taru¹,³, Philipp Schwabl¹,²,³,⁴, Michael Trauner¹,³,⁴, Thomas Reiberger¹,²,³,⁴, Kerstin Zinober¹,²,³, Georg Semmler¹,²,³,⁴, Philipp Königshofer¹,³,⁴, Thomas Sorz¹,³,⁴, Vlad Taru¹,³, Philipp Schwabl¹,²,³,⁴, Michael Trauner¹,³,⁴, Thomas Reiberger¹,²,³,⁴.
¹Medical University of Vienna, Division of Gastroenterology and Hepatology, Department of Internal Medicine III, Vienna, Austria; ²Medical University of Vienna, Vienna Hepatic Hemodynamic Laboratory, Division of Gastroenterology and Hepatology, Department of Internal Medicine III, Vienna, Austria; ³Medical University of Vienna, Vienna, Christian Doppler Lab for Portal Hypertension and Liver Fibrosis, Vienna, Austria; ⁴Center for Molecular Medicine (CeMM) of the Austrian Academy of Sciences, Vienna, Austria.
Email: thomas.reiberger@meduniwien.ac.at

Background and aims: Portal hypertension (PH) drives disease progression in cirrhosis even after removal/suppression of the primary aetiological factor. While the static component of PH is reflected by the degree of liver fibrosis, the assessment of dynamic contributors to PH is particularly challenging. We assessed the impact of hepatic/systemic inflammation on the dynamic component of PH in (i) rodent models of cirrhosis regression and in (ii) abstinent patients with cirrhosis due to alcohol-related liver disease (ALD).

Method: Male C57BL/6J mice were exposed to carbon tetrachloride or thioacetamide for 12 weeks to induce cirrhosis before allowing for regression by discontinuing the toxic stimulus for one (R1, n = 15) or two (R2, n = 15) weeks. ALD patients with sustained abstinence (>1 month) undergoing same-day hepatic venous pressure gradient (HVPG) and liver stiffness measurement (LSM) were included. The static component of PH (histological collagen proportionate area [CPA]; %) in animals; LSM in patients) was used in a linear model to predict portal pressure (PP). Factors affecting the dynamic component of PH (i.e., the discrepancy between the true PP and the PP predicted by LSM/CPA) were explored using the respective linear model’s residuals (Figure).

Results: In animals, CPA demonstrated a significant positive relationship with PP (beta: 0.20; p <0.001). Hepatic inflammatory gene expression was linked to higher-than-expected PP. Specifically, TNF-alpha (r: 0.46, p = 0.012), CXCL1 (r: 0.36, p = 0.054), IL1-beta (r: 0.46, p = 0.012) and MCP1 (r: -0.32, p = 0.005) were positively correlated with the model’s residuals. The impact of intrahepatic inflammation was significantly more pronounced in R2 than R1 animals. In addition to the animal models, 130 ALD patients (median abstinence: 6 [IQR: 10] months) with a median HVPG of 19 (IQR: 8) mmHg and a median LSM of 49 (IQR: 44) kPa were included. In the linear model, LSM showed a significant positive relationship with HVPG (beta: 0.15; p <0.001). Systemic inflammation was significantly upregulated in patients with higher-than-expected HVPG, as demonstrated by a positive correlation of the model’s residuals to CRP (Spearman’s r: 0.19, p = 0.026) and IL-6 (r: -0.16, p = 0.066). In contrast, complement factors C3c (r: -0.32, p = 0.005) and C4 (r: -0.21, p = 0.059) were lower in patients with higher-than-expected HVPG. While the negative correlation of C3c was only found in short-term abstinence (<6 months), the impact of systemic inflammation was notably more pronounced in long-term abstinence (>6 months).

Conclusion: In animal models of regressive cirrhosis, increased intrahepatic inflammatory gene expression was linked to more pronounced dynamic PH. Similarly, systemic inflammation, as evident from increased CRP and IL-6 and consumption of complement factor C3c, drives the dynamic PH component in abstinent ALD patients.
SAT-337
Robust identification of patient subgroups in acute decompensated cirrhosis
Sara Palomino1, Estefanía Huergo1, Eva Uson2, Cristina Sanchez2, Vincenzo Lagani3, Narsis Kiani4, Nuria Planell5, Unai Gurbindo5, Jonel Trebicka5, Alberto Q. Farias6, Paolo Caraceni7, Pierre-Emmanuel Rautou1, David Gomez-Cabrero1,1 Navarrabiomed, Unit of Translational Bioinformatics, Pamplona, Spain; 2European Foundation for the Study of Chronic Liver Failure, Barcelona, Spain; 3Isla State University, Institute of Chemical Biology, Georgia; 4Karolinska Institute, Algorithmic Dynamics lab, Sweden; 5University of Münster, Department of Internal Medicine, Münster, Germany; 6Hospital das Clínicas da Universidade de São Paulo, Department of Gastroenterology, Brazil; 7University of Bologna, Department of Medical and Surgical Science, Bologna, Italy; 8Université Paris-Cité, Inserm, Centre de recherche sur l’inflammation, France
Email: sarapalominocheve@gmail.com

Background and aims: Understanding patient heterogeneity is essential to better comprehend the mechanisms underlying complex diseases and improve clinical decisions. Therefore, it is necessary to characterize patient diversity by identifying possible sub-types of patients and the clinical features that define them. Classical clustering methods allow patient stratification; however, the intricate nature of clinical data makes the development of more versatile and robust approaches necessary. Here, we developed a tool called ClustAll to identify patient subgroups in individuals with acute decompensation of cirrhosis (AD).

Method: In this study, part of the H2020 funded project DECISION, we developed and applied ClustAll, an unsupervised clustering strategy capable of identifying all possible robust ways of stratifying a population while addressing high dimensional data, missing values, and correlated features. For each resulting stratification, the subgroups identified by ClustAll were statistically characterized, and the minimal model was found using MXM. Subgroup associations with disease outcomes (ACLF, transplant or death) were explored using survival Kaplan-Meier curves. Then, a supervised classifier was trained to predict the groups obtained by ClustAll into additional independent cohorts.

Results: ClustAll was first applied to stratify AD patients from the European multicenter PREDICT cohort (n = 766). 74 clinical variables collected at hospital admission were included in the analysis. Five different robust stratifications were identified. Based on clinical expertise, one of the stratifications was selected for further exploration, defining three sub-groups of AD patients: 306 patients were assigned to Cluster 1, presenting the highest rates of organ dysfunction, clinical events, and precipitating events; Cluster 2 (n = 118) included the highest percentage of diabetic patients (51%) and of patients with suffering from hepatic encephalopathy (HE) (89%); Cluster 3 (n = 342) revealed a cluster with similar patterns to Cluster 2, but not affiliated by HE. Regarding the outcomes, patients in Cluster 1 had a poorer outcome (ACLF, transplant or death) compared to the other groups. Cluster 2 and Cluster 3 had similar prognoses. This patient clustering was validated in two independent international cohorts of AD patients (CANONIC, n = 572 and ACLAARA, n = 580) as well as in follow-up visits of PREDICT cohort (n = 725). The resulting clustering was robust in all three cohorts, and survival significantly differed in the subgroups identified.

Conclusion: Using a data driven approach, our analysis of three large international prospective cohorts of AD patients robustly identified three clusters of patients with different clinical features and short term outcomes. ClustAll may help improve the characterization of AD complexity.

SAT-338
Clinical profile of porto-sinusoidal vascular disorder: experience from tertiary referral hospital in India
Love Garg1, Akash Shukla1, Kashmira Kawi1, Arun Vaidya2, Aditya Kale1, Shashank Pujalwar2, 1Seth GS Medical College and KEM hospital, Mumbai, Gastroenterology, Mumbai, India; 2Seth GS Medical College and KEM hospital, Mumbai, India
Email: drakashshukla@yahoo.com

Background and aims: Porto-sinusoidal vascular disorder (PSVD) is recently described clinical entity encompassing non cirrhotic portal fibrosis, idiopathic portal hypertension, non cirrhotic intrahepatic portal hypertension and various overlapping histologic patterns. We decided to study clinical profile of patients with PSVD at our center.

Method: Prospectively maintained liver clinic database was reviewed to identify 125 patients meeting the inclusion criteria of PSVD proposed in Baveno VII guidelines. Demography, clinical features, endoscopic, radiological and histological findings and associated conditions were noted.

Results: Median age of cohort was 34 years. Females were 80 (64%). Median duration of symptoms at the time of diagnosis was 8 months. Common presentations were gastrointestinal bleed in 59 (47.2%), symptomatic splenomegaly in 45 (36%), transient ascites following bleed in 25 (20%), incidentally detected in 21 (16.8%) patients. Hemogram showed pancytopenia in 101 (80.8%) patients. Portal hypertension was seen in 120 patients (96%). End stage liver disease (ESLD) developed in 18 (14.4%) patients with median follow-up of 110 months (range 30–150 months). Significant ascites was seen in 16 (12.8%) and spontaneous hepatic encephalopathy in 3 (2.4%) patients. Autoantibodies seen in 41 patients (ANA- 29 (23.2%) and ASMA-12 (9.6%)). IgG elevation was seen in 36 (28.8%) cases. Imaging revealed collaterals and splenomegaly in 113 (90.4%) and 103 (82.4%) patients respectively. Portal vein thrombosis and splenic vein thrombosis was present in 18 (14.4%) and 3 (2.4%) patients respectively. Specific biopsy findings like oblitative portal venopathy, nodular regenerative hyperplasia and incomplete septal fibrosis were seen in 19 (15.2%), 2 (1.6%), 6 (4.8%) patients and combination of oblitative portal venopathy and nodular regenerative hyperplasia in 1 (0.8%). Table 1 shows associated conditions with PSVD. Pancytopenia and IgG elevation was seen significantly more commonly in males than female patients (32 v/s 69 and 7 v/s 29, p value <0.05 for both). Splenomegaly was significantly more common in <35 years age group than >35 years (57 v/s 46, p value <0.005). Significant ascites was seen in 16 (15.2%), 2 (1.6%), 6 (4.8%) patients and combination of oblitative portal venopathy and nodular regenerative hyperplasia in 1 (0.8%).

Table 1: Conditions associated with porto-systemic vascular disorder

<table>
<thead>
<tr>
<th>Associated disorders</th>
<th>Number of patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immunological (Autoimmune hepatitis)</td>
<td>7</td>
<td>5.6%</td>
</tr>
<tr>
<td>Myeloproliferative disorder</td>
<td>1</td>
<td>0.8%</td>
</tr>
<tr>
<td>Hodgkin’s lymphoma</td>
<td>1</td>
<td>0.8%</td>
</tr>
<tr>
<td>Prothrombotic disorders</td>
<td>10</td>
<td>8%</td>
</tr>
<tr>
<td>Protein S deficiency</td>
<td>1</td>
<td>0.8%</td>
</tr>
<tr>
<td>Protein C + S deficiency</td>
<td>4</td>
<td>3.2%</td>
</tr>
<tr>
<td>Antiphospholipid antibody</td>
<td>2</td>
<td>1.6%</td>
</tr>
<tr>
<td>JAK 2 mutation</td>
<td>2</td>
<td>1.6%</td>
</tr>
<tr>
<td>Factor V mutation</td>
<td>1</td>
<td>0.8%</td>
</tr>
</tbody>
</table>

Conclusion: PSVD is female predominant entity with varied clinical and histological manifestations. PSVD can present without portal hypertension. Portal vein thrombosis is common. Prothrombotic disorders and autoimmune disorders are less common than reported in western. A proportion of patients developed ESLD (End stage liver disease) with median follow-up of 110 months.
SAT-339
Impact of rifaximin use post-discharge of an overt hepatic encephalopathy (OHE) hospitalization on the annual rates of OHE-related inpatient stays
Arun Jesudian1, Patrick Gagnon-Sanschagrin2, Zeev Heimanson3, Rebecca Bungay4, Jingyi Chen4, Annie Guérin5, Ankur Dashputre6, Brock Bumpass7, Danielle Borroto8, George Joseph9, 1Weill Cornell Medicine, New York, United States; 2Analysis Group, Inc., Montreal, Canada; 3Salix Pharmaceuticals, Bridgewater, United States; 4Analysis Group, Inc., Boston, United States; 5Bausch Health Companies Inc., Bridgewater, United States.
Email: brock.bumpass@bauschhealth.com

Background and aims: Overt hepatic encephalopathy (OHE) is a severe neurologic manifestation of cirrhosis, with a wide range of symptoms related to loss of brain function, cognitive impairment, and confusion. Healthcare resource use (HRU) in OHE is substantial, with OHE recurrence as a significant driver. Thus, a key element of OHE treatment is preventing recurrence. Among patients with an initial OHE hospitalization in a real-world setting, literature on the impact of rifaximin use post-discharge on rates of OHE-related inpatient (IP) stays is limited.

Method: Adults (18–64 years) with an OHE index hospitalization were identified from the MarketScan® Commercial claims database (Q4/2015-Q2/2020). Patients were classified into two mutually exclusive cohorts based on treatment following index hospitalization: rifaximin treated (with/without lactulose) and not rifaximin treated. Patients were further classified into four subgroups based on decreasing quality of care (QOC): Type 1 (highest QOC) received rifaximin with no gap in treatment following index hospitalization; Type 2 received rifaximin within 30 days post-discharge; Type 3 received only lactulose within 30 days post-discharge; Type 4 (lowest QOC) received no treatment. The impact of rifaximin use on annual rates of OHE-related IP stays was described and compared by cohort, by QOC subgroup, and by treatment received pre-index hospitalization, accounting for differences in patient characteristics.

Results: At baseline, patients in the rifaximin treated cohort (N = 1,452; Type 1: N = 1,138, Type 2: N = 314) and not rifaximin treated cohort (N = 560; Type 3: N = 337, Type 4: N = 223) had similar demographic characteristics. Specifically, mean age of rifaximin treated and not rifaximin treated patients were 54.2 and 55.2 years, respectively, and 39.3% and 42.7% were female, respectively. Following the index hospitalization, the annual rate of OHE-related IP stays was 59% lower for the rifaximin treated cohort compared to the not rifaximin treated cohort (0.72 vs. 2.04; adjusted incidence rate ratio [IRR] 0.41, p < 0.01). Decreasing QOC (from Type 1 to Type 4) after the index hospitalization resulted in higher annual rates of OHE-related IP stays; more specifically, the annual rate for Type 1 was 0.6 whereas it ranged as high as 1.4 for Type 4. Compared to Type 1; the IRRs were 1.61 (Type 2), 2.60 (Type 3), and 2.90 (Type 4) (all p < 0.01; Figure). Regardless of whether patients received treatment with rifaximin, lactulose only, or neither prior to the index hospitalization, annual rates of OHE-related IP stays were numerically lower in Type 1 (0.6–0.7) compared to Type 2 (1.1–1.2), Type 3 (1.3–3.7), and Type 4 (1.2–2.6).

Conclusion: Patients receiving rifaximin without any gap in treatment following an index OHE hospitalization had lower annual rates of OHE-related IP stays compared with patients who did not receive rifaximin.

SAT-340
MELD-sarcopenia and clinically significant portal hypertension as independent risk factors in the evolution of liver cirrhosis
Elba Llop1,2,3, Marta Hernández Conde1,4, Marta López-Gómez1,4, Christie Perelló1,2, Carlos Fernández-Carrillo1,2, Javier Abad1,2, Jesús Rivera1,2, José Luis Martínez Porras1,2, Natalia Fernández Puga1,2, María Traperó1,2, Enrique Fraga1, José Luis Calleja Panero1,2,2,2,2,3, 1Hospital Universitario Puerta de Hierro Majadahonda, Gastroenterología y Hepatología, Spain; 2IDIPHISA, Spain; 3CIBERhd, Spain.
Email: elballop@gmail.com

Background and aims: Clinically significant portal hypertension (CSPH) and MELD-sarcopenia score have been related to the prognosis of liver cirrhosis. Our aim was to evaluate the relationship between both in the evaluation of hepatic decompensation and mortality.

Method: Single-center prospective study that included consecutive patients with liver cirrhosis who underwent baseline laboratory tests, anthropometric and impedance measurements, sarcopenia assessment (by CT scan (SMI <50 cm²/m² in men and <39 cm²/m² in women) or Handgrip (<19.5 kg) and measurement of hepatic venous pressure gradient ( HVPG) or Fibroscan® for the evaluation of clinically significant portal hypertension (CSPH; HVPG ≥10 mmHg or Fibroscan® ≥25 kPa in the rest). Exclusion criteria were HIV coinfection, hepatocellular carcinoma outside the Milan criteria and TIPS. Hepatitis C had to be cured, hepatitis B controlled with treatment and patients had to demonstrate abstinence of at least 6 months (through AUDIT). Clinical follow-up was carried out until December 2022.

Results: From January 2016 to December 2019, 196 patients were included with a mean follow-up of 47 months (SD 20). Mean age 63 years (SD 10), 67.8% males and predominant HCV etiology 52.6%, CHILD-L–PUGH A/B/C was 83.2%/5.1%/1.5%. Mean MELD was 9.4 (SD 2.7) and 32.7% had sarcopenia, the mean MELD-sarcopenia was 12.6 (5.1).
Background and aims: Severity of portal hypertension is a crucial prognostic factor in patients with liver cirrhosis. The spleen stiffness as compared with liver stiffness might better assess the more advanced stages of portal hypertension. The aim of our study was to assess the usefulness of spleen elastography in the evaluation of portal hypertension in cirrhotic patients and to evaluate the relationship between spleen stiffness measurement and hepatic venous pressure gradient (HVPG).

Method: We examined 138 patients (84 men, 54 women), average age 60.1 ± 12.1 years, with liver cirrhosis (81 ethylc, 15 viral hepatitis, 14 NAFLD, 18 other aetiology). Diagnosis of cirrhosis was confirmed by liver biopsy and/or by ultrasound-based elastography. Every patient underwent standard biochemistry and blood count, abdominal ultrasound and elastography of liver and spleen using point shear-wave elastography (pSWE). HVPG was afterwards measured in every patient.

Results: Clinically significant portal hypertension (HVPG ≥ 10 mmHg) was diagnosed in 110 patients. The average HVPG was 16.07 ± 7.4 mmHg (median 16.0). The average liver stiffness was 2.7 ± 0.55 m/s (median 2.72), stiffness of the spleen was 3.14 ± 0.47 m/s (median 3.22). HVPG correlated with pSWE liver stiffness measurement (p = 0.0408, RR = 1.79 per IQr, CI = (1.024, 3.14), whereas liver pSWE did not (p = 0.300).

Conclusion: Spleen stiffness measured using pSWE correlates positively with HVPG independently of aetiology in contrast with liver stiffness. Spleen stiffness also predicts overall survival and may represent a useful additional non-invasive method in the evaluation of portal hypertension in cirrhotic patients. Supported by: MH CZ-DRO-VFN000064165 and KNLVR 180310.
**Background and aims:** Unit, Department of Medicine, Padova, Italy

**Method:** patients are lacking the risk of non-neoplastic portal vein thrombosis (PVT) in cirrhosis. – other segments as: reviewed by a single radiologist. PVT evolution was categorized plantation or up to 36 months. HCC and PVT (baseline and incident) and cortisol signaling. ACLD may explain this clinically relevant suppression of ACTH-cortisol signaling.

**SAT-343**

**Role of non neoplastic portal vein thrombosis in natural history of patients with cirrhosis and hepatocellular carcinoma**

Sarah Shalaby1, Marco Grasso1, Alessandro Vitale2, Enrico Pizzirani3, Alberto Zanetto1, Paolo Feltracco4, Paolo Simioni5, Patrizia Burra1, Alberto Zanetto1, Paolo Feltracco4, Paolo Simioni5, Patrizia Burra1, Alberto Zanetto1, Paolo Feltracco4, Paolo Simioni5, Patrizia Burra1, Alberto Zanetto1, Paolo Feltracco4, Paolo Simioni5, Patrizia Burra1

**Background and aims:** Hepatocellular carcinoma (HCC) increases the risk of non-neoplastic portal vein thrombosis (PVT) in cirrhosis. However, data on its natural history and prognostic role in HCC-patients are lacking.

**Method:** Cirrhotic HCC-patients undergoing laparoscopic ablation were consecutively enrolled (2015–2018) and followed until transplantation or up to 36 months. HCC and PVT (baseline and incident) characteristics, and their evolution in the first 12 months, were reviewed by a single radiologist. PVT evolution was categorized according to changes in occlusion (cut-off 20%) and extension to other segments as: ‘complete/progressive’; partial-PVT progressing to complete, complete-PVT not improving or PVT extending to other segments; ‘partial/ameliorated’; partial-PVT improving or remaining stable, complete-PVT improving. Variables associated with presence of PVT and evolution patterns were analyzed, as well as its impact on survival.

**Results:** Seven-hundreds-fifty patients were included, 88 with PVT (78.4% partial, 43.2% extended to mesenteric and/or splenic vein). On multivariate analysis, presence of PVT was associated with pre-treatment total-tumor-volume (TTV) (OR1.10, p = .0001) and clinically-significant portal hypertension (OR2.90, p = .0046). During follow-up, 46 incident PVT occurred, 27/46 (58.7%) in the presence of viable tumor. Among total 115 PVT diagnosed in presence of HCC, 83 had available radiological follow-up (77.1% partial, 43.2% extended to the mesenteric and/or splenic vein), and 22 were anticoagulated. The ‘complete/progressive’ evolution pattern was associated with occlusive PVT at diagnosis and absence of anticoagulation in all PVT; whereas to Child C score and non-responsiveness to HCC treatment in anticoagulated patients. Overall survival was lower in presence of PVT, specifically for ‘complete/progressive’ PVT [HR3.9, p = .0001]. A higher cumulative risk of death emerged for ‘complete/progressive’ PVT, both for HCC-related (p < .0001) and non-HCC-related (p < .0001) death.

**Conclusion:** Non neoplastic PVT in HCC seems to be characterized by a higher risk of progression when not anticoagulated, correlated with the HCC activity. Complete/progressive PVT is an independent factor associated with mortality, regardless of HCC evolution.

**SAT-344**

To study effect of the combination of midodrine and tolvaptan versus tolvaptan alone in patients with severe hyponatremia in cirrhosis-an open label RCT (TOLMINA Trial-NCT05060523)

Srinivasa Reddy Golamari1,2, Shiv Kumar Sarin1, Manoj Kumar Sharma1, Jaya Benjamin1, 1Institute of liver and biliary sciences, hepatology, NEW DELHI, India; 2Institute of liver and biliary sciences, hepatology, delhi, India

**Background and aims:** Decreased effective circulating volume secondary to splanchnic vasodilatation plays a central role in the pathogenesis of hyponatremia in patients with cirrhosis. Vaptans have shown promise in increasing serum sodium levels in hyponatremia. Vasoconstrictor therapy may improve the diminished effective circulating volume, which in turn would reduce vasopressin release, thereby allowing for more urinary electrolyte-free water excretion. There is no data on combination of vasoconstrictors and tolvaptan till now. Therefore, the current study reports analysis of the efficacy and safety of tolvaptan and midodrine versus tolvaptan alone in patients with cirrhosis and hyponatremia.

**Method:** Patients [n = 135] with severe chronic hyponatremia (<120 meq/L) who did not respond to albumin infusion [40 gm/day for 48 hours] were randomized to receive Midodrine plus Tolvaptan (n = 70) or Tolvaptan alone (n = 65) for 7 days with a follow-up of 1 month. Tolvaptan was administered as 15–30 mg/d for 7 days and midodrine as 5–15 mg/d to achieve a target Mean Arterial Pressure of ~80 mmHg. Primary end point was improvement in serum sodium to 125 meq/L within 1 week.

**Results:** 135 patients were included; 85.2% males. Baseline parameters in the two groups were comparable. Grade 3 ascites was seen in 45 (65%) cases in group A and 35 (53%) in group B. There was significant difference in improvement in serum sodium levels from day 1 to day 7 in group A compared to group B (p = 0.007). The proportion of patients in group A who improved serum sodium at day 7 was higher, 60/75 (80%) compared to group B 42/65 [p = 0.001]. Absolute Change in Serum sodium levels increase at day 5 and 7 was significant in group A p = 0.001 ([OR] 4.7021; 95% CI: 3.554–5.432, p = 0.001) ([OR] 6.11; 95% CI: 5.238–7.142.5). Overall adverse events occurred in 45 (65%) cases in group A and 35 (53%) in group B. There was also significant in group A than group B (p = 0.007). Plasma renin activity and pro b-type natriuretic peptide (proBNP) significantly decreased in both groups at day-7 compared to baseline respectively (p = 0.003, p = 0.01). Absolute change in urine sodium was significantly increased in group A than group B (p = 0.05). Plasma renin activity and pro b-type natriuretic peptide (proBNP) significantly decreased in both groups at day-7 compared to baseline respectively. (p = 0.027, p = 0.023). Renal resistivity index significantly decreased in group A at day 7 compared to group B (p = 0.03). Absolute change in renal resistivity index was also significant in group A than B (p = 0.027). Mean arterial pressure (MAP) in group A was higher than group B (p = 0.004). Twenty-four –hour urine output was significantly higher in group A than B (p = 0.03) when compared to baseline. Mortality was high in group B at 7 and 28 days [p = 0.005 ([OR] 6.281; 95% CI: 1.354–29.9, p = 0.003 ([OR] 2.121; 95% CI: 0.8–5.5). Overall adverse events occurred in 30.2% of group A and 24% in group B (p = 0.39). Development of acute kidney injury/Hepatic encephalopathy at day 7 and day 28 in group A [16.7%, 12.75%] and B [9.7%, 6%] were not different.

**Conclusion:** With increasing cirrhosis severity, the pituitary-adrenal axis is progressively suppressed in stable outpatients with ACLD. Mechanistically, elevated levels of BA and systemic inflammation in ACLD may explain this clinically relevant suppression of ACTH-cortisol signaling.
**Background and aims:** Bacterial translocation (BT) is considered to play an important role in advanced chronic liver disease (ACLD) by promoting systemic inflammation, portal hypertension, and circulatory dysfunction. BT occurs in early clinical stages of ACLD and linked to a selective inflammatory response.

**Method:** Patients with ACLD (n = 249) and absence of acute decompensation or infections undergoing hepatic venous pressure gradient (HVPG) measurement were classified according to EASL stages of compensated and decompensated (c/d) ACLD (cACLD: S0 : HVPG 6–9 mmHg, S1–2 : HVPG ≥10 mmHg/barriques; dACLD: S3 : previous variceal bleeding, S4 : one previous non-bleeding decompensation; S5 : 2 or more previous decompensation events). BT biomarkers (lipopolysaccharide, LPS; lipoteichoic acid, LTA; bacterial DNA, bactDNA) and markers of systemic inflammation and circulatory dysfunction were evaluated. Furthermore, T-cell subsets were characterized by flow cytometry in small intestinal biopsies in additional 7 ACLD patients and 4 controls.

**Results:** The main cohort had a median HVPG of 18 (12–21) mmHg and 58% had dACLD. BT markers were significantly elevated in patients with ACLD compared to healthy controls (n = 40; p < 0.001): The median LPS levels were 0.04 (0.02–0.06) in controls vs. 0.64 (0.30–1.06) EU/ml, LTA 4.53 (3.58–5.97) vs. 43.2 (23.2–109) pg/ml, and bactDNA was detected (≥5 pg/ml) in 5% of controls vs. 41% of patients with ACLD, respectively. Surprisingly, BT markers were similar across the clinical stages of ACLD and not linked to HVPG, systemic hemodynamics, or clinical events during follow-up. LPS was correlated with TNF-α and IL-10 (Spearman’s r = 0.523, p < 0.001; r = 0.143, p = 0.024). The presence of bactDNA was associated with elevated LPS (0.54, 0.28–0.95, vs. 0.88, 0.32–1.31 EU/ml, p = 0.001) and TNF-α levels (15.3, 6.31–28.1, vs. 20.9, 13.8–32.9, pg/ml). Patients with ACLD displayed a decreased CD4 : CD8-ratio and higher TH1-cells in their intestinal mucosa than liver-healthy controls.

**Conclusion:** Our results clearly demonstrate that combination of tolvaptan and midodrine is superior to Tolvaptan monotherapy in the treatment of severe hyponatremia in cirrhosis patients with ascites.

**SAT-345**

**Bacterial translocation has an early onset in cirrhosis and induces a selective inflammatory response**

Benedikt Simbrunner¹, Esther Caparrós², Teresa Neuwirth³, Philipp Schwabl¹, Philipp Königshofer¹, David Jm Bauer¹, Rodrig Marculescu⁴, Michael Trauner¹, Bernhard Scheiner¹, Georg Stary⁴, Mattias Mandorfer¹, Thomas Reiberger¹,⁵

Rubén Francés², Division of Gastroenterology and Hepatology, Department of Medicine III, Medical University of Vienna, Vienna, Austria; ¹Division of Gastroenterology and Hepatology, Department of Medicine III, Medical University of Vienna, Vienna, Austria; ²CIBEREHD, Instituto de Salud Carlos III, Madrid, Spain; ³CeMM Research Center for Molecular Medicine of the Austrian Academy of Sciences, Austria; ⁴Department of Laboratory Medicine, Medical University of Vienna, Austria, Austria

Email: thomas.reiberger@meduniwien.ac.at

**Background and aims:** Bacterial translocation (BT) is considered to play an important role in advanced chronic liver disease (ACLD) by promoting systemic inflammation, portal hypertension, and circulatory dysfunction.

**Method:** Patients with ACLD (n = 249) and absence of acute decompensation or infections undergoing hepatic venous pressure gradient (HVPG) measurement were classified according to EASL stages of compensated and decompensated (c/d) ACLD (cACLD: S0 : HVPG 6–9 mmHg, S1–2 : HVPG ≥10 mmHg/barriques; dACLD: S3 : previous variceal bleeding, S4 : one previous non-bleeding decompensation; S5 : 2 or more previous decompensation events). BT biomarkers (lipopolysaccharide, LPS; lipoteichoic acid, LTA; bacterial DNA, bactDNA) and markers of systemic inflammation and circulatory dysfunction were evaluated. Furthermore, T-cell subsets were characterized by flow cytometry in small intestinal biopsies in additional 7 ACLD patients and 4 controls.

**Results:** The main cohort had a median HVPG of 18 (12–21) mmHg and 58% had dACLD. BT markers were significantly elevated in patients with ACLD compared to healthy controls (n = 40; p < 0.001): The median LPS levels were 0.04 (0.02–0.06) in controls vs. 0.64 (0.30–1.06) EU/ml, LTA 4.53 (3.58–5.97) vs. 43.2 (23.2–109) pg/ml, and bactDNA was detected (≥5 pg/ml) in 5% of controls vs. 41% of patients with ACLD, respectively. Surprisingly, BT markers were similar across the clinical stages of ACLD and not linked to HVPG, systemic hemodynamics, or clinical events during follow-up. LPS was correlated with TNF-α and IL-10 (Spearman’s r = 0.523, p < 0.001; r = 0.143, p = 0.024). The presence of bactDNA was associated with elevated LPS (0.54, 0.28–0.95, vs. 0.88, 0.32–1.31 EU/ml, p = 0.001) and TNF-α levels (15.3, 6.31–28.1, vs. 20.9, 13.8–32.9, pg/ml). Patients with ACLD displayed a decreased CD4 : CD8-ratio and higher TH1-cells in their intestinal mucosa than liver-healthy controls.

**Conclusion:** Our results clearly demonstrate that combination of tolvaptan and midodrine is superior to Tolvaptan monotherapy in the treatment of severe hyponatremia in cirrhosis patients with ascites.

**SAT-346**

**Efficacy of long term albumin therapy in treatment of decompensated cirrhosis**

Deepanshu Khanna¹,², Premashis Kar¹, Pabitra Sahul.¹ Max Super Speciality Hospital, Vaishali, Ghaziabad, India; ²Max Super Speciality Hospital, Vaishali, Gastroenterology, Ghaziabad, India

Email: drdeepanshukhanna@gmail.com

**Background and aims:** Decompensated liver cirrhosis has a poor prognosis, with a median overall survival of 2–4 years, which is worse than for many oncological disorders. These patients are highly susceptible to infections due to increased systemic inflammation leading to kidney failure and death. Aim was to study the efficacy of albumin in reducing episodes of decompensation, preventing bacterial infection, kidney dysfunction and mortality.

**Method:** Study involved patients with Child B or C cirrhosis with albumin level below 30 g per litre, who were administered 20% human albumin weekly with standard medical treatment for 3 months and compared with age and sex matched controls who received only standard medical treatment. The primary end point was 6 month mortality, and the secondary end points were reduction in infections, kidney dysfunction, ascites recurrence, hepatic encephalopathy, gastrointestinal bleed and complications of cirrhosis.

**Results:** From September 2021 to January 2023, 88 cases and 86 controls were taken and followed up for 6 months. Overall 6-month survival was not statistically significant between groups (95.1% vs 91.9%; p = 0.330). Incidence of Recurrence of ascites (30.7% v/s 75.6%, P < 0.001), Kidney dysfunction (6.8% v/s 24.4%, P < 0.001) hepatic encephalopathy (18% vs 40%, P < 0.001), Spontaneous bacterial peritonitis (3.4% vs 25.6%, P < 0.001) were significantly less in cases as compared with controls, however infections (8% vs 11.6%, P =
and Gastrointestinal bleed (14.8% vs 17.4%, P = 0.632) was not statistically significant.

### End point Case Control P value

<table>
<thead>
<tr>
<th>End point</th>
<th>Case</th>
<th>Control</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>4.9%</td>
<td>8.1%</td>
<td>0.330 (NS)</td>
</tr>
<tr>
<td>Recurrence of ascites</td>
<td>30.7%</td>
<td>75.6%</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Refractory ascites</td>
<td>6.8%</td>
<td>16.3%</td>
<td>0.050</td>
</tr>
<tr>
<td>Kidney dysfunction</td>
<td>6.8%</td>
<td>24.4%</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Hepatic encephalopathy</td>
<td>18%</td>
<td>40%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Infections</td>
<td>8%</td>
<td>11.6%</td>
<td>0.603 (NS)</td>
</tr>
<tr>
<td>SBP</td>
<td>3.4%</td>
<td>25.6%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>GI Bleed</td>
<td>14.8%</td>
<td>17.4%</td>
<td>0.632 (NS)</td>
</tr>
</tbody>
</table>

NS- Not significant

**Conclusion:** Long-term Human albumin acts as a disease modifying treatment in patients with decompensated cirrhos.

**SAT-347**

**Recently validated non-invasive tests for liver fibrosis assessment have great performance in identifying NASH patients at risk for decompensation**

Vlad Taru1,2,3, Madalina Gabriela Taru2,4,5, Bobe Petrushev2, Rusu Ioana2, Horia Stefanescu2, Andreea Fodor2, Mina Dana Ignat2, Fischer Petra2, Oana Nicoara-Farcau1,2, Monica Platon6,7, Bogdan Procopet1,2. 1"Iuliu Hatieganu” University of Medicine and Pharmacy, Internal Medicine, Cluj-Napoca, Romania; 2Regional Institute of Gastroenterology and Hepatology “Octavian Fodor”, Hepatology, Cluj-Napoca, Romania; 3Medical University of Vienna, Medicine III-Division of Gastroenterology and Hepatology, Vienna, Austria; 4“Institute of Medicine and Pharmacy, Biotechnology and Molecular Biology, Cluj-Napoca, Romania; 5University of Bologna, Medical and Surgical Sciences, Bologna, Italy; 6“Iuliu Hatieganu” University of Medicine and Pharmacy, Medical Imaging, Cluj-Napoca, Romania; 7Regional Institute of Gastroenterology and Hepatology “Octavian Fodor”, Medical Imaging, Cluj-Napoca, Romania

Email: vlad.taru@irec.ro

**Background and aims:** Non-alcoholic fatty liver disease (NAFLD) has become a substantial burden worldwide, with alarmingly increasing prevalence. NAFLD may progress to non-alcoholic steatohepatitis (NASH), NASH-related cirrhosis, and hepatocellular carcinoma. Scientific efforts concentrate on developing non-invasive tests (NITs) to predict clinically significant portal hypertension (CSPH) and reduce the need for invasive, costly investigations. The vibration-controlled transient elastography (VCTE) has become part of many algorithms, including the recent Baveno VII criteria. A new model (ANTICIPATE-NASH) was proposed to identify CSPH in obese patients. Other NITs, such as Agile 3+ and Agile 4, were recently validated for predicting advanced fibrosis and cirrhosis in patients with NAFLD/NASH. Still, their performance in assessing CSPH has not been tested yet. This study aimed to evaluate the performances of Agile3+ and Agile 4 in identifying CSPH in patients with NAFLD/NASH.

**Method:** Seventy-six consecutive patients with biopsy-proven NAFLD/NASH were included. Hepatic venous pressure gradient (HVPG) was assessed using a 7F-balloon catheter, and a value ≥10 mmHg was considered CSPH. LS was measured by VCTE and fibrosis was assessed histologically using the Metavir scoring system. The statistical analysis was performed in MedCalc v20, using AUROC analysis to assess the performance of NITs and DeLong protocol for comparison of NITs. Differences in classification between NITs were tested using McNemar’s test. Continuous variables are expressed as median (interquartile range), and a p value <0.05 was considered statistically significant.

**Results:** The median HVPG was 7 (4–13) mmHg, and 27 (35.5%) patients had CSPH. The liver histology fibrosis scoring identified 1 (1.3%), 10 (13.2%), 18 (23.7%), 15 (19.7%) respectively 32 (42.1%) patients as F0, F1, F2, F3, respectively F4. The performance of VCTE in identifying CSPH was excellent (AUC = 0.95, 95% CI: 0.86–0.99, p < 0.001). The ANTICIPATE-NASH score had a slightly lower but still excellent performance (AUC = 0.935, 95% CI: 0.84–0.98, p < 0.001). Agile 3+ had the best performance in identifying CSPH (AUC = 0.96, 95% CI: 0.89–0.99, p <0.001) and was significantly better only compared to FIB-4 (p = 0.04) and FIB-4+ (p = 0.02). The Baveno VII criteria for CSPH had excellent rule-out (Se = 96%, NPV = 96.3%) and rule-in (Sp = 100%, PPV = 100%) performance, with 21 (33.9%) patients left unclassified. Agile 3+ was superior to the Baveno VII criteria in identifying patients with CSPH, with 17 (24.2%) patients still in the “grey zone,” and no significant difference in classification (3.1%, CI: –5.59–11.94, p = 0.22).

**Performance of NITs in identifying NASH patients with CSPH**

<table>
<thead>
<tr>
<th>Variable</th>
<th>AUC</th>
<th>SE</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>VCTE</td>
<td>0.95</td>
<td>0.0235</td>
<td>0.882 to 0.969</td>
</tr>
<tr>
<td>ANTICIPATE-NASH</td>
<td>0.935</td>
<td>0.0281</td>
<td>0.843 to 0.982</td>
</tr>
<tr>
<td>Agile 3+</td>
<td>0.961</td>
<td>0.0204</td>
<td>0.879 to 0.954</td>
</tr>
<tr>
<td>Agile 4</td>
<td>0.941*</td>
<td>0.0206</td>
<td>0.851 to 0.950</td>
</tr>
<tr>
<td>FIB-4</td>
<td>0.878</td>
<td>0.0433</td>
<td>0.770 to 0.947</td>
</tr>
<tr>
<td>FIB-4+</td>
<td>0.885</td>
<td>0.0484</td>
<td>0.743 to 0.932</td>
</tr>
</tbody>
</table>

*vs FIB-4plus, **vs FIB-4; p<0.05; other comparisons p>0.05

<table>
<thead>
<tr>
<th>NITs</th>
<th>Grey zone (n, %total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAveno VII</td>
<td>21 (33.9%)</td>
</tr>
<tr>
<td>ANTICIPATE-NASH</td>
<td>19 (30.6%)</td>
</tr>
<tr>
<td>Agile 3+</td>
<td>15 (24.2%)</td>
</tr>
<tr>
<td>Agile 4</td>
<td>16 (25.8%)</td>
</tr>
</tbody>
</table>

Figure: (abstract: SAT-347).
SAT-348
Earlier diagnosis of hepatorenal syndrome-acute kidney injury with updated guidelines-review of the CONFIRM trial

Richard Frederick1, Florence Wong2, Hugo Vargas3, Chris Pappas4, Khurram Jamil5,6, California Pacific Medical Center, Department of Transplant, San Francisco, CA, United States; 2University of Toronto, Department of Medicine, Toronto, ON, Canada; 3Mayo Clinic Hospital, Phoenix, AZ, United States; 4Orphan Therapeutics, LLC, Longboat Key, FL, United States; 5Mallinckrodt Pharmaceuticals, Hampton, NJ, United States

Background and aims: In 2015, the International Club of Ascites (ICA) published revised consensus recommendations for the diagnosis of acute kidney injury (AKI) and hepatorenal syndrome (HRS) based on a change in serum creatinine (Scr) rather than a required threshold of Scr of 2.5 mg/dL in patients with cirrhosis, to facilitate earlier treatment of HRS Type 1 (HRS-1). Patients receiving vasoconstrictor-based treatment for HRS-AKI respond better and have higher rates of HRS reversal if treatment is started at lower Scr. This study estimated the effect of using the updated ICA-AKI diagnostic criteria on diagnosis and timing of HRS treatment in patients who were enrolled in CONFIRM-a large, prospective, randomized (terlipressin vs placebo) clinical trial.

Method: 2015 HRS-AKI criteria were retrospectively applied to available individual patient’s pre-enrollment serial Scr data from CONFIRM. The number of days between meeting current ICA HRS-AKI criteria (for both Stage 1b and Stage 2) and old HRS-1 criteria were determined to estimate the impact of the new criteria on potential earlier treatment. In addition, Scr at HRS-AKI diagnosis using the ICA 2015 criteria was compared to Scr at diagnosis of HRS-1 using the 2007 diagnostic criteria to estimate the effect of the new criteria on Scr at the potential start of vasoconstrictor therapy.

Results: Of 300 patients included in CONFIRM, 297 and 215 subjects had data available for this analysis (Stage 1b and 2, respectively). Compared with the traditional diagnostic criteria used for CONFIRM: the diagnosis of HRS-AKI could be made a median of 4 and 2 days earlier for Stage 1b and Stage 2, respectively; and the absolute median Scr was 1.0 mg/dL and 0.4 mg/dL lower at the time of diagnosis of AKI-HRS Stage 1b and 2, respectively (Figure).

<table>
<thead>
<tr>
<th>Stage 1b (n = 297)</th>
<th>Stage 2 (n = 215)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in median time to diagnosis</td>
<td>4 days</td>
<td>2 days</td>
</tr>
<tr>
<td>Change in median Scr at diagnosis</td>
<td>1.0 mg/dL</td>
<td>0.4 mg/dL</td>
</tr>
</tbody>
</table>

*T-test for the change between the 2 diagnostic criteria.

Conclusion: Applying the new 2015 ICA AKI-based criteria for HRS-AKI is estimated to result in earlier diagnosis and treatment of patients by approximately 2–4 days, depending on use of Stage 1b or 2. The Scr at initiation of treatment would be 0.4–1.0 mg/dL lower with use of the updated criteria. Using the new ICA HRS-AKI diagnostic criteria will allow for earlier treatment at lower Scr and the potential for better clinical outcomes.
SAT-350
Hepatic venous pressure gradient predicts further decompensation in cirrhosis patients with acute esophageal variceal bleeding
Manas Vaishnav1, Sagnik Biswas1, Shekhar Swaroop1, Arnav Aggarwal1, Piyush Pathak1, Abhinav Anand1, Shalimar1. 1All India Institute of Medical Sciences, New Delhi, India
Email: drshalimar@yahoo.com

Background and aims: Portal hypertension is the major driver in the transition from compensated to decompensated cirrhosis. However, the role of hepatic venous pressure gradient (HVPG) in predicting further decompensation in cirrhosis decompensated with acute variceal bleeding (AVB) is not known. We aimed to evaluate the role of HVPG in predicting the risk of further decompensation in cirrhosis patients with AVB.

Method: In a prospective study, 190 patients with cirrhosis with esophageal (n = 103) or gastric AVB (n = 87) were included. HVPG was measured on the day of the AVB, within 8 hours of endotherapy. Decompensating events occurring after 42-day of AVB were considered further decompensation. Multivariate analysis was performed to assess factors associated with further decompensation. Multivariate analysis was performed to assess factors associated with further decompensation.

Results: The median age of the study cohort was 45 years with 81.6% male. The predominant etiology of cirrhosis was alcohol in 82 (43.2%), chronic hepatitis B in 27 (14.2%), and chronic hepatitis C in 18 (9.5%). Overall, 53 (27.9%) patients developed further decompensation during a median follow-up duration of 274 days following AVB. New-onset/worsening ascites and GI bleeding were the most common decompensating event in 30 (15.8%). On the multivariate model, HVPG was an independent predictor of any further decompensation in esophageal AVB patients but not in gastric variceal bleeding patients. HVPG cut-off of ≥16 mmHg predicted further decompensation in the esophageal AVB cohort with a sensitivity and specificity of 66.7% and 57.5% respectively. Patients with HVPG ≥16 mmHg compared to <16 mmHg had higher cumulative probability of further decompensation: GI bleed (log-rank p = 0.013) and new-onset/worsening ascites (log-rank p = 0.023). There were no differences in hepatic encephalopathy and jaundice (Figure 1). However, HVPG was not an independent predictor of mortality in the entire, esophageal or gastric AVB cohorts.

Conclusion: HVPG measured during an episode of acute variceal hemorrhage from esophageal varices predicts further decompensating events in patients with liver cirrhosis. For patients with gastric varices, no similar relationship with HVPG could be established. Further studies, including a dynamic evaluation of HVPG in relation to impending decompensation, would shed more light on this matter.

SAT-519
Ultrasound predictors of hemodynamic TIPS dysfunction: friends or foes?
Andreea Fodor1, Rares Craciun1, Oana Nicoara-Farcau1, Fischer Petra1, Mina Ignat1, Tonel-Andrei Motofelea1, Roxana Buda2, Corina Radu1, Zeno Sparerchez1, Horia Stefanescu3, Bogdan Procopet1. 1“Prof Dr Octavian Fodor” Regional Institute of Gastroenterology and Hepatology, Romania; 2“Iuliu Hatieganu” University of Medicine and Pharmacy, Romania; 3Regional Institute of Gastroenterology and Hepatology, Liver Unit and Clinical Ultrasound Department, Cluj Napoca, Romania
Email: andreea.fodor11@gmail.com

Background and aims: Although the role of non-invasive tools, namely ultrasound (US) parameters, in the assessment of transjugular intrahepatic portosystemic shunt (TIPS) dysfunction has widely been studied, there is insufficient data regarding clear criteria applicable in current practice.

We primary aimed at evaluating the performance of US parameters for detection of hemodynamic TIPS dysfunction. Since US parameters may not always give clear results, we also aimed at evaluating US parameters in case of hemodynamic TIPS dysfunction. We have also evaluated the role of spleen and liver stiffness measured by 2D shear wave elastography (2D SWE) and Fibroscan in predicting hemodynamic dysfunction (HD).
Method: All consecutive patients treated with TIPS for portal hypertension-related complications and systematic hemodynamic TIPS revision at 6 weeks after the procedure have been included. Clinical dysfunction was defined as recurrence of variceal bleeding or inadequate control of ascites, whereas HD was defined as revision portal pressure gradient (PPG) $\geq 12$ mmHg. Subgroup analysis was performed on available elastography measurements (initial and at revision) of spleen (delta SSM) and liver (delta LSM).

Results: 86 eligible patients with paired US parameters at TIPS placement and first TIPS revision were analyzed. Recurrent variceal bleeding was the main indication for TIPS placement (82.5%), while 17.5% had refractory ascites. 6 weeks clinical dysfunction rate was 18.6%. Two patients presented with recurrence of PHT-related bleeding and 14 had no clinical improvement of ascites. Median initial and post-TIPS PPG were 16 mmHg (14–19) and 7 mmHg (5.5–8), respectively. A decrease higher than 50% in PPG was achieved in 74.4% of cases. Median 6 weeks systematic PPG was 10 mmHg (7–14).

HD occurred in 37 cases (43%). Portal vein velocity had an AUROC of 0.71 for a cut-off of 40.5 cm/s (p < 0.001) in detecting HD, with a sensitivity of 0.84 and specificity of 0.50. In subgroup analysis (n = 30), the percentage change in delta 2D SWE SSM predicted HD with a modest AUROC of 0.77 for a cut-off of 40% (p = 0.03). However, percentage change in delta LSM in both 2D SWE and Fibroscan, exhibited low performance in discriminating HD (see Figure).

Conclusion: Doppler US and elastography surveillance cannot replace systematic TIPS revision for diagnosing hemodynamic TIPS dysfunction.
nitric oxide and hepatic endothelial dysfunction. We therefore assessed the efficacy of simvastatin with a non-selective beta blocker in improving survival for cirrhotic patients with variceal bleed through a systematic review and meta-analysis.

**Method:** A comprehensive systematic search through PubMed, Cochrane and Google scholar was performed to include clinical studies that examined the use of statin with a beta blocker in improving survival in cirrhotic patients. Two reviewers independently screened and reviewed all abstracts and full text papers available. An inclusion and exclusion criteria was made which was a basis for selection of included studies. The Cochrane Risk of Bias tool was used to assess possible bias in each article. Data was analyzed using RevMan 5.4 and GRADEPro. The dichotomous outcomes were analyzed using relative risk with a confidence interval of 95% and the primary outcome pertained to improvement in survival, with a secondary outcome of rebleeding also noted.

**Results:** The study included 3 randomized control trials with 361 patients with variceal bleeding. There was significant survival benefit among patients given simvastatin therapy with a risk ratio of 0.43 (95% confidence interval 0.26–0.73; p value = 0.002). A secondary outcome of rebleeding was also studied and showed a trend towards benefit with a risk ratio of 0.72. However, the results were not statistically significant (95% confidence interval; 0.47–1.09; p value = 0.12).

**Conclusion:** Among cirrhotic patients with variceal bleeding, the addition of simvastatin provides a significant benefit in survival, but not in rebleeding. However, there remains a need for larger studies with more participants to strengthen this evidence, and a deeper look into its safety profile in cirrhotic patients specifically.

**SAT-521 Validation and refinement of the Baveno VII criteria for risk stratification in compensated advanced chronic liver disease after HCV-cure**


**Background and aims:** Baveno VII has established criteria for excluding clinically significant portal hypertension (CSPH) after HCV-cure in compensated advanced chronic liver disease (cACLD), and thus, identifying patients who may be discharged from portal hypertension surveillance (post-treatment liver stiffness measurement (LSM) <12kPa and platelet count (PLT) >150G/L). In contrast, post-treatment LSM values ≥25kPa indicate CSPH and a substantial risk of hepatic decompensation, despite HCV-cure. However, the long-term prognostic value of these criteria has yet to be independently validated and determinants of decompensation in the gray zone (i.e., in patients meeting none of these criteria) have yet to be identified.

**Method:** We retrospectively analyzed cACLD patients with paired LSM and PLT before and after HCV-cure by interferon-free therapies from 7 European regions. Fine and Gray competing risk regression models adjusted for clustered data with respective cumulative incidence curves were used to study risk of hepatic decompensation across risk strata. Factors associated with hepatic decompensation in the gray zone were studied using backward elimination. Development of hepatocellular carcinoma and death were considered as competing risks.

**Results:** 2347 cACLD patients (mean age 60 ± 12 years, 60% male, 21% obese, and 21% diabetes) were followed for a median of 6.0 years during which 65 patients (2.8%) developed hepatic decompensation. In the subgroup of patients who have not been analyzed previously (n = 1527), Baveno VII criteria for excluding CSPH identified patients at a negligible risk of decompensation (at 6 years: 0.5%), while those for ruling-in CSPH identified a high-risk population (at 6 years: 11.4%; Figure-panel A). In the overall study population, decompensation in gray zone patients was uncommon (2.0%, incidence rate 0.4/100 patient years) and was associated with diabetes (adjusted subdistribution hazard ratio (SHR): 2.61 (95%CI: 1.70–4.00), p < 0.001) and post-treatment γ-glutamyltranspeptidase (γ-GT; SHR: 1.38 (95%CI: 1.11–1.73), p = 0.003) independently of LSM, PLT, and albumin. Diabetes or elevated γ-GT identified a subset of gray zone patients (39%) at higher risk (at 6 years: 3.6%; Figure-panel B).
Conclusion: Baveno VII criteria for excluding/ruling-in CSPH in HCV-cured patients accurately stratify decomposition risk and may guide patient management. The increased risk of hepatic decomposition in gray zone patients with diabetes and/or elevated γ-GT highlights the importance of managing cofactors. Notably, gray zone patients without diabetes and with normal γ-GT had a negligible risk of hepatic decomposition, despite LSM values of 12–25 kPa and/or thrombocytopenia.

SAT-522
Real-world practice of pre-emptive tipps: an Asia perspective based on Singapore nationwide variceal bleeding audit
Yu Jun Wong1,2, Margaret Teng3, Alyssa Sim3, Marianne De Roza3, Junhui, Garrett Kang4, Guan Sen Kew4, Jia Hong Koh3, Jonathan Kuang4, Htay Myat Thet7, En Xian Sarah Low5, Pooi Ling Loi8, Kai Lim9, Xuhui Teoh9, Jing Liang Ho10, Gabriel Cher9, Kenny Sze9, Andrew Kwek1, Guan Wee Wong11, Wei Lyn Yang4, Jason Pik, Eu Chang5,1, Changi General Hospital, Gastroenterology and Hepatology, Singapore, Singapore; 2Duke-NUS Medical School, Singapore, Singapore; 3National University Hospital (NUH)-Singapore, Singapore, Singapore; 4Tan Tock Seng Hospital, Singapore, Singapore; 5Sengkang General Hospital, Singapore, Singapore; 6Changi General Hospital, Singapore, Singapore; 7Lalit Narayana Medical Academy, Karnataka, India; 8National University Hospital (LEMP)-Gastroenterology and Hepatology, Antwerp, Belgium; 9Antwerp University Hospital, Leuven, Belgium; 10University Medical Center of the Johannes Gutenberg University, Metabolic Liver Disease Research Program, I. Department of Internal Medicine, Mainz, Germany; 11University of Turin, Division of Gastroenterology and Hepatology, Department of Medical Sciences, Turin, Italy; 12University of Antwerp (UA), Laboratory of Experimental Medicine and Paediatrics (LEMP)-Gastroenterology and Hepatology, Antwerp, Belgium.

Background and aims: The Baveno-VII consensus recommends pre-emptive transjugular intrahepatic portosystemic shunt (pTIPSS) in acute variceal bleeding (AVB) patients with high-risk of rebleeding, ie: Child-Turcotte-Pugh (CTP) class C < 14, or CTP class B > 2 with active bleeding. Data on the real-world adoption and practice on pTIPSS remains limited, particularly from Asia. To understand the real-world practice on pTIPSS, we aimed to determine: (1) the proportion of patients eligible for pTIPSS, (2) the proportion of patients who underwent pTIPSS based on a Singapore nationwide AVB audit.

Method: We performed a nationwide audit to retrospectively review all adult cirrhosis patients consecutively admitted for AVB from January 2015 to December 2020. Individual patient data on baseline characteristics and clinical outcomes were reviewed and extracted using unified data frame. Eligibility for pTIPSS was based on Baveno-VII consensus; implementation of pTIPSS was based on institutional protocol. We compare the clinical outcomes (5-day rebleeding, 6-week mortality and 1-year mortality) between (1) patients eligible for pTIPSS (vs not eligible), and (2) patients who were eligible and underwent pTIPSS (vs. eligible but no pTIPSS).

Results: This nationwide acute variceal bleeding audit included 910 adult cirrhosis patients with AVB from all 7 public hospitals in Singapore. The mean age was 61 years, 73.7% were male, with ethnicity distribution similar to the general Singapore population. The mean (± SD) MELD score was 13 (± 6). The mean CTP score was 7 (± 1.3), among which 42.2% were CTP-A, 51.2% were CTP-B and 5.7% were CTP-C. At baseline, 18.0% had prior variceal bleeding, 28.7% had ascites requiring diuretics, 34.5% had prior HE, 23.7% had HCC and 18.9% had PVT. Among 14.3% of hospitalized AVB patients who fulfil the eligibility for pTIPSS, only 1.8% underwent pTIPSS. Patients eligible for pTIPSS (vs. not eligible for pTIPSS) had a significantly shorter median (IQR) time to rebleeding [4 (1–15) days vs. 18 (2–111) days, p = 0.025], a higher risk of early rebleeding (19% vs 6%, p < 0.0001) and death at 6 weeks (30% vs 11%, p < 0.0001) and 1 year (45% vs 25%, p < 0.0001), respectively. Yet, only 44% of pTIPSS were performed within 72 hours of AVB. Low uptake of pTIPSS were similar between transplant and non-transplant centers (6.8% vs 3.5%, p = .357). Patients who underwent pTIPSS were more likely to have prior AVB (60% vs 18%, p < 0.001), lower baseline MELD score (11.6 vs 13.5, p = 0.02), lower serum bilirubin (25 vs 41, p < 0.001) and lower AST (47 vs 87, p < 0.001). pTIPSS patients were more likely to be intubated (63% vs 37%, p = 0.025), had early endoscopy <12 hours (100% vs 80.2%, p = 0.03), and had active bleeding during endoscopy (50% vs 17.8%, p = 0.003).

Among patients eligible for pTIPSS, those who underwent pTIPSS (vs. no pTIPSS) had a lower risk of 6-week mortality (17% vs 30%), but a higher risk of HE at 1-year (67% vs 21%, p < 0.001), with a similar risk of early rebleeding within 5 days (17% vs 19%) and 1-year mortality (50% vs 44%).

Conclusion: The Singapore nationwide AVB audit showed that one in seven hospitalized AVB patients were eligible for pTIPSS, but only 1.8% underwent pTIPSS. Future work is needed to identify the barrier for timely pTIPSS implementation among high-risk AVB patients.
Background and aims: The BA VENO VI criteria, combining liver stiffness measurement (LSM < 20 kPa) and platelet count (>150 × 10^9/L), have set the stage for non-invasive assessment of patients with compensated advanced chronic liver disease (cACLD) who can safely avoid screening endoscopy at the cost of <5% missed varices needing treatment (VNTs). Attempts to expand these two parameters (expanded BA VENO VI) to save a higher proportion of endoscopies resulted in a relevant loss of negative predictive value. For this reason, we aimed to evaluate the potential additive value of spleen stiffness measurement (SSM) using spleen-dedicated vibration-controlled transient elastography (FibroScan® Expert 630, EchoSens) and in addition, to test a novel spleen-centered algorithm combining spleen size and SSM.

Method: We first analyzed in a single-center fashion (Leuven) all consecutive patients with ACLD (LSM ≥10 kPa) from 2020 till 2022 undergoing LSM/SSM and had available reports on upper endoscopy, abdominal ultrasound (spleen size, i.e. craniocaudal diameter) and platelet count. VNTs were defined as grade II or III esophageal varices or varices of any size with red spots. Different models were built in this derivation cohort (see Figure 1). Subsequently, these were tested in an external validation cohort (Mainz, Antwerp) with a higher prevalence of VNTs as this was the downfall of the expanded BA VENO VI criteria.

Results: The derivation cohort included 201 patients (123 men, mean age 58 years, 85.1% Child A-14.9% Child B). Overall prevalence of VNTs was 11.9% (comparable to the ANTICIPATE study). In the derivation cohort, BA VENO VI criteria could spare 33.8% of screening endoscopies which could be doubled to 66.2% by applying sequential BA VENO VI/SSM-criteria (using a SSM cut-off at 43kPa) (Figure 1). A newly developed simple ‘spleen size and stiffness’ algorithm could save even more patients (71%) from undergoing endoscopy. All applied algorithms missed less than 5% of VNT.

The validation cohort included 176 patients (104 men, mean age 58 years, 70.4% Child A-29.6% Child B). The prevalence of VNTs amounted to 34.7%. Applying the BA VENO VI criteria in this cohort spared a lower amount of screening endoscopies (8.5%). Adding SSM tripled the gain to 27%. The ‘spleen stiffness and size’ model equally avoided 31% of screening endoscopies, all at the cost of less than 5% of VNT being missed.

Conclusion: The sequential BA VENO VI plus dedicated SSM (<43 kPa) or the more simplified spleen-centred algorithm (size and stiffness) can safely and more extensively “rule out” VNT than the BA VENO VI criteria alone.

SAT-525 Detection of candida species in hospitalized patients with decompensated liver cirrhosis and ascites indicates an unfavorable clinical course and outcome

Marie Griemsmann1, Tammo Lambert Tergast1, Michael P. Manns1, Heiner Wedemeyer1, Markus Cornberg1, Benjamin Maasoumy1.
1Medical School Hannover, Germany

Email: griemsmann.marie@mh-hannover.de

Background and aims: Long hospital stays, invasive procedures and antibiotic treatment are major risk factors for fungal colonisation in patients with decompensated liver cirrhosis. However, the general impact of fungal colonisation on outcome and clinical course in patients with decompensated liver cirrhosis has not been investigated, so far. Therefore, we aimed to evaluate the predictive value of the detection of candida species for the further clinical outcome in patients with decompensated liver cirrhosis.

<table>
<thead>
<tr>
<th>BA VENO VI criteria</th>
<th>BA VENO VI + SSM</th>
<th>spleen size and stiffness model</th>
</tr>
</thead>
<tbody>
<tr>
<td>spared endoscopies</td>
<td>33.8 %</td>
<td>66.2 %</td>
</tr>
<tr>
<td>missed VNT</td>
<td>0 %</td>
<td>4.2 %</td>
</tr>
<tr>
<td>sensitivity</td>
<td>100 %</td>
<td>95.8 %</td>
</tr>
<tr>
<td>specificity</td>
<td>38.4 %</td>
<td>74.6 %</td>
</tr>
<tr>
<td>PPV</td>
<td>18.0 %</td>
<td>33.8 %</td>
</tr>
<tr>
<td>NPV</td>
<td>100 %</td>
<td>99.2 %</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DERIVATION COHORT (n = 201, 11.9% VNTs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>spared endoscopies</td>
</tr>
<tr>
<td>missed VNT</td>
</tr>
<tr>
<td>sensitivity</td>
</tr>
<tr>
<td>specificity</td>
</tr>
<tr>
<td>PPV</td>
</tr>
<tr>
<td>NPV</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VALIDATION COHORT (n = 176, 34.7% VNTs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>spared endoscopies</td>
</tr>
<tr>
<td>missed VNT</td>
</tr>
<tr>
<td>sensitivity</td>
</tr>
<tr>
<td>specificity</td>
</tr>
<tr>
<td>PPV</td>
</tr>
<tr>
<td>NPV</td>
</tr>
</tbody>
</table>

Figure 1. Performance of non-invasive models in the decision for screening endoscopy.

EGD = esophagogastroduodenoscopy, LSM = liver stiffness measurement, NPV = negative predictive value, PPV = positive predictive value, SSM = spleen stiffness measurement, VNT = varices needing treatment.
Method: Overall, 1314 patients, in whom a paracentesis was performed in Hannover Medical School between 2012 and 2018, were retrospectively screened for liver cirrhosis and ascites. After applying in- and exclusion criteria, 667 consecutive patients of the Hannover Ascites Cohort were eligible for further analysis. Patients were followed up for incidence of acute kidney injury (AKI), acute-on-chronic liver failure (ACLF) and death. Multivariable competing risk analysis was performed to adjust for potential confounders (e.g. the MELD score).

Results: Candida species were detected in 81 patients (12%). In the baseline characteristics some significant differences were shown. In the group of patients with detection of candida species was associated with a higher MELD score (22 vs. 18, p < 0.001), proportion of female patients (48% vs. 34%, p = 0.014) and incidence of diabetes (36% vs. 23%, p = 0.011). Of note, most of the detected candida species were candida albicans and were located in urine and respiratory aspirations. Incidence of AKI and incidence of ACLF was significantly higher in the group of patients with detected candida species. Even after adjusting to several confounders spotted candida species was a significant risk factor for development of AKI and ACLF (p = 0.013, HR = 1.57; p = 0.009, HR = 1.84, respectively).

In the univariate competing risk analysis a significant association between detection of candida species and 90-day mortality (p < 0.001) was identified. The 90-day mortality remained significantly influenced by detection of candida species after adjusting to confounders in multivariable competing risk analysis with liver transplantation as competing risk (p = 0.033, HR = 1.66).

Conclusion: Detection of candida species is linked to an impaired short-term mortality and development of severe complications in patients with liver cirrhosis. Further studies may assess if treatment of candida colonisation influences the clinical course and survival in this patient collective or the detection on candida can be used to identify patients that require specific measures to prevent cirrhosis-associated complications.

SAT-526
Clinical utility of liver and spleen elastography in the management of patients living with liver disease
Carmen Lara Romero1, María Del Barrio2, María Del Carmen Rico2, Belen Pino1, Manuel Romero Gomez1. 1Liver and Digestive Diseases Unit, Virgen del Rocío University Hospital; Seliver Group, Biomedicine Institute of Seville (HUVR/CSIC/US), Medicine Department, University of Sevilla, CIBEREHD, Sevilla, Spain; 2Gastroenterology and Hepatology Department, Clinical and Translational Research in Digestive Diseases, Valdecilla Research Institute (IDIVAL), Marqués de Valdecilla University Hospital, Santander, Spain
Email: carmenlararomero@gmail.com

Background and aims: Portal hypertension (PH) is responsible for the progression of liver diseases and the development of complications. In patients with liver elastography <10 kPa, advanced liver disease is ruled out according to Baveno VII consensus. Our aims are a) To analyze the prevalence of portal hypertension and portosinusoidal vascular disease (PSVD) in patients with liver disease; b) Identify non-invasive parameters of suspicion of PSVD and/or hidden PH; c) To assess the clinical impact of the presence of elevated spleen stiffness in the development of complications.

Method: Prospective cohort of 276 consecutive patients seen in a hepatology consultation who underwent liver and spleen transient elastography (Fibroscan 630, Echosens, France). Thresholds for advanced disease were spleen stiffness measurement (SSM) >45 kPa and Liver stiffness measurements (LSM) >10 kPa. It was evaluated: hepatic, renal, metabolic function, concomitant treatment, ultrasound, endoscopy, liver histology and portal hemodynamic. Statistical analysis: t-student, ANOVA, Chi-square, Spearman’s coefficient, U-Mann-Whitney, Wilcoxon, logistic regression, and linear correlation.

Results: SSM >45 kPa in 23 cases of 154 with LSM <10 kPa (14.9%) versus 56 of 122 with LSM >10 kPa (45.9%); p = 0.001. The predictive parameters of SSM >45 kPa in patients with LSM <10 kPa were collected in the table (platelets, INR, Child-Pugh and MELD3.0). In the multivariate analysis, the platelet count and MELD 3.0 were independently related to SSM >45kPa and LSM <10 kPa. The rate of decompensation (hepatic encephalopathy, ascites, or variceal bleeding) was 1.5% in patients with LSM <10kPa and SSM<45kPa (2/131), versus 13% (3/23) in patients with LSM <10 kPa and SSM >45 kPa, 15.4% (10/65) in patients with LSM>10 kPa and SSM <45 kPa and 44% (24/54) in patients with LSM>10 kPa and SSM >45 kPa; p < 0.0001.

Table: Univariate and multivariate analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>SSM&lt;45kPa (n = 129)</th>
<th>SSM&gt;45kPa (n = 23)</th>
<th>p (HR IC95%)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platelets</td>
<td>240 ± 83</td>
<td>173 ± 112</td>
<td>&lt;0.001</td>
<td>0.982 (0.614–1.578)</td>
</tr>
<tr>
<td>INR</td>
<td>0.99 ± 0.18</td>
<td>1.13 ± 0.29</td>
<td>&lt;0.073</td>
<td>1.770 (1.004–3.130)</td>
</tr>
<tr>
<td>MELD 3.0</td>
<td>6.93 ± 0.98</td>
<td>8.75 ± 2.93</td>
<td>&lt;0.055</td>
<td>1.335 (1.002–1.778)</td>
</tr>
<tr>
<td>Child-Pugh</td>
<td>5.0 ± 0.0</td>
<td>5.75 ± 2.36</td>
<td>&lt;0.082</td>
<td>1.048 (0.204–5.369)</td>
</tr>
</tbody>
</table>

Conclusion: The SSM can detect up to 15% of cases of occult PH/PSVD in patients with LSM <10 kPa and SSM>45kPa. In patients with LSM <10kPa, a decrease in platelet count or an increase in MELD 3.0 should lead to suspicion of PH. The presence of altered SSM is associated with an increased risk of liver events. The implementation of SSM will improve the management of patients with liver disease.

SAT-527
Secondary prevention of variceal bleeding is often imperfect: a national, population-based cohort study of 5,018 patients
Hannes Hagström1, Ying Shang1, Elliot Tapper2, Axel Wester1, Linnea Widman1. 1Karolinska Institutet, Sweden; 2University of Michigan, United States
Email: hannes.hagstrom@ki.se

Background and aims: Secondary prevention of variceal bleeding is important to improve prognosis, but uptake of guidelines is unknown in a real-world setting. Here, we determined the proportion of patients receiving appropriate beta-blocker treatment and repeat upper endoscopy after a first episode of variceal bleeding within a reasonable timeframe.

Method: Population-based registers were used to identify all patients with a first episode of variceal bleeding in Sweden, 2000–2020. Cross-linkage between registers was performed to receive information on the cumulative incidence of patients with a dispensation of beta-blockers within 30 days and repeat upper endoscopy within 120 days from baseline. Overall mortality was investigated using Cox regression.

Results: In total, 5,018 patients were identified, with a median age of 62 years (IQR = 54–71). Of patients not on previous beta-blocker
therapy, the cumulative incidence of a dispensation of beta-blockers within 30 days was 54.3%. The cumulative incidence of repeat endoscopy was 34.5% within 120 days. Overall mortality was high, with 71.2% of patients dying after variceal bleeding during the full follow-up period (median 1.8 years). We observed an improved overall mortality during the later years of the study period (adjusted hazard ratio for the 2016–2020 period compared to the 2000–2005 period: 0.84, 95%CI = 0.75 – 0.93). Patients with beta-blockers and repeat upper endoscopy had better overall survival compared to those without, respectively.

Conclusion: Secondary prevention of variceal bleeding has not been widely undertaken, with many patients not receiving guideline-supported interventions within a reasonable timeframe. This highlights a need to raise awareness on appropriate prevention strategies to clinicians and patients.

SAT-528 Terlipressin has acute effects on systemic inflammation markers in patients with cirrhosis and ascites

Nikolaj Torp1,2, Mads Israelsen3, Emil Deleuran Hansen1,2, Stine Johansen1,2, Camilla Dalby Hansen1,2, Emilie Dahl3, Bjørn Stærh Madsen1, Johanne Krag Hansen1, Katrine Prier Lindvig1,2, Katrine Thorhauge1,2, Ida Villesen1, Ellen Jensen1,2, Ida Ziegler Spedtsberg1,2, Peter Andersen1, Annette Fialla1, Boye Jensen2, Maja Thiele1,2, Sabine Klein4, Robert Schierwagen4, Jonel Trebic4,5, Aleksander Krag1,2, 1Odense University Hospital, Department of Gastroenterology and Hepatology, Odense, Denmark; 2University of Southern Denmark, Faculty of Health Science, Odense, Denmark; 3Copenhagen University Hospital Herlev, Department of Gastroenterology, Denmark; 4University of Münster, Department of Internal Medicine B, Germany; 5European Foundation for the Study of Chronic Liver Failure, Spain
Email: aleksander.krag@rsyd.dk

Background and aims: Terlipressin is widely used in the management of variceal bleeding and hepatorenal syndrome. However, terlipressin increases the risk of intestinal ischemia, respiratory failure and possibly sepsis and septic shock. The complications are all associated to systemic inflammation, where IL-6 is a pivotal marker. IL-6 is associated to a poor prognosis in patients with cirrhosis, but the immediate effect of terlipressin on IL-6 and other systemic inflammation markers is unknown. We therefore aimed to investigate the acute impact of terlipressin on markers of systemic inflammation in patients with cirrhosis and ascites.

Method: We included 25 stable patients with cirrhosis and ascites from a 2:2:1 cross-over randomized controlled trial of terlipressin with dobutamine as a cardioselective control. The intervention was administered in two treatment periods with A) dobutamine followed by terlipressin (n = 10), B) terlipressin followed by both terlipressin and dobutamine and C) placebo (n = 5). Serial blood and urine samples were available before treatment (baseline) and during both treatment periods. We used the Luminex MAGPIX platform to measure changes of inflammatory markers in blood and urine (CCL2, CCL3, CCL4, CXCL10, IL-1alpha, IL-1beta, IL-1RA, IL-6, IL-10 and IL-18). Urine measurements were corrected for changes in glomerular filtration rate (GFR) as assessed by 51Cr-labeled clearance. All measurements were log-transformed to normalize data.

Results: Mean age was 57 (± 9 years), majority were male (68%) with alcohol-related cirrhosis (92%) as the dominant etiology. Baseline WBC=6.1×10^9/L [5.0–7.7], CRP=6 mg/L [2–10] and MELD-Na=10 [9–14]. Before treatment, CRP correlated positively with blood IL-6 (p = 0.040) while WBC did not (p = 0.384). Relative to placebo and before treatment periods, terlipressin increased blood IL-6 (p < 0.001) and urine IL-6 (p < 0.001), while dobutamine did not (Figure). Terlipressin also led to increased levels of inflammasome activation markers IL-1alpha (p < 0.001) and IL-1beta (p < 0.01) in the urine, whereas dobutamine treatment only increased urine IL-1alpha (p < 0.05). A significant decrease of differing systemic inflammatory chemokines was observed in blood (CCL2, p < 0.001 and CXCL10, p < 0.001) and urine (CCL3, p < 0.001 and CCL4, p < 0.01) following terlipressin. As expected, GFR improved in treatment periods with only terlipressin (+18.8 ml/min/1.73 m², 95% CI: +5.7 to +32.0, p < 0.01). However, the changes in blood systemic inflammation markers were not associated with the effect of terlipressin on GFR.

Figure: Heatmap of the effect of terlipressin and dobutamine on systemic inflammatory markers in blood and urine. Z-value changes are relative to placebo and before treatment periods.
**Conclusion:** Terlipressin induces a rapid changes in systemic inflammatory marker, including an increase in IL-6. This increase may likely be a result of intestinal ischemia, since cardioselective dobutamine did not elicit this effect. We did not observe an association between systemic inflammatory changes and the effect of terlipressin on renal function.

**SAT-530**

**Individualized portal pressure gradient threshold based on liver function categories in preventing rebleeding after TIPS**

Yifu Xia1, Jun Tie2, Guangchuan Wang3,4, Yuzheng Zhuge3, Hao Wu6, Hui Xue, Jiao Xu3, Feng Zhang5, Lianhui Zhao1,2, Guangjun Huang3, Mingyan Zhang1, Bo Wei6, Pelije Li1, Wei Wu6, Chao Chen8, Chengwei Tang3, Chunqing Zhang1,3, 1Shandong Provincial Hospital Affiliated to Shandong University, China; 2National Clinical Research Center for Digestive Diseases and Xijing Hospital of Digestive Diseases, China; 3Shandong Provincial Hospital Affiliated to Shandong First Medical University, China; 4Department of Biostatistics, School of Public Health, Shandong University, China; 5Affiliated Drum Tower Hospital of Nanjing University Medical School, China; 6West China Hospital, China; 7First affiliated hospital of xian Jao Tong university, China; 8The First Affiliated Hospital of Wenzhou Medical University, China

**Background and aims:** The evidence in Portal pressure gradient (PPG) ≤12 mmHg after transjugular intrahepatic portosystemic shunt (TIPS) for preventing rebleeding mostly comes from observations in uncovered stents era. Moreover, association between Child-Pugh classes and post-TIPS hepatic encephalopathy (HE) has indicated that tolerance of PPG reduction depends on liver function. We aimed to investigate the optimal PPG for covered TIPS and explore the optimal threshold tailored to the Child-Pugh classes to find individualized PPG to balance rebleeding and overt HE.

**Method:** This multicenter retrospective study analyzed rebleeding, OHE, and mortality of patients associated with post-TIPS PPGs (8, 10, 12, and 14 mmHg) in the entire cohort and among different Child-Pugh classes. Propensity score matching (PSM) and competing risk analyses were performed for sensitivity analyses.

**Results:** We included 2100 consecutively screened patients undergoing TIPS. In all patients, PPG ≤12 mmHg reduced rebleeding after TIPS ($p = 0.022$). In Child-Pugh class A, none of the PPG thresholds were discriminative of clinical outcomes. In Child-Pugh class B, 12 mmHg ($p = 0.022$) and 14 mmHg ($p = 0.037$) discriminated rebleeding, but 12 mmHg showed a higher net benefit. In Child-Pugh class C, PPG ≤14 mmHg had a lower rebleeding incidence ($p = 0.017$), and exhibited more net benefit than 12 mmHg.

**Conclusion:** Different PPG standards may be required for patients with different liver function categories. A PPG threshold ≤12 mmHg might be suitable for patients in Child-Pugh class B, while ≤14 mmHg might be optimal for patients in Child-Pugh class C.

**SAT-531**

**Serum procalcitonin and interleukin-6 predict acute-on-chronic liver failure following transjugular intrahepatic portosystemic shunt implantation in patients with refractory ascites**

Lukas Sturm1, Michael Schultheiss1, Laura Stolz1, Marlene Reincke1, Patrick Huber1, Robert Thimme1, Dominik Bettinger1, 1Medical Center University of Freiburg, Germany

**Background and aims:** As acute-on-chronic liver failure (ACLF) is associated with high morbidity and mortality, early identification of patients who are at risk for developing ACLF is crucial. However, risk factors for ACLF in connection with transjugular intrahepatic portosystemic shunt (TIPS) implantation are only sparsely investigated. Therefore, the present study aimed to evaluate the predictive relevance of inflammatory markers in the context of ACLF development following TIPS implantation.

**Method:** Sixty-nine patients allocated to TIPS implantation due to refractory ascites were included and blood samples were obtained prior to TIPS placement. Serum levels of high sensitive c-reactive protein (hsCRP), procalcitonin (PCT) and interleukin-6 (IL-6) were determined. The development of ACLF and death within 90 days after TIPS implantation were recorded. Inflammatory markers were evaluated as predictors of ACLF using uni- and multivariable Fine and Gray competing risk regression models, considering death as competing risk.

**Results:** Twenty-two patients (31.9%) developed ACLF within 90 days after TIPS implantation, thereof 86.4% ACLF grade 1 and 13.6% ACLF grade 2. ACLF was lethal in 27.3% of cases. Patients developing ACLF had significantly elevated plasma levels of PCT (0.12 [0.09–0.24] ng/ml vs. 0.08 [0.00–0.12] ng/ml, $p = 0.004$) and IL-6 (30.5 [20.2–41.9] pg/ml vs. 21.4 [13.3–39.2] pg/ml, $p = 0.048$) prior to TIPS implantation in comparison to patients without ACLF, while there was no significant difference in levels of hsCRP. Competing risk regression analyses showed that besides the Freiburg Index of Post-TIPS Survival (FIPS), serum creatinine (SHR 2.450, $p = 0.008$), levels of PCT (SHR 1.002, 95% CI 1.001–1.004, $p = 0.015$) were independent predictors of ACLF. ROC-analyses confirmed a high discriminatory performance especially of PCT in the prediction of ACLF (AUC 0.715 [0.594–0.836]; IL-6: AUC 0.648 [0.514–0.782]).

**Conclusion:** The present results indicate that besides impaired renal function, an inflammatory status predisposes for ACLF development following TIPS implantation in patients with refractory ascites. In this context, the inflammatory markers PCT and IL-6 can help to identify patients at high risk of developing ACLF.

**SAT-532**

**Refractory hepatic hydrothorax is associated with Increased mortality compared to cirrhosis and refractory ascites**

Allison Chin1, Dustin Bastaich2, Bassam Dahman2, David Kaplan3, Tamar Tadder2, Binu John2, 1Florida International University, United States; 2Virginia Commonwealth university, United States; 3University of Pennsylvania, Philadelphia, United States; 4Vale School of Medicine and VA Connecticut Healthcare System, West Haven, CT, United States; 5University of Miami and Miami VA, United States

**Background and aims:** Refractory hepatic hydrothorax (RH) requiring therapeutic thoracentesis is a serious complication of cirrhosis. Undrained effusions can lead to pulmonary atelectasis, while thoracentesis (particularly multiple), can be complicated by life threatening hemo- or pneumothorax. Patients with RH on the liver transplant list do not receive standardized MELD exemption points because of inadequate evidence to suggest increase mortality. The
aim of this study was to examine liver-related death associated with RH compared to participants with refractory ascites (RA).

**Method:** This was a retrospective cohort study of patients with cirrhosis from the Veterans Health Administration. Eligibility criteria included patients with RH or RA who underwent at least one therapeutic thoracentesis or paracentesis respectively. The primary outcome was LRD, with non-liver-related-death or liver transplantation as competing risk.

**Results:** Of 120,952 participants with cirrhosis in the VOCAL cohort, 2,225 met study inclusion criteria. On multivariable analysis, hepatic hydrothorax was associated with a 4.0-fold increased adjusted hazard of LRD compared to refractory ascites (95% CI 3.15–5.07, p < 0.0001). This association of increased LRD with RH was observed across varying levels of MELD-Na from <10 (aHR 3.23, 95% CI 2.10–4.95, p < 0.0001), 10–15 (aHR 4.39, 95% CI 2.78–6.93, p < 0.0001), 15–25 (aHR 4.38, 95% CI 2.96–6.50, p < 0.0001), and ≥25 (aHR 5.81, 95% CI 2.97–11.34, p < 0.0001). Compared to participants requiring a single thoracentesis, LRD was similar for those requiring 2–3 (aHR 1.33, 95% CI 0.75–2.35, p = 0.33), but higher with ≥4 thoracentesis (aHR 2.80, 95% CI 1.52–5.16, p = 0.001). There was no association between number of paracentesis and LRD among participant with RA.

Figure: Cumulative incidence for adjusted hazard ratio of liver-related death with transplantation and non-liver-related death as competing risk.

**Conclusion:** RH is associated with significantly higher LRD compared to participants with ascites across varying levels of MELD. Consideration should be given for a standard MELD exemption in participants with RH listed for transplantation.

**SAT-533 Validation of Baveno-VII criteria regarding non-invasive diagnosis of clinically significant portal hypertension**

**Background and aims:** Baveno VII consensus introduced the criteria of clinically significant portal hypertension (CSPH) by non-invasive tools (NITs) using liver stiffness measurement (LSM) and platelet. We aimed to validate the Baveno VII criteria to predict the risk of adverse liver related events in patients with compensated advanced chronic liver disease (cACLD).

**Method:** We conducted a retrospective cohort study of 1,966 patients with cACLD. Patients were grouped into four subgroups (CSPH excluded (n = 619), grey zone (low probability of CSPH (n = 699), high probability of CSPH (n = 207)), and CSPH included (n = 441)) according to Baveno VII consensus. Risk of decompensation and HCC was estimated using a Fine and Gray competing risk regression analysis, with liver transplantation and death as competing events.

**Results:** Among 1,966 patients, 178 and 176 patients developed decompensation and HCC over a median follow-up of 3.06 (range, 1.03–6.00) years, respectively. Patients with CSPH had substantially higher risk of decompensation compared to those without CSPH (18%, 21%, 22% vs. 0.69%, 1.1%, 1.4% at 1-year, 2-year, 3-year, respectively). Patients with CSPH had 8-fold higher risk of decompensation (standardized hazard ratio (sHR) 8.00, 95% confidence interval (CI) 4.00–16.00). Also, patients with CSPH had higher risk of HCC compared to those without CSPH (sHR 3.14 (95% CI 1.96–5.04)), yet considerable proportion of patients without CSPH also developed HCC (2.4% at 3-year). Restricted cubic spline curves showed linear relationship between LSM and risk of decompensation. Among patients within the grey zone, alcoholic liver disease, high prothrombin time, high bilirubin, and low albumin was associated with higher risk of decompensation.

**Conclusion:** Baveno VII criteria for CSPH using NITs can stratify the risk of decompensation and liver related events.

**SAT-534 Pressure response to TIPS does not depend on stent diameter**

**Background and aims:** In patients receiving the transjugular intrahepatic portosystemic shunt (TIPS) a greater reduction of the portosystemic pressure gradient (the difference between the portal and right atrial pressure) may harbour a higher risk of shunt-induced complications such as liver failure and hepatic encephalopathy. Prediction of the stent diameter necessary to reach the treatment goal (5–12 mmHg) may reduce the risk of overtreatment with its respective consequences.

**Method:** We evaluated immediate post-TIPS pressures and stent diameters in 208 patients with liver cirrhosis receiving a TIPS for refractory ascites (69.7%) or variceal bleeding (30.3%). Diameters were determined by planimetry from the angiographic image. Clinical and hemodynamic factors (portal vein diameter, portal vein flow velocity, hepatic resistance) possibly related to response to TIPS were determined before the intervention. Patients were divided into groups with post-TIPS pressure gradients of ≥6 mmHg (low risk; group 1, n = 155) or <6 mmHg (high risk; group 2, n = 53).

**Results:** Mean post-TIPS pressure gradients, relative reduction of the pre-TIPS pressure gradient, and specific reduction of the pre-TIPS pressure gradient per mm of stent diameter were 10.2 ± 2.3 mmHg, 50.0 ± 12.5%, and 7.1 ± 2.1% per mm in group 1 and 4.5 ± 1.5 mmHg (p < 0.001), 73.6 ± 11.1% (p < 0.001), and 10.1 ± 2.0% per mm in group 2 (p < 0.001), respectively. The stent diameters did not correlate with the reduction of the pressure (r = 0.17) and the pressure changes in group 1 and group 2 were achieved with similar diameters (7.2 ± 1.0 vs. 7.4 ± 0.9 mm, p = 0.999). The right atrial pressures, a measure of the preload, increased in group 1 and group 2 by 4.1 ± 3.1 mmHg and 5.0 ± 2.9 mmHg (p = 0.042), and the portal pressures decreased by 6.64 ± 3.9 mmHg and 8.6 ± 4.4 mmHg (p = 0.002), respectively. Prediction of the appropriate stent diameter was not possible.

**Conclusion:** In most patients, pressure response to TIPS was achieved with real diameters of <8 mm and was not correlated to the measured stent-diameter. The stent diameter was not predictable and a greater response (group 2, ≥6 mmHg) was associated with a greater increase in the right atrial (increased preload) and greater decrease in the portal pressure (decreased afterload) suggesting that systemic hemodynamics and cardiac function may play a role in the response to TIPS.
SAT-535
Single-centre experience of spleen stiffness measurement across the spectrum of chronic liver disease
Sarah Romero1, Alexander Thompson1, Jessica Howell1, Marno Ryan1, Swie Lin Chen Yi Mei1, Catherine Croagh1, Barbara Demedts1, David Iser1, Tim Papaluca1, Paul Desmond1, Jacinta Holmes1, 1St Vincent’s Hospital Melbourne, Department of Gastroenterology, Melbourne, Australia
Email: s.romero.md@gmail.com

Background and aims: Onset of clinically significant portal hypertension (PH) is a critical clinical event, predicting liver-related events and death in cirrhosis1. However, HVPG is invasive and inaccessible, and current non-invasive tools are suboptimal. Liver stiffness measurement (LSM) >25 kPa has been suggested to be sufficient to rule in clinically significant PH (CSPH), but LSM <25 kPa remains indeterminate. Spleen stiffness measurement (SSM) correlates strongly with HVPG, where SSM >40 kPa rules in CSPH2; therefore SSM may be superior to detect CSPH where current algorithms remain indeterminate. However, SSM remains suboptimal due to lack of data regarding optimal procedural technique, quality metrics, and validation with the dedicated spleen probe. We report procedural success and limitations, and clinical correlates of SSM across the spectrum of chronic liver disease (CLD).

Method: Prospective, single-centre study of SSM (100Hz) for CLD from January 1 to December 31, 2022, under ultrasound guidance, with paired LSM. Demographics and clinical parameters of PH were collected. Outcomes included: SSM success [10 valid SSM, representing >60% of total SSM, with IQR <30%]; SSM correlation with parameters of PH; factors associated with SSM failure.

Results: 63 patients underwent SSM; 87% (n = 55) had cirrhosis, 62% male, median age 62 yrs [IQR 51–68], median body mass index (BMI) 28 [IQR 24–32]. Child-Pugh A/B/C status was present in 77/16/7% of cirrhotics, respectively, with a median Meld-Na of 10 [IQR 8–14]. Aetiology of liver disease included: viral (35%), alcohol (32%), MAPLD (17%), other (16%). Varices were present on gastroscopy or abdominal imaging in 37% (n = 20). 11% (n = 7) had ascites at time of SSM. SSM was successful in 70% (n = 44); median stiffness 42.6 kPa. SSM failure was due to failure to meet quality criteria or failure to return SSM. Maximum SSM (100 kPa) was reached in 7% (n = 3) and 27% (n = 12) had SSM >75 kPa. SSM was significantly higher in patients who met criteria for CSPH (LSM >25 kPa), 61.3 vs 25.6 kPa (p = 0.001), and in patients with thrombocytopenia (Table). Interestingly, SSM met criteria for CSPH in patients with LSM >15 kPa (median LSM 58.3 kPa [Table]). SSM was significantly higher in patients with non-viral vs viral CLD aetiology (46.6 vs 27.1 kPa, p = 0.044) and in those with varices (90.4 vs 29.1 kPa, p < 0.0001). SSM failure was more common if LSM <25 kPa (p = 0.047). SSM correlated only moderately with platelet count (r² = 0.304, p = 0.001), LSM (r² = 0.190, p = 0.006) and Meld-Na (r² = 0.235, p = 0.002). SSM procedural success was not affected by age, BMI or ascites.

Table:

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LSM &lt;15: 22.3</td>
<td></td>
<td>0.0001</td>
</tr>
<tr>
<td>LSM &gt;15: 58.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(kPa)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LSM &lt;25: 23.6</td>
<td></td>
<td>0.0010</td>
</tr>
<tr>
<td>LSM &gt;25: 61.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plt &gt;150: 26.1</td>
<td></td>
<td>0.0012</td>
</tr>
<tr>
<td>Plt &lt;150: 61.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plt &gt;100: 38.2</td>
<td></td>
<td>0.0072</td>
</tr>
<tr>
<td>Plt &lt;100: 90.4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: In this real-world cohort with mixed liver disease aetiology (treated and untreated), LSM >25 kPa alone was not sufficient to exclude probable CSPH, based on LSM threshold of 40kPa. Furthermore, SSM was significantly higher in non-viral CLD. SSM could not be obtained in 30%. These data have significant implications for wider applicability of LSM in CLD to predict for CSPH. SSM should be considered an adjunct to existing tools for CSPH screening, however further data is required to identify optimum quality criteria, factors associated with SSM failure and optimal SSM cut-offs for degrees of PH according to CLD aetiology, particularly non-viral subgroups.

References
2. Colecchia A. Gastroent 2012; 143:646.

SAT-536
Adverse outcomes following transjugular intrahepatic portosystemic shunt placement in relation to the underlying cause of portal hypertension
Adriaan Van der Meer1, Michelle Spaan1, Adriaan Moeller2, Willemijn Dijkstra2, Ellen Werner1, Diedrik Bijdevate2, Tychon Gereaets2, Milan Sonneveld1, Sandra Coenen1, Dave Sprengers1, Robert De Man1, Raelo Maan1, Sarwa Darwish Muralid2, 3Erasmus MC University Medical Center Rotterdam, Gastroenterology and Hepatology, Netherlands; 4Erasmus MC University Medical Center Rotterdam, Radiology, Netherlands; 1Erasmus MC Transplant Institute, Netherlands
Email: s.darwishmurad@erasmusmc.nl

Background and aims: A variety of non-cirrhotic liver diseases, predominantly Budd-Chiari syndrome (BCS) and portal vein thrombosis (PVT), can lead to portal hypertension (PH) with the need for transjugular intrahepatic portosystemic shunt (TIPS). In comparison to cirrhosis-related PH (CPH), non-cirrhotic PH (NCPH) differ in underlying pathophysiological conditions, e.g. in hypercoagulability and residual liver function. Therefore, the aim of this study was to assess TIPS thrombosis and hepatic encephalopathy (HE) in patients with NCPH in comparison to patients with CPH.

Method: Occurrence of TIPS thrombosis (i.e. in-stent or in proximity of TIPS) and HE was assessed in a retrospective mono-center cohort, which included all consecutive patients with PH who received a TIPS with a covered stent between 2007 and 2021. End points were assessed as time-to-event data in Kaplan Meier and Cox proportional hazard analyses, and compared those with NCPH and CPH. Patients were censored at the time of liver transplantation or death.

Results: Overall, 385 patients with PH received a TIPS of which 55 (14.3%) had NCPH and 330 (85.7%) had CPH. Among patients with NCPH, 28 (51%) were male, median age was 51 (range 19–75) years, 26 (47%) had Budd-Chiari syndrome (BCS), 13 (24%) had portal vein thrombosis, and 16 (29%) had other causes of PH. Among patients with cirrhosis, 222 (67%) patients were male, the median age was 57 (range 15–84) years, and the etiology of cirrhosis was viral hepatitis/auto-immune or cholestatic liver disease/(non)alcoholic steatohepatitis or cryptogenic/other in 12/11/7% respectively. Patients with NCPH were significantly younger (p = 0.005) and more frequently female (p = 0.019). NCPH patients developed significantly more TIPS thrombosis than CPH patients (22% vs 8.5%) with 1- and 5- year cumulative incidence of 19.1% (95% CI 13.3–24.9) and 33.2% (95% CI 23.7–42.7) versus 7.1% (95% CI 5.5–8.7) and 12.1% (95% CI 9.4–14.8) (p = 0.002). Likewise, the need for re-intervention at 1 and 5 y in NCPH was 33.6% (95% CI 26.4–40.8) and 52.8% (95% CI 43.6–62.0) versus 22.0% (95% CI 19.3–24.7) and 35.4% (95% CI 31.6–39.2) in CPH (p = 0.026). BCS patients had the highest 3-year incidence of TIPS thrombosis of 39.6% (95% CI 28.3–50.9) compared to 19.2% in PVT (95% CI 6.6–31.8) and 6.2% for other NCPH (95% CI 0.1–12.3), despite the fact that 92.3% used anticoagulants. HE was more prevalent in CPH (47% vs 31%) with 1- and 5-year cumulative incidence of 46.7% (95% CI 43.6–49.8) and 58.9% (95% CI 55.4–62.4) versus 29.1% (95% CI 22.5–35.7) and 43.6% (95% CI 34.4–52.8) in NCPH (p = 0.022).

Conclusion: Post-TIPS complications in patients with PH differ according to the etiology, with a higher risk of TIPS thrombosis in those with NCPH, in particular BCS, despite anticoagulation and a higher risk of HE in those with CPH. Importantly, post-TIPS HE is not uncommon following TIPS in NCPH.
Background and aims: The development of cirrhotic ascites is associated with significant complications and costs. We previously developed a discrete event simulation (DES) model to assess the cost-effectiveness of long-term albumin (LTA; 40 g twice/week for 2 weeks, 40 g/week thereafter) in a UK patient cohort, based on patient characteristics and healthcare resource use (HCRU) from Hospital Episode Statistics (HES) and outcomes from the ANSWER trial. We estimated that treating 30/100 eligible patients with LTA may save up to £264,589/year. We aimed to validate our model and the HES inputs, by performing a detailed notes-based audit of patients undergoing large-volume paracentesis (LVP) for cirrhotic ascites at University Hospitals Plymouth NHS Trust (UHP).

Method: All patients undergoing LVP at UHP between March 2016-June 2018 were identified by OPCS procedure code (T46). Patients were excluded if ascites was not due to cirrhosis or there was insufficient follow-up data. Demographics, cirrhosis aetiology/severity, and 12-month rates for complications and HCRU, was collected by audit of patient records. Patients with recurrent ascites were considered eligible for LTA. The cost-effectiveness of LTA in this cohort was assessed using the previously developed DES by simulating the clinical and economic impact of treating 50% of the cohort with LTA+SMT vs SMT only. Clinical complications and HCRU were transformed into costs using NHS tariffs. Reductions in event probabilities associated with LTA were based on ANSWER trial data.

Results: 87 patients underwent an index LVP for cirrhotic ascites during the study period. 56 were considered ineligible for LTA due to early death (7), rapid ascites resolution (27) or refractory ascites (RA; 22), leaving a sample of 31 patients with recurrent ascites. Patients were predominantly male with alcohol-related liver disease and a median MELD score of 17. 12-month HCRU and complication rates were similar to previous HES data inputs and this DES model supports the conclusion that treating patients with recurrent ascites with LTA improves survival and leads to cost-savings through reduction of HCRU and complications.

Conclusion: This detailed audit of patients with recurrent ascites validates our previous analysis; we found similar HCRU and event rates to previous HES data inputs and this DES model supports the conclusion that treating patients with recurrent ascites with LTA improves survival and leads to cost-savings through reduction of HCRU and complications.

Figure 1: Main events avoided and associated costs savings when adding long-term albumin to standard medical treatment to 15 patients with recurrent ascites out of a cohort 31 patients.
SAT-539
Baveno VII algorithm can avoid endoscopic surveillance in patients with cirrhosis
Jinjun Chen1, Haiyu Wang1, Jiankang Song1, Biao Wen1, Yunnian Zhang1. 1Hepatology Unit, Department of Infectious Diseases, Nanfang Hospital, Southern Medical University, Guangdong Provincial Key Laboratory of Viral Hepatitis Research, Guangdong Provincial Clinical Research Center For Viral Hepatitis, Guangzhou, China Email: chjj@smu.edu.cn

Background and aims: Baveno VI criteria combined with spleen stiffness measurement (SSM) ≤40 kPa (Baveno VII algorithm) can safely rule out high-risk varices (HRV) and avoid esophagogastroduodenoscopy (EGD) screening. With a prospective cohort of cirrhosis patients having paired EGDs assessments, the present study aimed to validate the performance of Baveno VII algorithm in avoiding endoscopic surveillance in cirrhosis patients.

Method: The present study was a prospective study. Patients with cirrhosis were enrolled from April 2019 to February 2020 for endoscopic screening analysis (NCT04123509; NCT04890730). Endoscopic surveillance was performed and recorded in studied patients from June 2020 to April 2022. Liver and spleen transient elastography and EGD were performed within one month. Patients were followed up every 6 months at the clinic, and liver related events including clinical significant ascites, variceal bleeding, overt hepatic encephalopathy, HCC development and death were documented.

Results: Overall 715 patients with compensated cirrhosis were enrolled into screening analysis, of which 287 patients with paired EGDs were further analyzed. At screening, 153 (21.4%) patients had HRVs. Baveno VII algorithm with HRV missing rate at 2.0% (3/153) can avoid more EGDs than Baveno VI criteria (52.0% vs 32.7%, p < 0.001). Of the 287 patients, 27 patients were HRVs, Baveno VII algorithm can avoid 61.3% (176/278) endoscopic screening without (0/27) missing HRV. The distribution of varices at baseline in the 287 patients was as follows: no EV: 111 (38.7%), low-risk varices (grade 1 EV without red sign): 149 (51.9%), and high-risk varices: 27 (9.4%). During 17 (12–24) months follow-up, of the 111 patients without EV at baseline, 35 (31.5%) progressed to low-risk varices at follow-up. In the 149 patients with low-risk varices, varices disappearance of varices at follow-up was found in 19 patients, and 7 cases progressed to HRV. Of the remaining 27 patients with HRV at baseline, 3 regressed to low-risk varices and 24 remained as HRV at follow-up. Eventually, the distribution of varices at follow-up were as follows: no EV: 95 (33.1%), low-risk varices: 161 (56.1%), and HRV: 31 (10.8%). At follow-up, 31 HRV was eventually diagnosed and 27 found in patients with consecutive unfavored Baveno VII status, 3 in worsening Baveno VII status and 1 in consecutive favored Baveno VII status. Baveno VII algorithm spared 63.8% (183/287) EGDs surveillance and only one HRV was missed (3.2%, 1/31). Baveno VII algorithm can avoid more EGDs than Baveno VI criteria both at screening (61.3% vs 40.8%, p < 0.001) and surveillance (63.8% vs 50.5%, p = 0.001). In the whole 715 patients, after 33 months of follow-up, Baveno VII algorithm could be a predictive model to detect patients with low risk of decompensation.

Conclusion: We have validated that the Baveno VI criteria and Baveno VII algorithm (Baveno VI criteria combined with SSM ≤40 kPa) both can safely avoid EGDs surveillance. Baveno VII algorithm is able to avoid more unnecessary EGDs surveillance than Baveno VI criteria in compensated liver cirrhosis patients. The Baveno VII algorithm was able to rule out HRVs safely with HRV missing rate (missed/total) <5%, and over a half of EGD procedures were spared at both screening and surveillance. As well as Baveno VII algorithm was developed to detect cirrhotic patients with low risk of decompensation.

SAT-540
Symptoms from refractory ascites: contributions from both abdominal pressure and the patient
Nikhilesh Mazumder1, Sardar Ansari2, Elliot Tapper1, Anna Lok1. 1University of Michigan Hospital, Gastroenterology and Hepatology, Ann Arbor, United States; 2University of Michigan Hospital, Emergency Medicine, Ann Arbor, United States Email: mazumde@med.umich.edu

Background and aims: Ascites significantly impairs quality of life among patients with cirrhosis. Large volume paracentesis (LVP) can relieve patient symptoms. However, data are limited regarding both the threshold at which a patient experiences symptoms and potential

Figure: (abstract SAT-539).
for relief. The objective of this study was to delineate predictors of patient relief and persistence of symptoms after paracentesis.

**Method:** Patients with cirrhosis undergoing outpatient, therapeutic paracentesis were included. An open-ended manometer was used to measure ascites pressure at 1.5L increments during the procedure. The Ascites Symptom Index-7 (ASI-7), a validated PRO measure that rates seven domains impacted by ascites, was assessed before and at the end of the procedure (0: no symptoms, 35: maximal symptoms).

Each component of ASI-7 was also examined separately. Relation between patient-specific responses to ASI-7 and ascites pressure was determined using a random-effects linear mixed model.

**Results:** 61 LVPs were performed on 21 unique patients (median 2 per patient, IQR 1–3). Opening pressure was 10.7 cmH₂O (IQR 8–13), which dropped to a median of 0 cmH₂O (IQR 0–5) after an average of 7.1 L (SD 2.1L) was removed per procedure. Median ASI-7 score pre-procedure dropped from 25 (IQR 20.5 to 27.5) to 7 (IQR 1–11) immediately after the procedure. Opening pressure was significantly associated with pre-LVP total ASI-7 score (β = 0.04). By univariate regression, opening pressure had the strongest association with difficulty moving (β = 0.12, p = 0.0016), bloating/discomfort (β = 0.06, p = 0.05), and dyspnea while walking (β = 0.09, p = 0.07). An ASI-7 score focused on these three questions was more predictive of opening pressure (p = 0.03) and closing pressure (p = 0.04) than the full survey. Random effects linear modeling suggests that each patient had a unique pressure-symptom relationship (p < 0.001). Regression trendlines by patient are plotted denoting the pressure-symptom relationship (Figure). This model also suggests that at abdominal pressure of zero, patients had residual symptoms even using the focused score (7.5 [max 15], 95% CI [5.4, 9.7], p < 0.006).

**Conclusion:** Cirrhosis patients seeking relief from ascites-related discomfort typically present with abdominal pressure 10.7 cmH₂O which correlated with specific portions of the ASI-7 score. Each patient had a unique but typically direct relationship between the amount of discomfort experienced and abdominal pressure. However, residual discomfort was reported despite removing attaining zero pressure from ascites. Understanding this relationship will guide when and how much ascitic fluid should be drained for each patient to maximize symptom relief.

**Background and aims:** Long term abdominal drains (LTAD) are a cost-effective palliative measure to manage malignant ascites in the community, but their use in patients with end-stage liver disease (ESLD) and refractory ascites (RA) is not routine practice. We aimed to retrospectively evaluate effectiveness and safety of LTAD in palliative patients with ESLD and RA followed-up at our UK tertiary centre, in 2018–2022, and assess survival and the incidence of peritonitis, acute kidney injury (AKI), drain related complications and relevant hospitalisations, in comparison with a group of palliative patients with ESLD undergoing regular large volume paracentesis (LVP).

**Method:** Data was collected retrospectively from patients’ electronic health records. Fisher’s exact tests and Mann–Whitney U Test were used to compare qualitative and quantitative variables, respectively. Significance was set at p < 0.05. Kaplan-Meier survival estimates were generated to stratify outcomes according to type of drain.

**Results:** Thirty patients had LTAD (35 drains, 1–2 litre drained per week). There were no peri-operative complications. Drain displacement occurred in 4 cases (11%), catheter blockage in 2 (6%). Symptoms of shortness of breath and abdominal pain resolved in 70% and anorexia in 50% of patients, following LTAD insertion. Nineteen patients only underwent regular LVP (median drain frequency 21 days).

Median follow-up (with LTAD in place/undergoing LVP), age, Child-Pugh score, liver disease aetiology, baseline renal function, ascitic protein, and presence of hepatocellular carcinoma were not significantly different between the LTAD and LVP cohort (Table 1). Prophylactic antibiotics were more frequently prescribed in the patients with LTAD (p = 0.012), but the incidence of peritonitis did not differ between the two groups (p = 0.46). Despite a similar use of diuretics, the incidence of AKI was significantly higher in the LVP group (p = 0.014). Ascites/drain related hospital admissions occurred more frequently in the LVP cohort (p = 0.004). Survival was similar in the two groups (log-rank p = 0.71). End point-free survival was significantly shorter in the LVP group (p = 0.004, p <0.001, p = 0.018 for first ascites/drain related hospitalisation, AKI and drain related complications, respectively).

**Conclusion:** The use of LTAD for the management of RA in palliative patients with ESLD is effective and relatively safe compared to LVP, and may reduce hospital admissions and health resource utilisation. A randomised controlled trial comparing LVP and LTAD is currently recruiting in the UK, to confirm these retrospective findings.
Coagulation profile in adult patients with porto-sinusoidal vascular disease

Sidharth Harindranath1, Ankita Singh1, Kashmira Kawli1, Aditya Kale1, Akash Shukla1. 1King Edward Memorial Hospital, Gastroenterology, Mumbai, India
Email: drakashshukla@yahoo.com

Background and aims: Porto-sinusoidal vascular disease is a recently described clinical entity that includes non-cirrhotic portal fibrosis, idiopathic portal hypertension, non-cirrhotic intrahepatic portal hypertension and various overlapping histological patterns. The proposed aetiologies of this conditions is wide including autoimmune conditions, genetic disorders and thrombophilic states. We decided to study the clinical profile and prevalence of thrombophilic conditions in patients with PSVD at our centre.

Method: It was a single centre prospective study conducted over a period of 12 months. 69 consecutive patients were identified meeting the inclusion criteria of PSVD as defined by the recent BA VENO VII guidelines. Clinical, biochemical, and imaging findings were recorded. Thrombophilia profile was done in all patients which included analysis for MTHFR mutation, prothrombin gene mutation, factor V Leiden mutation, JAK2 mutation, estimation of level of homocysteine, Anti-thrombin III, protein C, protein S, APLA and ACLA

Table: (abstract SAT-541).

Table 1. Comparison of baseline characteristics and outcomes between the LTAD and the LVP cohort.

<table>
<thead>
<tr>
<th>Baseline characteristics</th>
<th>LTAD</th>
<th>LVP</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years (SD)</td>
<td>71 (11)</td>
<td>66 (12)</td>
<td>0.07</td>
</tr>
<tr>
<td>Child-Pugh score (IQR)</td>
<td>9 (2)</td>
<td>9 (2)</td>
<td>0.48</td>
</tr>
<tr>
<td>Aetiology (NASH/ArLD/viral/other)</td>
<td>9/12/2/7 (30%/40%/7%/23%)</td>
<td>3/10/1/5 (16%/53%/5%/26%)</td>
<td>0.69</td>
</tr>
<tr>
<td>HCC</td>
<td>5 (16.6%)</td>
<td>4 (21%)</td>
<td>0.46</td>
</tr>
<tr>
<td>Proteins in ascites ≤15 g/L</td>
<td>14 (47%)</td>
<td>9 (53%)</td>
<td>0.76</td>
</tr>
<tr>
<td>Prophylactic antibiotics</td>
<td>25 (81%)</td>
<td>8 (44%)</td>
<td>0.012</td>
</tr>
<tr>
<td>Previous peritonitis</td>
<td>2 (7%)</td>
<td>5 (28%)</td>
<td>0.86</td>
</tr>
<tr>
<td>T2DM</td>
<td>12 (40%)</td>
<td>8 (42%)</td>
<td>1.00</td>
</tr>
<tr>
<td>AKI</td>
<td>8 (23%)</td>
<td>11 (61%)</td>
<td>0.014</td>
</tr>
<tr>
<td>Baseline creatinine</td>
<td>104 (68)</td>
<td>84 (143)</td>
<td>0.44</td>
</tr>
<tr>
<td>Use of diuretics</td>
<td>23 (66%)</td>
<td>12 (63%)</td>
<td>1.00</td>
</tr>
<tr>
<td>Median follow-up</td>
<td>77 (191)</td>
<td>64 (132)</td>
<td>0.45</td>
</tr>
<tr>
<td>Ascites/drain related admissions</td>
<td>11 (31.4%)</td>
<td>17 (73.7%)</td>
<td>0.004</td>
</tr>
<tr>
<td>Time to first hospitalisation (days)</td>
<td>44 (93)</td>
<td>7.5 (35)</td>
<td>0.002</td>
</tr>
<tr>
<td>AKI</td>
<td>8 (23%)</td>
<td>11 (61%)</td>
<td>0.014</td>
</tr>
<tr>
<td>Drain-related complications</td>
<td>14 (40%)</td>
<td>11 (73%)</td>
<td>0.06</td>
</tr>
<tr>
<td>Patients with peritonitis</td>
<td>5 (17%)</td>
<td>5 (28%)</td>
<td>0.46</td>
</tr>
<tr>
<td>Total no. of peritonitis episodes</td>
<td>10 (28%)</td>
<td>5 (26%)</td>
<td>0.98</td>
</tr>
<tr>
<td>Drain-related complications</td>
<td>14 (40%)</td>
<td>11 (73%)</td>
<td>0.06</td>
</tr>
<tr>
<td>Cellulitis</td>
<td>4 (11%)</td>
<td>2 (11%)</td>
<td>1.00</td>
</tr>
<tr>
<td>Site leakage</td>
<td>12 (34%)</td>
<td>2 (11%)</td>
<td>0.10</td>
</tr>
<tr>
<td>Bleeding of drain site</td>
<td>2 (6%)</td>
<td>1 (6%)</td>
<td>1.00</td>
</tr>
<tr>
<td>Hypotension</td>
<td>5 (17%)</td>
<td>4 (23%)</td>
<td>0.711</td>
</tr>
</tbody>
</table>

Abbreviations: LTAD, Long term abdominal drains; LVP, large volume paracentesis; SD, standard deviation; IQR, interquartile range; NASH, non-alcoholic fatty liver disease; ArLD, alcohol-related liver disease; HCC, hepatocellular carcinoma; T2DM, type 2 diabetes mellitus; AKI, acute kidney injury.
antibody levels and flow cytometry for PNH. Bone marrow aspiration with biopsy was done where indicated.

**Results:** Forty patients (58%) were male with a median age of 37 years (18–61). Common presentations were gastrointestinal bleed in 27 (39.1%), symptomatic splenomegaly in 27 (39.1%) and transient but clinically significant ascites in 20 (28.9%) patients. Twenty two patients (31.8%) were incidentally detected. Evidence of portal hypertension was seen in 62 (89.1%) patients. Portal vein thrombosis was seen in 13 (18.8%) patients. Superior mesenteric vein and splenic vein thrombosis was seen in 4 (5.7%) and 3 (4.3%) patients respectively. Twenty three patients (33.3%) had one or more thrombophilic disorders. Four patients (5.7%) had more than two thrombophilic disorders. Anti-phospholipid antibodies was the most common thrombophilic condition seen in 16 (69.5%), followed by MTHFR mutation in 8 (34.7%), low protein S in 6 (26%), low protein C in 5 (21.7%), prothrombin mutation in 5 (21.7%), JAKV617F mutation in 3 (13%), hyperhomocysteinemia, lupus anticoagulant and antithrombin III deficiency in 1 (4.3%) patient each. Symptomatic splenomegaly was seen significantly more commonly in males than in females (p = 0.003). MTHFR mutation was seen more commonly in patients who presented later (age > 35 years). Patients with one or more thrombophilic disorders had a higher incidence of splanchic venous thromboses like superior mesenteric vein and/or splenic vein thrombosis (p = 0.034) and had a higher chance of presenting with variceal bleeding (p = 0.07).

![Figure](image.png)

**Conclusion:** PSVD is a distinct and all encompassing clinical entity with varied clinical manifestations. Association of prothrombotic conditions with this disorder has been established. One or more thrombophilic states can be seen in upto 30% of patients. These patients had a higher chance of presenting with splanchnic venous thrombosis and variceal bleeding. Hence all adult patients with PSVD should undergo thrombophilic workup as presence of thrombophilic risk factor like anti-phospholipid antibodies and JAK2 mutation may require additional therapy.

**SAT-543**

**Continuous terlipressin infusion improves muscle function but not muscle mass in patients with cirrhosis and portal hypertension**

Ryma Terbah,1,2, Darren Wong,1,2, Paul Gow,1,2, Avik Majumdar,1,2, Brooke Chapman,1,2, Adam Testro,1,2, Marie Sinclair,1,2, Austin Health, Department of Gastroenterology and Liver Transplant Unit, Melbourne, Australia;1The University of Melbourne, Department of Medicine, Melbourne, Australia;2Austin Health, Department of Nutrition and Dietetics, Australia

Email: rterbah@hotmail.com

**Background and aims:** Sarcopenia is highly prevalent in patients with cirrhosis and is associated with increased morbidity and mortality both pre- and post-liver transplant. It tends to progress with increasing severity of liver disease and has few treatment options. We have previously shown that terlipressin, a vasopressin analogue, can improve handgrip strength (HGS), but there remains little data on the impact of terlipressin on muscle mass and function.

**Method:** In this single-centre, prospective study, a continuous infusion of terlipressin 3.4 mg daily was given for 12 weeks to adult patients with cirrhosis, diuretic-refractory ascites, and sarcopenia. Muscle function was assessed using three HGS measurements in the non-dominant hand and the Liver Frailty Index (LFI). Muscle mass was evaluated using dual x-ray absorptiometry (DEXA) appendicular lean mass (APLM) and CT skeletal muscle index (SMI) at the level of the L3 vertebra. Assessments were performed at baseline and at the end of treatment.

**Results:** Twenty-three patients have completed study to date. The majority were male (n = 15, 65%) and the median age was 62 years (IQR 57–64 years). The most common aetiology of cirrhosis was alcohol (n = 9, 39.1%), followed by NASH (n = 7, 30.4%), chronic hepatitis C (n = 4, 17.4%), cryptogenic (n = 2, 8.7%), and chronic hepatitis B and delta co-infection (n = 1, 4.3%). The median MELD score at enrolment was 16 (12.5–17.5). Muscle function improved after terlipressin therapy. The maximum HGS recording increased from 27.5 kg (21.2–31.6 kg) to 28.4 kg (21.8–34.2 kg), p = 0.012, and the mean HGS increased from 25.9 kg (20–29.6 kg) to 27.8 kg (20.9–31.8 kg), p = 0.021. There was also a significant improvement in the liver frailty index from 4.25 (3.88–4.50) to 4.02 (3.69–4.28), p = 0.01. The SMI increased slightly from 46 cm²/m² (42–54 cm²/m²) to 47 cm²/m² (42–51 cm²/m²), however this was not significant (p = 0.2). DEXA APLM decreased from 7.53 kg/m² (6.22–8.30 kg/m²) to 7.09 kg/m² (6.04–7.78 kg/m²) but was not significant (p = 0.07). Of the APLM, the DEXA lower limb lean mass decreased from 16.54 kg (14.14–19.96 kg) to 15.58 kg (14.06–17.72 kg), p = 0.008, but the lean mass in the upper limb, which is less affected by peripheral oedema, increased from 5.13 kg (4.52–5.54 kg) to 5.22 kg (4.64–5.59 kg), p = 0.4.

![Figure 1](image.png)

**Conclusion:** In a sick cohort of cirrhotics for whom muscle function tends to steadily decline, 12 weeks of terlipressin therapy significantly improved muscle function and reduced frailty. While not statistically significant in this small cohort, the trend towards improvement in SMI and DEXA arm lean mass warrants further investigation with larger and longer studies, given muscle mass tends to take longer to increase than improvements in muscle function. This study provides a promising new therapy for sarcopenia in the sickest cohort of chronic liver disease patients.

**SAT-544**

**Predicting the efficacy of splenic embolization on refractory ascites using a computational model of portal hypertension**

Nikhilesh Mazumder,1 Filip Jezek,2 Elliot Tapper,1 Daniel Beard.2

1University of Michigan Hospital, Gastroenterology and Hepatology, Ann Arbor, United States; 2University of Michigan, Department of Molecular and Integrative Physiology, Ann Arbor, United States

Email: mazumde@med.umich.edu

**Background and aims:** Ascites is the most common cause of decompensation among patients with cirrhosis and carries a high morbidity and mortality rate. When refractory, splenic artery embolization offers a potential therapeutic option. Using a computational model of portal hypertension, we previously predicted the probability of response to splenic embolization in a single-center cohort of chronic liver disease patients.

**Method:** This study provides a computational model that can help predict the response to splenic embolization in patients with refractory ascites. The model incorporates various clinical and laboratory parameters to predict the likelihood of response to splenic embolization. The accuracy of the model was validated using a separate dataset.
embolization is often offered to patients not eligible for liver transplantation or transjugular intrahepatic portosystemic shunt (TIPS) creation, however its effect on ascites volume varies among patients. The objective of this study was to utilize a computational model of portal hypertension to simulate the effect of splenic embolization on portosystemic gradient (PSG) and ascites volume in different patients.

Method: We developed model of isolated portosplanchnic hemodynamics. This model consists of resistive components in series (intestinal arteries and veins, liver, hepatic vein) and a model of ascites generation (adapted from Levitt and Levitt. BMC Gastroenterol. 2012). We then modeled portosystemic collateral shunts with a diameter proportional to its pressure gradient. With increasing luminal diameter, larger amounts of portal flow is shunted, altering the hemodynamics. We then gradually increased intrahepatic resistance to model the progression of liver disease and simulated the steady state ascites volume at each stage. Splenic artery (SA) resistance to model the progression of liver disease and simulated the steady state ascites volume at each stage. Splenic artery (SA) embolization was simulated by dropping portal inflow by 40% and the resulting effect on portosystemic gradient (PSG) and steady state ascites volume was compared across various levels of portosystemic collateralization.

Results: Representative cases comparing a no-shunt to a shunt case are displayed in the Figure with an end stage marked by the orange line. As liver disease progressed, patients with increased shunting (Fig. A, open red boxes) had a more gradual rise in PSG compared to patients without any shunting (Fig. A, open blue circles). At the same liver resistance (orange line), the end stage of disease resulted in a PSG of 25 vs 18 mmHg. Similarly, patients with shunts had lower ascites volumes at all stages (Fig. B, red crosses) with end stage patients attaining a steady state volume of 6L compared to 12L in the patients without collaterals. PSG was reduced by the same percent-age regardless of shunt status, but the absolute drop was greater in patients with fewer shunts (Fig. A). Most notably, in patients with more portosystemic shunting splenic embolization was less effective at improving ascites volume compared to the no shunt case (Fig. C) with an average drop in steady state ascites volume of 3.5 vs 9.6 L.

Conclusion: We developed a computational model for portal hypertension that demonstrates varying trajectories dependent on the quantity of portosystemic shunting. This model also shows the importance of portosystemic shunting on the severity of ascites and the effectiveness of splenic artery embolization. Such computational models may provide an explanation for heterogenous effects of this intervention in patients with ascites. Future work should seek to fit computational models to individual patients in order to personalize care of portal hypertension.

SAT-545
Administration of Lactulose, Rifaximin, or combination therapy for hepatic encephalopathy is associated with a reduction in gastrointestinal cancers
Ankoor Patel1, You Li2, Carlos Minacapelli2, Carolyn Catalano2, Vinod Rustgi2. Rutgers-Robert Wood Johnson Medical School, Medicine, New Brunswick, United States; 2Rutgers-Robert Wood Johnson Medical School, Gastroenterology and Hepatology, United States
Email: ahp60@rwjms.rutgers.edu

Background and aims: Patients with cirrhosis are frequently administered rifaximin and/or lactulose for prevention and treatment of hepatic encephalopathy (HE). Both rifaximin and lactulose theoretically have anti-cancer effects. The risk of GI cancers in patients with cirrhosis on lactulose, rifaximin, and/or combination therapy has not been evaluated.

Method: A retrospective cohort study was conducted using the Truven Health MarketScan® Commercial Claims database from 2007 to 2017. Patients with cirrhosis were identified using ICD-9/10 codes. An index date was defined for each participant as the earliest date of cirrhosis diagnosis. A baseline period for each participant was defined as the twelve months prior to the first medication date while the study follow-up period represented the period form the first medication date to the last medication date. Patients with history of any cancer before the first medication date were excluded from the study. Student’s t tests were used to compare all continuous measures of age and duration of medication. Wald Chi-square tests were performed to test the associations between the study groups.

Results: The rifaximin only cohort had the lowest risk of developing colorectal cancer (rifaximin only vs lactulose plus rifaximin vs lactulose only (0.28% vs 0.56% vs 0.69%; p < 0.0001), esophageal cancer (0.08% vs 0.19% vs 0.27%; p < 0.0001), and stomach cancer (0.0% vs 0.15% vs 0.31%; p < 0.0001).

Conclusion: Colon, esophageal, and gastric cancers had an incidence reduction in the rifaximin only cohort compared to the lactulose only and lactulose plus rifaximin cohorts. Further studies are required to understand the mechanisms by which rifaximin may exert anti-cancer properties.

Table 1. (abstract: SAT-545): Development of GI cancer in the Lactulose only, Rifaximin only, and Lactulose plus Rifaximin cohorts in the follow-up period.

<table>
<thead>
<tr>
<th>Development of Cancer:</th>
<th>Total</th>
<th>Lactulose only</th>
<th>Rifaximin only</th>
<th>Lactulose plus Rifaximin combination therapy</th>
<th>Lactulose only vs Rifaximin only</th>
<th>Lactulose plus rifaximin only vs Lactulose only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Characteristics</td>
<td></td>
<td>----------------</td>
<td>---------------</td>
<td>-----------------------------------------------</td>
<td>--------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Total GI Cancers [%]</td>
<td>1.141</td>
<td>0.148</td>
<td>0.171</td>
<td>0.161</td>
<td>0.148</td>
<td>0.171</td>
</tr>
<tr>
<td>colon [n %]</td>
<td>0.009</td>
<td>0.009</td>
<td>0.009</td>
<td>0.009</td>
<td>0.009</td>
<td>0.009</td>
</tr>
<tr>
<td>rectum and anus [n %]</td>
<td>0.005</td>
<td>0.005</td>
<td>0.005</td>
<td>0.005</td>
<td>0.005</td>
<td>0.005</td>
</tr>
<tr>
<td>esophageal [n %]</td>
<td>0.003</td>
<td>0.003</td>
<td>0.003</td>
<td>0.003</td>
<td>0.003</td>
<td>0.003</td>
</tr>
<tr>
<td>stomach [n %]</td>
<td>0.006</td>
<td>0.006</td>
<td>0.006</td>
<td>0.006</td>
<td>0.006</td>
<td>0.006</td>
</tr>
<tr>
<td>liver and intrahepatic bld [n %]</td>
<td>0.011</td>
<td>0.011</td>
<td>0.011</td>
<td>0.011</td>
<td>0.011</td>
<td>0.011</td>
</tr>
<tr>
<td>other GI organs/pancreon [n %]</td>
<td>0.011</td>
<td>0.011</td>
<td>0.011</td>
<td>0.011</td>
<td>0.011</td>
<td>0.011</td>
</tr>
</tbody>
</table>
Background and aims: Portal hypertension (PHT) is the driver of many complications in liver cirrhosis. The number of cirrhosis cases as well as diagnosis of PHT-driven complications have increased over time. Transjugular intrahepatic portosystemic shunt (TIPS) placement is the most effective treatment of PHT. The aim of this study was to analyze the use and impact of TIPS placement in patients with different portal hypertensive complications during the last decade in a German nationwide study.

Method: We analyzed 14,598 admissions of patients for TIPS insertions in Germany from 2007 to 2018 using the DRG system. All diagnoses and procedures were coded according to ICD-10-CM and OPS code. The data were analyzed focusing on the number of admissions and in-hospital mortality in patients admitted for TIPS.

Results: The number of admissions of patients received TIPS insertion increased from 439 in 2007 to 2,037 in 2018. The vast majority (88.7%) of patients received TIPS in the observational 14 years had cirrhosis. The survival of cirrhotic patients with ascites and HRS increased significantly from TIPS insertions by 6.1% and 24.4%, respectively, compared to patients without TIPS. In cirrhotic patients with gastrointestinal bleeding, TIPS significantly decrease their in-hospital mortality with concomitant ascites or hepatorenal syndrome (HRS). 22.6% of patients with TIPS insertion developed hepatic encephalopathy (HE). However, compared to cirrhotic patients without TIPS, TIPS improved the survival of patients with HE grades-1 and -2 as comorbidity by 10% and 33%, respectively. In the logistic regression, higher HE grade (-3 and -4), as well as infection and circulatory diseases (including any forms of diseases of the circulatory system excluding ischemic heart diseases) are found independently associated with in-hospital death in patients with TIPS. Furthermore, TIPS and TIPS revision were independently associated with improved in-hospital survival in cirrhotic patients (Figure).

Conclusion: Our nationwide population-based study demonstrates that TIPS insertion is more frequently used, and it improves outcomes, especially in patients with ascites and HRS. In gastrointestinal bleeding, the effect is significant only when ascites and/or HRS is present. TIPS is beneficial with regard to better survival despite lower HE grades, while higher grade HE, infection and circulatory diseases seem to be associated with risk of in-hospital mortality.

SAT-547
Spontaneous portosystemic shunts (SPSS) regress after transjugular intrahepatic portosystemic shunt (TIPS) implantation

Theresa Bucsi1,2, Katharina Lampichler2,3, Maria Schoeder3, Lukas Reider4, Konstantin Vier zig4, Lukas Hartl1,2, David Jn Bauer5,1, Mathias Jachs5,2, Georg Semmler1,2, Rafael Paternostro1,2, Philipp Schwab1,2,5, Lorenz Balzer5,1, Katharina Pomej1,2, Michael Trauner1, Mattias Mandorfer1,2, Thomas Reiberger1,2,5, Medical University of Vienna, Department of Internal Medicine III, Division of Gastroenterology and Hepatology, Wien, Austria; 2Medical University of Vienna, Vienna Hepatic Hemodynamic Laboratory, Department of Internal Medicine III, Division of Gastroenterology and Hepatology, Wien, Austria; 3Medical University of Vienna, Department of Biomedical Imaging and Image-Guided Therapy, Wien, Austria; 4Klinik Favoriten-Wiener Gesundheitsverbund, Department of Radiology, Vienna, Austria; 5Medical University of Vienna, Christian-Doppler Laboratory for Portal Hypertension and Liver Fibrosis, Wien, Austria

Email: thomas.reiberger@meduniwien.ac.at

Background and aims: The impact of transjugular intrahepatic portosystemic shunt (TIPS) on the evolution of spontaneous portosystemic shunts (SPSS) has not been systematically evaluated.

Method: Ninety-one patients with paired contrast-enhanced CT scans pre and post TIPS were included. The presence of small (S-SPSS, 3–8 mm) and large SPSS (L-SPSS, ≥8 mm) as well as total cross-sectional diameter and area of all SPSS were evaluated. A semiquantitative visual SPSS score was applied: (Coll-0) no, (Coll-1) one S-SPSS, (Coll-2) 2–3 S-SPSS; (Coll-3) ≥4 S-SPSS or 1 L-SPSS.

Results: Median total SPSS diameter and area significantly decreased after TIPS from 14 mm [10–19] to 6 mm [3–10; p < 0.0001] and from 69.9 cm² [33.8–523.1] to 15.7 cm² [7.1–412.3; p < 0.0001]. Respectively. The proportion of patients with pre-TIPS L-SPSS decreased from 45.1% (n = 41/91) to 19.8% (18/91; p < 0.001), and the proportion of patients with Coll-3 from 85.7% to 51.6% (p < 0.001). Patients with persisting L-SPSS (or a post-TIPS visual SPSS score of 3) showed a significantly shorter transplant-free survival than those with only few S-SPSS or improvement of SPSS (median 30.0 vs 84.0 months, log-rank p = 0.011 and median 53.0 vs 115.0 months, p = 0.037, respectively).

Figure: Logistic regression of in-hospital mortality in 2,000,836 admissions of patients with liver cirrhosis
Conclusion: TIPS implantation ameliorates the extent of SPSS. While large SPSS regress in a considerable number of patients, their persistence after TIPS is linked to an increased risk of mortality.

SAT-548 Predicting post-TIPSS mortality: external validation of the FIPS score in a Canadian cohort
Shamir Malik1, Arash Jaberi2, Sebastian Mafeld2, Bettina Hansen3, Morven Cunningham4, Jordan J. Feld4, Scott K Fung4, Aliya Gulamhusein4, Keyur Patel4, David Wong5, Gideon Hirschfield4, Ann T Ma4. 1Faculty of Medicine, University of Toronto, Canada; 2JDMI, University Health Network, Toronto, Canada; 3Institute of Health Policy, Management and Evaluation, University of Toronto, Canada; 4Toronto Centre for Liver Disease, University Health Network, Toronto, Canada
Email: ma.ann.thu@gmail.com

Background and aims: The Model for End-Stage Liver Disease (MELD) score was originally developed to predict mortality post-transjugular intrahepatic portosystemic shunt (TIPSS) insertion. A new prognostic score, the “Freiburg index of post-TIPSS survival” (FIPS) score, has emerged and includes age, serum creatinine, bilirubin and albumin. Preliminary data suggest FIPS outperforms MELD in predicting mortality in certain European and Asian cohorts, while a recent US Veterans Affairs (VA) study did not. We aimed to validate its use in a single-centre cohort in Canada.

Method: This retrospective cohort study included patients who underwent TIPSS insertion between 2010 and 2021 at the University Health Network in Toronto. Prognostic scores including MELD, MELD-Na and FIPS were obtained within 3 months prior to TIPSS insertion. Patients were followed for up to 12 months post-TIPSS. Patients who were lost to follow-up within the first 90 days post-TIPSS were excluded. The performance of prognostic scores at 90 days post-TIPSS was assessed by area under the receiver operating characteristic curve (AUROC).

Results: A total of 129 patients were included (median age 58, 46% male). The indication for TIPSS placement was refractory ascites in 64%, variceal bleeding in 26%, hydrothorax in 5%, hepatorenal syndrome in 4% and portal vein thrombosis in 1%. TIPSS insertion was done in an emergent setting in 19%. The main etiologies of liver disease were alcohol in 46%, autoimmune in 16% and non-alcoholic fatty liver disease in 15%. The median [P25-P75] MELD, MELD-Na and FIPS scores before TIPSS were 15 [12–17], 16 [13–19] and 0.30 [−0.24–0.69], respectively. At 90 days, 6 patients had died (7%), while none had undergone liver transplant. The performance of all prognostic scores to predict 90-day mortality was poor (AUROC 0.54, 0.47 and 0.60 for MELD, MELD-Na and FIPS, respectively). However, using the FIPS cut-off of 0.92 as reported in the original derivation cohort, patients with a high FIPS score had significantly poorer 90-day survival compared to those with a low FIPS score (84% vs 97% respectively, p = 0.04) (Figure).

SAT-549 Clinical practice results of the use of intrahepatic portosystemic shunt for the treatment of refractory hepatic hydrothorax
Elena Tenorio González1, Enrique Pérez-Cuadrado Robles1, Rocio González-Grande2, Miguel Jiménez-Pérez2, 1Georges-Pompidou European Hospital, AP-HP, Paris, France; 2Regional University Hospital, Málaga, Spain
Email: etengo89@gmail.com

Background and aims: Technical advances and accumulated experience in the placement of intrahepatic portosystemic shunt (TIPS) in patients with endoscopically uncontrolled gastrointestinal bleeding have allowed their use in other less predominant indications for which there is less data. Refractory hepatic hydrothorax (RHH) is defined as that which either does not respond to treatment with diuretics at maximum doses (spironolactone 400 mg/day and furosemide 160 mg/day) or develops complications derived from their use, and therefore requires periodic thoracentesis for its control. We analyzed the results obtained in terms of clinical success and survival in patients with RHH treated at a tertiary hospital.

Method: Single center cohort retrospective study. Patients who required TIPS placement due to RHH between January 2011 and December 2019 was included, with the last prospective review of the status of the patients being in August 2022. Baseline analytical data and clinical and radiological follow-up data were analyzed at 1, 3, 6, and 12 months after TIPS placement, as well as until death or liver transplantation (if this occurred). Matching techniques were performed for the descriptive analysis of the results, taking into account the cases lost due to loss of follow-up, transplantation or exitus.

Results: Among 83 patients who required TIPS placement during this period of time, 7 were due to HRH. Only one patient required posterior thoracentesis during the first month after TIPS placement due to persistent severe hydrothorax. No patient required further thoracentesis to control hydrothorax after 3, 6, or 12 months (Table 1). However, it should be noted that all the patients had previous ascites, and the ascites resolved in 4 of them (57.1%) during the first year of follow-up. 85.7% of patients (n = 6) required, however, associated diuretics to control hydrothorax. It should be noted that at 6 months
the best results are observed due to maximum improvement in hyperdynamic circulation thanks to the TIPS. Thus, there is a 12-month survival of 71.4%, being 57.1% without the need for liver transplantation and 14.3% thanks to transplantation.

**Conclusion:** These data allow us to corroborate that the placement of TIPS is effective and safe in the treatment of RHH, with a gradual improvement in hydrotorax during the first year of follow-up, which is accompanied by an improvement in ascites when associated and, with it, of their MELD score, sometimes avoiding the need for transplantation and increasing their survival.

**SAT-550**

**Detection of minimal hepatic encephalopathy: standardization of psychometric hepatic encephalopathy scale for Israeli population**

Nave Firestein¹, Niv Zmora²,3,4, Nir Barz3,4, Oren Shiboler2,3, Helena Katchman2,3.¹ Barzilai Medical Center, Israel; ²Tel Aviv University, Israel; ³Tel Aviv Sourasky Medical Center, Israel; ⁴Tel Aviv Sourasky Medical Center-Ichilov, Department of Gastroenterology and Hepatology, Tel Aviv-Yafo, Israel

Email: hkatchman@gmail.com

**Background and aims:** Minimal hepatic encephalopathy (MHE) is a subclinical form of hepatic encephalopathy (HE) that leads to decreased quality of life and increased incidence of overt HE in cirrhotic patients. Psychometric hepatic encephalopathy scale (PHES) is the gold standard for MHE diagnosis, but its use requires adjustment to population-specific norms of performance. The aim of this study was to construct and validate a set of normal values for PHES in an Israeli population.

**Method:** PHES tests (NCT-A, NCT-B, DST, SDT and LTT) were performed on 189 healthy volunteers and 63 cirrhotic patients, and possible confounding factors, including age, gender and years of education, were assessed. Linear regression models were computed on the healthy cohort to generate confounder-adjusted equations for each of the PHES components. Reference values were then calculated for the cirrhotic patients with suspected MHE and Z-scores determined. Flicker and ICT tests were also performed in cirrhotic patients and their correlations with PHES results were evaluated.

**Results:** Age was correlated with all 5 components of PHES and education level was only correlated with NCT-A, NCT-B and DST results. No correlation between gender and test results was noted in our population. Adjusted Z-scores were calculated (figure 1A) and found to be in closest correlation to Chinese scores (figure 1B). Among 45 cirrhotic patients without previous overt HE, MHE was diagnosed in 22 (49%), 17 (38%) and 22 (49%) patients using PHES, ICT or Flicker respectively. Flicker and ICT tests were also performed in cirrhotic patients and their correlations with PHES results were evaluated.

**Conclusion:** Norms for PHES tests were generated and validated, demonstrating a good diagnostic capability, a fair agreement with ICT and Flicker tests and a correlation to liver disease severity.

**SAT-551**

**Impact of non-selective beta-blockers on first and further hepatic decompensation after transjugular intrahepatic portosystemic shunt insertion**

Anja Tiede1, Jim Benjamin Mauz1, Lena Stockhoff1, Hannah Schneider2, Bernhard Meyer2, Heiner Wedemeyer1,3, Markus Cornberg1,2,4, Jan Hinrichs2, Tammo Lambert Tergast1, Benjamin Maasoumy1,3.1 Hannover Medical School, Department of Gastroenterology, Hepatology and Endocrinology, Hannover, Germany; ²Hannover Medical School, Department of Diagnostic and Interventional Radiology, Hannover, Germany; ³German Center for Infection Research (DZIF), Braunschweig, Germany; ⁴Center for Individualised Infection Medicine (CIIM), c/o CRC Hannover, Hannover, Germany

Email: tiede.anja@mh-hannover.de

**Background and aims:** Treatment with non-selective beta-blockers (NSBB) is linked to a lower risk of hepatic decompensation in patients with liver cirrhosis and portal hypertension. These positive effects of NSBB do not directly correlate with the decrease of portal pressure and are even present if portal pressure remains unaffected. So far, little is known about the impact of NSBB therapy on the outcome of patients after insertion of a transjugular intrahepatic portosystemic shunt.

**Table 1 (abstract: SAT-549).**

<table>
<thead>
<tr>
<th></th>
<th>1 month</th>
<th>3 months</th>
<th>6 months</th>
<th>12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>No hydrotorax</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Mild hydrotorax</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Moderate hydrotorax</td>
<td>6</td>
<td>85.7</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Severe hydrotorax</td>
<td>1</td>
<td>14.3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Survival rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>After liver transplantation</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Without liver transplantation</td>
<td>7</td>
<td>100</td>
<td>7</td>
<td>100</td>
</tr>
<tr>
<td>Frequency</td>
<td>0%</td>
<td>0%</td>
<td>16.7%</td>
<td>26.7%</td>
</tr>
<tr>
<td>Percentage</td>
<td>0%</td>
<td>0%</td>
<td>75%</td>
<td>66.7%</td>
</tr>
</tbody>
</table>

Figure: Calculation of adjusted Z-scores (A) and evaluation of PHES for Israeli population. Correlation to other national PHES norms (B), other MHE tests (C) and MELD-Na score (D).
shunt (TIPS). In this study we aimed to investigate the role of NSBB treatment in preventing first and further hepatic decompensation after TIPS.

**Method:** A number of 366 consecutive patients receiving a TIPS between 2009 and 2021 were considered. Patients with Budd-Chiari syndrome, absence of liver cirrhosis, history of liver transplantation (LTx), cystic fibrosis, or those receiving a rescue TIPS were excluded. First and further hepatic decompensation (HD) were assessed according to the Baveno VII criteria. After evaluating the impact of NSBB intake at TIPS insertion on the occurrence of periinterventional HD, patients were followed up for one year after hospital discharge with continuous reassessments of NSBB status. Link between NSBB intake and development of HD as well as LTx-free survival was tested adjusting for FIPS score, TIPS indication refractory ascites and Cholinesterase (CHE).

**Results:** Overall, 176 (57.3%) of the included 307 patients received NSBB therapy prior to TIPS insertion. Patients in the NSBB group had lower FIPS (−0.25 vs −0.15; p = 0.001) and MELD scores (11 vs 13; p = 0.008) and a higher CHE (2.63 vs 2.13; p < 0.001). Refractory ascites for TIPS indication was more common in the no-NSBB group (94.7% vs 71.0%, p < 0.001). In the periinterventional period, NSBB therapy at TIPS insertion had no significant impact on the development of first or further HD (first: n = 34, NSBB/no-NSBB 16/18; p = 0.21; further: n = 77, 38/39, p = 0.10). Most common first and further HD was hepatic encephalopathy (HE, n = 18) and acute kidney injury (n = 46), respectively. At time of discharge, 132 patients (43.0%) still received NSBB therapy, of whom 125 (34.2%) received NSBB therapy before end of follow-up. After discharge, ascites (n = 66/127 first HD) and HE (n = 55/119 further HD) were the respective predominant HD. While NSBB therapy was associated with a lower risk for first and further HD in univariable competing risk analysis (first: HR 0.625, p = 0.01; further: HR 0.588, p = 0.005), this did not remain statistically significant in multivariable analysis (HR 0.787, p = 0.23; HR 0.729, p = 0.12). NSBB intake was also not linked to a higher LTx-free survival in multivariable analysis (HR 0.810, p = 0.16).

**Conclusion:** NSBB therapy at TIPS insertion and its (dis-)continuation afterwards has no significant impact on the development of first and further hepatic decompensation after TIPS.

**SAT-552**

Audit assessing real-world incidence of adverse events and mortality rate in patients receiving Terlipressin for hepatorenal syndrome at Royal Free Hospital

Naz Kanani Alviri1, Fatema Jessa1, David Patch2, 1Royal Free Hospital, Pharmacy, London, United Kingdom; 2Royal Free Hospital, Hepatology, London, United Kingdom

Email: naz.kanani@nhs.net

**Background and aims:** Hepatorenal Syndrome-Acute Kidney Injury (HRS-AKI) involves an acute onset of renal dysfunction on a background of decompensated cirrhosis and ascites, and is associated with high mortality. Terlipressin (TRL), a synthetic vasopressin analogue, is widely used in the management of HRS-AKI to cause vasoconstriction of the splanchnic circulation and improve renal perfusion. In September 2022, the European Medicines Agency issued an alert regarding a higher than previously known risk of respiratory failure and a new risk of sepsis associated with TRL. An audit was carried out in Royal Free Hospital (RFH) in London with the aim of assessing the real-world incidence of adverse events and mortality rate in patients who received TRL for HRS-AKI.

**Method:** All patients initiated on TRL for HRS-AKI between April 2018 and October 2022 at RFH were investigated retrospectively. Data from electronic dispensing records, clinical documentation, prescription charts and discharge letters were used to determine diagnosis of HRS-AKI, the incidence of respiratory failure, respiratory distress, sepsis and mortality rate within 90 days of receiving the first dose of TRL.

**Results:** A total of 37 patients received TRL. The mean age was 52.8 years with a Male:Female ratio of 25:12. Within 90 days of the first dose of TRL, respiratory failure was reported in 19% (7), respiratory distress in 14% (5), and sepsis in 11% (4) of patients. Additionally, cardiac rhythm abnormalities were seen in 5% (2). A total of 46% (17) patients experienced adverse reactions; in which 90-day survival was 41% (7). Overall, a mortality rate of 49% (18) was observed. 8% (3) underwent liver transplantation.

**SAT-553**

Collagen-proportionate area determined by semiautomated histomorphometry correlates with HVPG across different liver disease etiologies

Thomas Sorz1,2,3, Benedikt Simbrunner1,2,3,4, Kerstin Zinober1,3,4, Georg Semmler1,4, Philipp Königshofer1,3,4, Christopher Kaltenecker5, Benedikt Hofer1,2,3,4, Behrang Mozayani6, Vlad Tari3,5, Renate Kain1, Michael Trauner1, Mattias Mandorfer1,4, Philipp Schwab1,2,3,4, Thomas Reiberger1,2,3,4, 1Medical University of Vienna, Department of Medicine III, Division of Gastroenterology and Hepatology, Vienna, Austria; 2Center for Molecular Medicine (CeMM), Vienna, Austria; 3Medical University of Vienna, Christian Doppler Lab for Portal Hypertension and Liver Fibrosis, Vienna, Austria; 4Medical University of Vienna, Department of Medicine III, Vienna Hepatic Hemodynamic Laboratory, Vienna, Austria; 5Medical University of Vienna, Department of Pathology, Vienna, Austria

Email: thomas.sorz@meduniwien.ac.at

**Background and aims:** Liver fibrosis represents the main static component of portal hypertension (PH). The gold-standard of sinusoidal PH evaluation in advanced chronic liver disease is the measurement of the hepatic venous pressure gradient (HVPG). Digital histomorphometry allows quantification of collagen proportionate area (CPA) on liver biopsies. We aimed (i) to assess the correlation between CPA and HVPG across different etiologies and (ii) to compare the diagnostic performance of CPA and liver stiffness measurement (LSM) for clinically significant portal hypertension (CSHP).
Method: Patients undergoing liver biopsy were included in this study. The biopsies were stained with picro-sirius-red (PSR) and digitalized with a slide scanner: HALO software (Indica Labs) was used for CPA morphometry. The data for HVPG, LSM, enhanced liver fibrosis (ELF) score, platelet count, MELD and Child-Pugh score were extracted from medical records. Correlations were analyzed using Spearman’s Rho (r) coefficient. The performance of CPA to diagnose CSPH was evaluated via ROC analysis and optimal cutoffs were determined by Youden’s index.

Results: 91 patients with a median HVPG of 17 (IQR: 10) mmHg (n = 72, 79.1% had CSPH) and a median CPA of 12.1 (IQR: 20) % were included. The liver disease etiologies were: alcohol-related liver disease (ALD; n = 27, 29.7%), non-alcoholic fatty liver disease (NAFLD; n = 28, 30.8%), viral hepatitis (n = 11, 12.1%), cryptogenic fibrosis (n = 14, 15.4%) and ALH/cholestatic disease (n = 11, 12.1%). CPA significantly correlated with HVPG (r = 0.494, p < 0.001), LSM (r = 0.478, p < 0.001), ELF (r = 0.433, p < 0.001) and MELD (r = 0.356, p < 0.001). Importantly, the correlation coefficient of CPA-to-HVPG was distinct for the various etiologies: r = 0.185 for ALD, r = 0.545 for viral hepatitis, r = 0.149 for NAFLD, r = 0.420 for ALH/cholestatic liver disease and r = 0.335 for cryptogenic liver disease. LSM (available in n = 71) showed a similarly high correlation with HVPG (r = 0.410, p < 0.001). CPA diagnosed CSPH with an area under the curve (AUC) of 0.801 (p < 0.001) with a Youden’s index-based CPA cutoff at 12.24% (sensitivity: 68.4%, specificity: 86.1%). LSM yielded a similar AUC of 0.770 (p = 0.001), with a Youden’s index-based cut-off at 23.5 kPa.

Conclusion: CPA is a valuable and investigator-independent diagnostic tool for quantification of the static component of PH across different liver disease etiologies. While CPA showed a higher specificity for CSPH diagnosis than LSM, the requirement of invasive liver biopsy limits the broad applicability of CPA.

SAT-554
Impact of new ESC/ERS diagnostic criteria for pulmonary hypertension in cirrhotic patients with portal hypertension on the frequency of portopulmonary hypertension
Hiroki Ono1, Masanori Atsukawa1, Kaori Koyano1, Yuta Hasegawa1, Tadamichi Kawanou3, Tomohide Tanabe2, Yuji Yoshida4, Tomomi Okubo5, Taeang Arai1, Korenobu Hayama3, Norio Itokawa1, Katsuhiko Iwakiri1, 1Nippon Medical School Hospital, gastroenterology and hepatology, Bunkyo City, Japan; 2Nippon Medical School Musashi Kosugi Hospital, gastroenterology, Kawasaki, Japan; 3Nippon Medical School Chiba Hokusoh Hospital, Inzai, Japan Email: h-ono0@nms.ac.jp

Background and aims: Portopulmonary hypertension (PoPH), which belongs to group 1 of the clinical classification of pulmonary hypertension (PH), in addition, PoPH is defined as PAH associated with portal hypertension. So far, conventional PoPH was defined as a mean pulmonary artery pressure (mPAP) ≥25 mmHg, pulmonary vascular resistance (PVR) >3 Wood units (WU), and pulmonary arterial wedge pressure (PAWP) ≤15 mmHg according the previous diagnostic criteria, whereas in 2022, the European guideline for pulmonary hypertension revised the hemodynamic definition of pulmonary hypertension in pre-capillary PH by lowering the mPAP to >20 mmHg and the PVR to >2 WU. Thus, the purpose of this study is to determine how the diagnosis of PoPH according to the new guideline may change among cirrhotic patients with portal hypertension who underwent hepatic venous catheterization and right heart catheterization that we have previously reported.

Method: One hundred eighty-six patients with liver cirrhosis and portal hypertension were subjected and underwent right heart catheterization in this analysis.

Results: The patients comprised 138 males and 48 females, with a median age of 59 (range, 35–80) years. The etiologies of liver cirrhosis were alcoholic liver disease (n = 61), chronic hepatitis B virus infection (n = 11), chronic hepatitis C virus infection (n = 91), autoimmune hepatitis (n = 2), primary biliary cholangitis (n = 4), non-alcoholic steatohepatitis (n = 7), and others (n = 10). The median Child-Pugh score was 8 (range, 5–13) points. The numbers of patients with Child-Pugh class A, B, and C were 53, 92, and 41, respectively. The median mPAP, PVR and PAWP were 12.9 mmHg (range, 6.6–40.8), 0.8 WU (range, 0.1–4.5) and 7.5 mmHg (range, 2.2–15.4) respectively. For both diagnostic criteria, many of the 186 patients were below the cut-off values for both mPAP and PVR, respectively (conventional, n = 184; new, n = 182). Two (1.1%) patients had conventional PoPH. In addition, two patients that were not diagnosed as PoPH by the conventional diagnostic criteria were included in the PoPH range by the new diagnostic criteria. For each diagnostic criteria, there were no patients that met only one criterion of mPAP and PVR, and were divided into two groups. mPAP and PVR were significantly but weakly correlated (p = 0.744 × 10−5, r = 0.286).

Conclusion: With the new diagnostic criteria of PoPH, there were patients that were not diagnosed with PoPH by conventional diagnostic criteria, resulting in an increase in the number of patients diagnosed with PoPH from 1.1% to 2.2% in this cohort. In particular, it is possible that the change in the cut-off value of PVR was particularly important, since patients with a PVR of 2 to 3 WU were newly diagnosed.
Background and aims: Lymphangiogenesis plays a major role in fluid homeostasis but its role in the development of ascites is not well studied. There is emerging inflammation during hepatic decompensation, whereas the interaction of lymphangiogenesis and inflammation is poorly understood. Therefore, the aim of our study was to analyze the role of inflammation in the context of lymphangiogenesis in patients with advanced chronic liver disease (ACLD).

Method: Markers of lymphangiogenesis (Vascular endothelial growth factor-D, VEGF-D, and VEGF-C, sVEGF-R3 as main markers of lymphangiogenesis growth factors) and inflammation (IL-6) were analyzed in healthy controls (n = 38), patients with compensated ACLD (cACLD, n = 27) and in patients with decompensated ACLD (dACLD, n = 35) with recurrent ascites. Patients with dACLD were allocated to TIPS implantation and markers of lymphangiogenesis were analyzed before and after TIPS implantation as well as in the portal vein and in peripheral veins.

Results: There was a significant increase in IL-6 along patients with cACLD and dACLD (3.8 vs. 33.3 pg/ml, p < 0.001). VEGF-C was significantly lower in patients with ACLD compared to healthy individuals (2825 vs. 1172 pg/ml, p < 0.001) and VEGF-R3 was significantly higher in ACLD (165119 vs. 143081 pg/ml, p < 0.001). VEGF-D did not differ between patients with ACLD and healthy donors, but was higher in cACLD than in dACLD (985 vs. 381 pg/ml, p = 0.004). Further, only VEGF-D showed an increase after compared to before TIPS implantation (467 vs. 381 pg/ml, p < 0.040). Importantly, no differences in lymphangiogenesis markers in the portal vein and the peripheral vein were observed. Only moderate correlation was observed between IL-6 and VEGF-C (r = 0.475, p < 0.001) and VEGF-R3 (0.348, p < 0.001).

Conclusion: Inflammation increased in patients with dACLD compared to cACLD. However, there was no concomitant increase in overall lymphangiogenesis. Correlation of lymphangiogenesis and inflammation was only moderate indicating that other co-factors may influence lymphangiogenesis in patients with ACLD.
Results: Out of Seventy-four patients, 42 (56.8%) were males and 32 (43.2%) were females. Mean age for males was 45.19 ± 9.70 and that for females was 48.19 ± 17.74 years, without statistically significant difference. Significant differences among gender were found between serum sodium levels and MELD Na scores. Varices were found in 66 out of 74 patients as 22 (29.7%) as Small, 42 (56.8%) Large and 2 (2.7%) Gastric varix. Presence of varices correlated positively and significantly with all three MELD score variants with p values of <.001. ROC curves were plotted for all three variants of MELD for absence of varices, small varices and large varices. AUC were also calculated for all three variants and options. MELD and MELD Na performed slightly better than MELD 3.0 in prediction of absence of varices with all having significantly high AUCs. For prediction of small varices MELD Na performed the best while simple MELD was non-significant. For prediction of large varices MELD Na performed the best. Details are given in Table 1. ROC Curves are plotted in Figure 1.

SAT-557
MELD 3.0 score in prediction of varices and comparison with its previous versions in patients undergoing esophago-gastro-duodenoscopy for variceal screening or band ligation
Bader Faiyaz Zuberi1, Faiza Sadaqat Ali1, Amanullah Abbasi1, Tazeen Rasheed1. 1Dow University of Health Sciences, Medicine/Gastroenterology, Pakistan
Email: faiza.sadaqat@duhs.edu.pk

Background and aims: For assessing and predicting complications of chronic liver disease, different prognostic scores have been formulated. In a recent validation study MELD 3.0, incorporating serum Albumin (Alb) and female gender, correctly making 8.8% subjects to a higher tier to be eligible for liver transplant especially in women, and lower waiting list deaths in comparison with MELDNa.4 Although the importance of MELD 3.0 is validated in liver organ transplant allocation, its use for predicting variceal bleed is not yet studied. Aims of this study are to estimate value of MELD 3.0 for predicting small and large varices using AUROC. To compare MELD, MELD Na and MELD 3.0 score values with presence of varices in patients undergoing variceal screening or band ligation.

Method: Cross-sectional ongoing study and is being conducted in Gastroenterology ward and endoscopy unit of Civil hospital Karachi and OMI Hospital, from August 2022 till Jan 2023 on 74 patients of either gender of age between 18 and 60 years undergoing screening endoscopy. Patients with severe cardio-respiratory or psychiatric disease, splenic or portal vein thrombosis, hepatocellular carcinoma, primary biliary cirrhosis, INR ≥5 were excluded from study. Online free calculator was used for calculation of all three scores.5. Normal distribution of quantitative variables was checked by Kolmogorov-Smirnov (KS) test and value of ≤.05 determined that variable is not normally distributed. Frequencies of qualitative variables were compared by χ² test. Means ± SD of quantitative variables was compared by Student’s t-test or ANOVA. AUROC plots were generated for all MELD variants for presence of both small and large varices separately. Sub-group analysis for gender and stage of varices was also done.

Conclusion: The prognosis of GVB treated in expert centers in France between 2019 and 2022 appears to be better than that reported in the literature. The impact of pTIPS on this prognosis will be assessed through the final analysis of the RCT.

SAT-558
Study the effect of serum YKL-40 as a risk of variceal bleeding in Egyptian cirrhotic patients
Abdelfattah Hanno1, Mohamed Ahmed2, Reham Aboelwafa3, Essam Bedewy2, Aly Elkady1. 1Alexandria University, Tropical Medicine, Alexandria, Egypt; 2Alexandria University, Tropical Medicine, Alexandria, Egypt; 3Alexandria University, Clinical and chemical pathology, Alexandria, Egypt
Email: dr_afhanno@yahoo.com

Background and aims: For prediction of small varices MELD Na performed the best while simple MELD was non-significant. For prediction of large varices MELD Na performed the best while simple MELD was non-significant.
expressing the severity of hepatic fibrosis, including the hepatic venous pressure gradient. The aim of the work was to assess the value of serum YKL-40 as a risk of variceal bleeding in cirrhotic Egyptian patients.

Method: This prospective controlled research was done on 60 HCV induced liver cirrhosis patients visiting the Tropical Medicine Department at the Main University Hospital in Alexandria. Participants were divided into two groups. Group I consisted of thirty patients having grade I, II oesophageal varices (bleeder and non-bleeder). Group II included thirty patients with grade III, IV oesophageal varices (bleeder and non-bleeder). Moreover, all participants in groups I and II had post-viral liver cirrhosis. All were due to chronic HCV infection and all of them received treatment for HCV and had a negative Polymerase Chain Reaction for HCV. Serum YKL-40 was measured by ELISA. Patients with sepsis, other causes of liver cirrhosis, portal vein thrombosis, diabetes mellitits, malignancies, acute liver failure and rheumatoid arthritis were excluded from the study.

Results: Table 1 showed that serum YKL-40 was statistically significantly higher in patients who suffered from bleeding varices in group I and II (p = 0.028*) and (p = 0.010*) respectively. Also serum YKL-40 was able to discriminate bleeder form non bleeder patients in group I at a cut of value of (>102.5 ng/dl) with sensitivity of 76.92% and specificity of 52.94%. Additionally, serum YKL-40 was able to discriminate bleeder form non bleeder patients in group II at a cut of value of (>160.1 ng/dl) with sensitivity of 75.0% and specificity of 57.14%. Moreover, a positive correlation between serum YKL-40 and spleen size in patients who suffered from bleeding varices in both groups was found, however there was a negative correlation between serum YKL-40 and platelets count in bleeder patients also in both groups.

### Table 1

<table>
<thead>
<tr>
<th>Group I (n=30)</th>
<th>Group II (n=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Serum YKL-40</strong></td>
<td><strong>Serum YKL-40</strong></td>
</tr>
<tr>
<td><strong>Non bleeder</strong></td>
<td><strong>Bleeder</strong></td>
</tr>
<tr>
<td>(n=17)</td>
<td>(n=13)</td>
</tr>
<tr>
<td>Min.-Max.</td>
<td>74.0–118.7</td>
</tr>
<tr>
<td>Mean ± SD.</td>
<td>99.51 ± 14.88</td>
</tr>
<tr>
<td>Median (IQR)</td>
<td>102.5 (88.1–114.5)</td>
</tr>
<tr>
<td>U (p)</td>
<td>U = 58.00, (p = 0.028)</td>
</tr>
</tbody>
</table>

IQR: Inter quartile range; SD: Standard deviation; U: Mann Whitney test

**Conclusion:** serum YKL-40 would be useful in prediction of esophageal varices bleeding risk in cirrhotic patients

**SAT-559**

**Progression of portal hypertension in PBC: doppler ultrasound velocity as a non-invasive assessment**

Aiyukul Ashkimhanova1,2, Damesh Orazbayeva3, Albar Agnbay4, Marzhun Zhanaqbaeva5, Kulpash Kalkassarova6,4, Gaukhar Kurnanova1, Nataliya Satkhova1, Irina Ten6, Raina Kapiya1, 1Al-Farabi Kazakh National University, School of Medicine and Health, Almaty, Kazakhstan; 2GastroHepatoTransplant Group, Astana, Kazakhstan; 3National Research Oncology Center, Radiology, Astana, Kazakhstan; 4National Research Oncology Center, Oncohepatology and Gastroenterology, Astana, Kazakhstan; 5UMC, Republican Diagnostic Center, Department of Internal Medicine, Astana, Kazakhstan; 6UMC, National Research Center for Maternal and Child Health, Interventional Radiology, Astana, Kazakhstan; 7MEDICAL CENTRE HOSPITAL OF PRESIDENTS AFFAIRS ADMINISTRATION OF THE REPUBLIC OF KAZAKHSTAN, Radiology, Astana, Kazakhstan

**Background and aims:** Primary biliary cholangitis is one of the most common autoimmune diseases worldwide with a female prevalence after age of 45–50’s. The natural history of the development of portal hypertension in PBC patients is still not well known. Doppler ultrasound can be routinely used modality to assess non-invasively portal venous system with the additional advantage of determining velocity and flow direction. It has been observed during routine clinical practice that signs of portal hypertension by Doppler ultrasound in Primary biliary cholangitis patients occur faster before the synthetic dysfunction of the liver can be observed or the progression into cirrhosis is established. In order to assess this hypothesis, we decided to analyse the role of ultrasound Doppler characteristics in 23 patients with confirmed diagnosis of primary biliary cholangitis.

Method: Patients admitted from 2018 to 2020 at National Research Oncology Center, Liver Unit were retrospectively analyzed. The chief specialist was a single person assessing the Doppler measurements to keep the validity of the results. Criteria of diagnosis for primary biliary cholangitis: positive AMA- M2 antibodies. Liver histology signs and ALP/GGTP elevation together with bilirubinemia and transaminasemia

**Results:** Out of 23 patients, female to male ratio was 21:2, AMA-M2 negative, but gp210 and sp100 antibodies positive patients were observed in 6 female patients with confirmatory features of bile duct inflammation and concurrent ALT/AST elevation. Among them there were 3 patients with an Overlap syndrome with IgG increase more than 20 g/L and gamma globulin fraction of more than 20% together with AMA-M2 high titers, and increase of ALT/AST more than 300 IU/ml. Mean age for the onset of disease was 47 ± 8.98 years, mean ALP of 475. ± 289.92 IU/ml, GGTP mean was 315 ± 228.49 IU/ml, mean cholesterol was 6.7 mmol/l ± 2.67 mmol/l, total bilirubin of 33.51 ± 35.17 mmol/l, direct bilirubin of 26.11 sd ± 32.29 mmol/l. Ultrasound Doppler characteristics for this cohort was following: mean portal vein size of 1.14 ± 0.2 cm, mean velocity was 21 ± 12.87 cm, Vjaminis diameter mean of 0.8 ± 0.28 cm, with a velocity of 21.31 ± 7.9 cm, the diameter of hepatic artery propria was 0.42 ± 0.06 cm, with a mean velocity of 98.57 ± 25.28 cm, mean IR of 0.67 ± 0.05, splenic artery diameter of 0.56 cm ± 0.1, with an increased velocity of 125 ± 31.5 cm, IR 0.64 ± 0.07, the averaged area of the spleen was calculated to be 66.94cm² ± 37.15 and with the following platelet average of 229 × 10³/μL ± 93, WBC average 5.31 × 10³/L ± 1.34 and a mean hemoglobin of 112 g/l ± 27. Other synthetic function tests measured by total protein (mean = 75.68), albumin (mean = 36.93), fibrinogen (mean = 2.97), INR (mean = 1.07) were not affected despite high inflammatory signs within the liver parenchyma.

Conclusion: According to the results of the Doppler measurements of portal system among patients with confirmed primary biliary cholangitis, there is a tendency in increasing velocity of splenic artery as a first sign of portal hypertension progression in patients without confirmed cirrhosis, Ishak fibrosis stage 3/6. Another finding is the splenomegaly which appears also earlier. Baveno-VII classification stratification might not be ideal for PBC patients, and Portal pressure gradient measurement needs to be applied to stratify these category of patients for future interventions.

**SAT-560**

**Clinical features and analysis of serum BMP9 levels in patients with portal pulmonary hypertension**

Ruihua Zhang1,2, Tengfei Li1, Yu Tian1, Xiaoyu Wen3, 1First Hospital of Jilin University, Department of Hepatology, China; 2First Hospital of Jilin University, Center of Infectious Diseases and Pathogen Biology, China

**Email:** 15804301609@163.com

**Background and aims:** Portal pulmonary hypertension (PPOH) is a serious complication of portal hypertension with low morbidity and high mortality. Bone morphogenetic protein 9 (BMP9), a member of the bone morphogenetic protein family, can protect endothelial integrity and maintain vascular homeostasis. It has been reported
that the BMP9 signaling pathway is involved in the pathogenesis of pulmonary arterial hypertension, and POPH is a sub-group of pulmonary arterial hypertension (PAH). While, it is unclear whether BMP9 is involved in the pathogenesis of POPH. The aim of this study is to collect the clinical data of POPH patients, and to compare the expression levels of BMP9 in POPH and other different forms of PAH.

**Method:** From January 2018 to July 2022, a total of 3348 patients with liver cirrhosis or portal hypertension were screened underwnt Doppler echocardiography in the First Hospital of Jilin University. Finally, 45 patients were considered to have POPH. The clinical data of these patients were collected. Serum samples from 10 patients with POPH, 9 patients with PAH caused by left heart disease, 9 patients with PAH caused by pulmonary disease, and 9 healthy individuals were detected by enzyme-linked immunosorbent assay (ELISA) to detect BMP9 levels.

**Results:** 1) The prevalence rate of POPH in patients with portal hypertension or liver cirrhosis was rare (1.34%). The basic information of 45 POPH patients selected were listed here, the average age was 60.29 ± 12.10 years old, 40% were female, hemoglobin:95.96 ± 29.67 g/L, platelet:83.96 ± 51.67 x10^12/L, albumin:28.50 ± 5.66 g/L, creatinine:91.28 ± 69.34 umol/L, prothrombin time:17.46 ± 5.83 s, partial pressure of CO2:31.31 ± 4.51 mmHg, the most common cause of cirrhosis was alcohol, and the most common complication of cirrhosis patients was gastrointestinal bleeding. 2) The expression levels of BMP9 in each group were detected, and the results were as follows: POPH group:2.345 ± 0 pg/ml (compared with 17.6 ± 8.1 pg/ml in healthy group, p < 0.0001); PAH caused by left heart disease:14.9 ± 5.7 mg/ml (compared with 2.345 ± 0 pg/ml in POPH group, p < 0.0002); PAH caused by pulmonary disease:12.6 ± 7.0 pg/ml (compared with 2.345 ± 0 pg/ml in POPH group, p < 0.0001); Healthy control group :17.6 ± 8.1 pg/ml.

**Conclusion:** 1) Compared with healthy control group, BMP9 in POPH patients was significantly decreased, and the decrease in BMP9 was considered to be related to the pathogenesis of POPH. 2) Compared with patients with PAH caused by left heart disease or by pulmonary disease, BMP9 in POPH group was significantly decreased. Thus, the application of BMP9 is helpful to distinguish POPH from PAH caused by common clinical cardiopulmonary diseases.

---

**Figure:**

**Clinical features of portal hypertension**

**Table:**

<table>
<thead>
<tr>
<th>Age</th>
<th>Hemoglobin</th>
<th>Platelet</th>
<th>Creatinine</th>
<th>Albumin</th>
<th>Partial pressure of CO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>60.29</td>
<td>83.96</td>
<td>28.50</td>
<td>17.46</td>
<td>31.31</td>
</tr>
</tbody>
</table>

**Conclusion:** We report a state-of-the-art integrative transcriptomics pipeline mapping molecular changes in liver non-parenchymal cell types covering the entire spectrum of fibrosis in NASH patients. Distinct HSC subpopulations and transcriptional programs may play important roles in the transition from advanced fibrosis to cirrhosis in human NASH.
Background and aims: Sarcopenia is a debilitating condition affecting 60–70% of patients with liver disease. Interestingly, the incidence of sarcopenia shows sex dimorphisms. In this condition, muscle atrophy is linked to a progressive loss of skeletal muscle function and strength, and correlated to an increased mortality. However, the mechanisms underlying liver-associated sarcopenia, and the role of sex in its the development are still poorly understood. In this study, we investigated sex dimorphism in the development and resolution of sarcopenia in a murine model of liver fibrosis and regeneration.

Method: Progressive stages of liver fibrosis were induced in female and male mice by injecting increasing doses of carbon tetrachloride (CCl4, from 0.17 to 0.72 ml/Kg*bw) for 12 weeks. At the end of the treatment, an 8-week washout period was set to allow liver regeneration. Muscle function and strength were evaluated by the grid hanging and the grip strength test. Mice were sacrificed after 6 and 12 weeks of CCl4-treatment, and after the washout period. Masson’s trichrome stain was used to assess liver fibrosis, while hematoxylin and eosin staining was used to calculate the cross-sectional area (CSA) of muscle quadriceps fibers. Muscle pAkt and p4EBP1 protein expression was assessed by western blot, and mRNA expression of Musa, Atrogin-1, Murf-1, and Bnip3 by qRT-PCR. Plasma levels of TNF were measured by means of multiplexed bead-based immunoassay.

Results: After 6 and 12 weeks of CCl4-treatment, mice developed a progressive liver fibrosis that was associated to a significant loss of muscle force in both sexes, as demonstrated by the poor performances on the grid hanging and the grip strength test (p < 0.05), and by the reduced CSA of quadriceps fibers (p < 0.001). pAkt and p4EBP1 levels, promoters of muscle protein synthesis, were not affected by fibrosis development. However, atrophy-related ubiquitin ligases (Musa, Atrogin-1, Murf-1, and Bnip3), responsible for the breakdown of muscle proteins, were significantly upregulated in fibrotic mice with respect to controls, especially in females (p < 0.05). Plasma levels of TNF, responsible for the hepatic-induced muscle damage, were higher in fibrotic mice than in controls. After the washout period, males recovered their physical force and CSA, although liver fibrosis was still present, whereas females were characterized by an amelioration of liver histology and a decrease in the plasma levels of TNF, which was not accompanied by a recovery of muscle function.

Conclusion: CLD-associated sarcopenia is due to an increase of muscle protein degradation, more evident in females, whereas muscle protein synthesis is not affected by liver fibrosis in both sexes. Furthermore, the severity of sarcopenia is not correlated to the severity of liver fibrosis.
**WED-216**

**TLC-3595, a selective acetyl-CoA carboxylase 2 (ACC2) inhibitor, improves steatosis and fibrosis in murine models of NASH via pleiotropic mechanisms**

Archana Vijayakumar1, Eisuke Murakami1, Ryan Huss1, Natalie Sroda1, Atsuyuki Shimazaki2, Ippei Morita3, Hideaki Katō2, Manami Nakai2, Naoki Ohyabu2, Mani Subramanian3, Robert Myers1, Orsobio, Inc, Palo Alto, United States; 2Shinogi and Co. Ltd., Osaka, Japan

**Background and aims:** TLC-3595 is a potent (IC_{50} = 14 nM), systemically distributed, allosteric inhibitor of acetyl-CoA carboxylase 2 (ACC2) that is 76-fold selective over ACC1. By increasing fatty acid oxidation, TLC-3595 has potential for the treatment of metabolic diseases including type 2 diabetes and NASH. Here, we report the pleiotropic benefits of TLC-3595 in vitro and in murine models of NASH and fibrosis.

**Method:** Hepatocyte (HepG2 and H4IE), hepatic stellate (LX2), or adipocyte (3T3L1) cell lines were treated with TLC-3595 (or a tool compound) for 24–72 hours in vitro. High-fat diet (HFD)-fed, diet-induced obese (DIO) mice, fatty liver Shinogoi-Lepr+/Lepr+/ob/ob (FLS-ob/ob) mice, or choline-deficient, L-amino acid-defined HFD (CDAHFD)-fed mice were treated with TLC-3595 (5–60 mg/kg BID) or the nonselective, liver-targeted ACC inhibitor firsocostat (FIR, 0.5–1.5 mg/kg BID) for 4–8 weeks. Liver fibrosis was quantified based on picrosirius red-positive (PSR+) area and hepatic hydroxyproline (HYP) content.

**Results:** In vitro, TLC-3595 or a tool ACC2i dose-dependently reduced apoptosis (27% lower caspase 3/7 activity) and gluconeogenesis (39%) in hepatocytes, decreased procollagen 1 secretion (20%) in LX2 cells, and increased adiponectin in the supernatant (25%) and decreased lipid droplet size (40%) in differentiated adipocytes. In FLS-ob/ob mice, TLC-3595 treatment for 4 weeks increased plasma adiponectin (51%; p ≤ 0.0001) (Fig. A). Additionally, TLC-3595 increased Fgf21 mRNA expression (4 to 15-fold) in skeletal muscle and intact FGF21–/- mice (Fig. B). TLC-3595 or a tool ACC2i dose-dependently reduced liver triglyceride (20%), hepatic PSR+ area (28%, Fig. B), and HYP content (36%) vs. vehicle. In contrast, FIR did not increase plasma adiponectin in FLS-ob/ob mice (Fig. A) but caused greater liver TG reduction (31%) without impacting hepatic PSR+ area (Fig. B) or HYP in CAHFD mice. Lastly, in DIO mice, TLC-3595 reduced liver TG by 35% (p < 0.05) without effects on plasma TG, unlike FIR, which decreased liver TG by 66% while increasing plasma TG by 168% after 4 weeks of treatment (Fig. C-D).

**Conclusion:** TLC-3595 has beneficial effects on steatosis and fibrosis in NASH via multiple mechanisms, including direct effects in hepatocytes, hepatic stellate cells, adipocytes, and skeletal muscle, without causing hypertriglyceridemia as seen with nonselective ACC inhibitors. These data support the development of TLC-3595 in patients with NASH.

---

**WED-217**

**Spatial lipidomics reveal dysregulated sphingolipid metabolism in liver fibrosis**

Aleksandra Gruevska1, Fiona Oakley2, Jack Leslie2, Derek A Mann2, Matthew Hoare3, Zoe Hall4, 1Division of Systems Medicine, Imperial College London, London, United Kingdom; 2Newcastle Fibrosis Research Group, University of Newcastle, Newcastle-upon-Tyne, United Kingdom; 3Early Cancer Institute, University of Cambridge, Cambridge, United Kingdom

**Background and aims:** Liver fibrosis (LF) represents a major health problem worldwide due to its increasing prevalence and the lack of effective treatments. Although detailed molecular mechanisms are still unclear, during development of fibrosis, specific lipid pathways are re-wired in the liver and may represent candidate therapeutic targets. This is especially relevant for NASH-induced LF where increased hepatic storage of potentially lipotoxic species occurs. The aim of this study is to uncover the complex metabolic adaptations in LF and identify key lipid markers of hepatic fibrosis.

**Method:** Animal models of liver fibrosis included western diet + CCl4, bile duct ligation (BDL) and chronic CCl4 treatment (all in C57BL/6 male mice). To verify findings in the animal models, background cirrhotic tissue from patients with fatty liver-associated hepatocellular carcinoma (HCC) undergoing liver resection or transplant were analyzed. Lipids were extracted from bulk liver tissue (mice and human) and analysed using liquid chromatography-mass spectrometry (LC-MS) to study metabolic changes. Key lipid-gene transcript correlations were evaluated by performing RNA sequencing on the same set of samples. Pathway analysis and integration of the transcriptomics and lipidomics data was done. Mass spectrometry imaging (MSI) on cryosectioned human liver tissue was used to evaluate the spatial distribution of key altered lipids/metabolites.

**Results:** RNA sequencing of whole liver samples from mice (n = 5 per group) revealed upregulation of glycosphingolipid metabolism in the fibrotic groups compared to their control groups. Differential gene expression showed an increased expression of the enzymes implicated in ceramide production and these results were confirmed using bulk tissue lipidomics, demonstrating higher amounts of hexose ceramides (HexCer) and sphingomyelins (SM) in the three animal models employed relative to control. Specific lipids such as SM (34:1), SM (42:2), HexCer (34:1) and HexCer (42:2) were able to discriminate fibrotic groups from control. In the human samples (n = 7), pathway analysis and the integration of the transcriptomics and lipidomics data was done. Mass spectrometry imaging (MSI) on cryosectioned human liver tissue was used to evaluate the spatial distribution of key altered lipids/metabolites.

**Conclusion:** Overall, these results have identified several prominent lipid markers for hepatic fibrosis and suggest that altered sphingolipid metabolism is a key process occurring during fibrogenesis.
Targeting these metabolic pathways could be a novel strategy to resolve fibrosis.

**WED-218**

**Cyclophilin inhibition exhibits preventive and curative antifibrotic effects via extracellular matrix remodelling**

Sara Campinoti1,2,3, Una Rastovic1,2,3, Lai Wei1,2, Nicola Harris1,2, Bruna Almeida1,2, Omolola Ajayi1,2, Caioimhe Kerins4, Fiona Kenny4, Sandra Phillips1,2, Ane Zamalloa5, Rosa Miquel6, Yoh Zen7, Krishna Menon8, Eileen Gentleman9, Tanya Shaw9, Nigel Heaton9, Daren Ure9, Shilpa Chokshi1,2, Luca Urbani1,2, Elena Palma1,2,1 The Roger Williams Institute of Hepatology, Foundation for Liver Research, London, United Kingdom; 2King’s College London, Faculty of Life Sciences and Medicine, London, United Kingdom; 3equal contribution, United Kingdom; 4King’s College London, Centre for Craniofacial and Regenerative Biology, London, United Kingdom; 5Institute of Liver Studies, King’s College London, London, United Kingdom; 6Heption Pharmaceuticals, Edison, United States

**Background and aims:** Fibrosis is caused by persistent liver damage and inflammation and is a central driver for disease progression in chronic liver disease. It is characterised by excessive activation of hepatic stellate cells (HSCs) and altered extracellular matrix (ECM) deposition and remodelling ultimately affecting liver function. Despite enormous research efforts, there are no approved antifibrotic drugs. Inhibition of cyclophilins, peptidyl-prolyl isomerases that facilitate protein folding and regulate several biological processes, has been proven beneficial in various disorders, including liver diseases, but the mechanism of action requires further elucidation. Here, we firstly investigate the role of cyclophilins in HSC transdifferentiation, ECM production, composition and 3D organisation and secondly, we tested the efficacy of a pan-cyclophilin inhibitor (rencofilstat) currently in clinical development for NASH, using patient-derived in vitro and ex vivo models of liver fibrosis. **Method:** Patient-matched Precision Cut Liver Slices (PCLS) and primary HSCs were prepared from human liver specimens and exposed to mechanical or chemical insults to induce fibrogenesis, in primary HSCs were prepared from human liver specimens and exposed to mechanical or chemical insults to induce fibrogenesis, in primary HSCs were prepared from human liver specimens and exposed to mechanical or chemical insults to induce fibrogenesis, in primary HSCs were prepared from human liver specimens and exposed to mechanical or chemical insults to induce fibrogenesis. **Results:** Rencofilstat profoundly and consistently reduced expression and secretion of pro-fibrogenic markers in both models, independently of insult and treatment regime. Remarkably, cyclophilin inhibition significantly reduced HSC activation and consequent ECM deposition and induced qualitative and quantitative changes in ECM composition (proteomic analysis on CDM and PCLS). The order of organisation of matrix fibres was affected by rencofilstat resulting in significantly less organised bundles, indicating remodelling towards a less stiff 3D matrix structure, which was in line with the AFM analysis performed on PCLS that showed decreased stiffness upon cyclophilin inhibition. **Conclusion:** This study confirms the key role of cyclophilins in liver fibrosis and inflammation in patient-derived 3D and multicellular models revealing the remarkable potential of cyclophilin inhibition as anti-fibrotic therapy in relevant models of human disease. We also provide novel insights regarding rencofilstat’s mechanism of action in the remodelling of the ECM in liver fibrosis, demonstrating a direct consequence on tissue stiffness.

**WED-219**

**Hepatic stellate cell-derived extracellular matrix to model aetiology-and patient-specific matrix remodelling and fibrosis progression**

Lai Wei1,2, Sara Campinoti1,2, Bruna Almeida1,2, Fiona Kenny4, Rosa Miquel5, Tanya Shaw9, Shilpa Chokshi1,2, Luca Urbani1,2, 1The Roger Williams Institute of Hepatology, United Kingdom; 2King’s College London, Faculty of Life Sciences and Medicine, United Kingdom; 3King’s College London, Centre for Inflammation Biology and Cancer Immunology, United Kingdom; 4King’s College Hospital, Institute of Liver Studies, United Kingdom

**Background and aims:** Liver fibrosis is characterised by aberrant accumulation of extracellular matrix (ECM) secreted by activated hepatic stellate cells (HSCs). Several factors (aetiology, pro-fibrogenic insults, and fibrotic stage) influence the ECM composition, organisation and quantity in fibrosis. However, mechanisms underpinning distinct remodelling processes that affect the ECM biochemical and biophysical properties are elusive, primarily due to the lack of relevant in vitro models. Typically, stellate cells are immortalised cells, such as LX-2, and whilst easy to use and inexpensive, they are not patient-specific and the immortalisation process alters their original characteristics. Here, we present the study of the activation potential, metabolic status and specific ECM deposition of patient-derived HSCs as an in vitro model to investigate ECM remodelling in chronic liver disease. **Method:** Primary human HSCs were isolated from liver tissue collected from patients with different fibrotic stages (META VIR score): F0 (no fibrosis) to F4 (cirrhosis). Cell activation was induced using different combinations of pro-fibrotic stimuli typically found in non-alcoholic fatty liver disease and steatohepatitis: TGFβ, IL-6, free fatty acids, high glucose and insulin. Cell activation towards myofibroblasts was determined by gene and protein expression analysis. The metabolic activity of activated cells was determined with Seahorse real-time cell metabolic analysis. ECM deposition was characterised for biochemical composition and fibre orientation by cellulolysis of cell-derived matrix (CDM) followed by immunofluorescence and confocal imaging and compared to standard LX-2. **Results:** Human HSCs were successfully isolated and cultured from liver tissue with different META VIR fibrotic scores. Upon administration of pro-fibrotic stimuli, HSCs showed clear increased gene and protein expression of activation markers (αSMA, SOX9, collagens), increased proliferation, and high deposition of ECM. Matrix deposition showed remarkable differences between LX-2 and primary HSCs, suggesting substantial limitations in the use of the immortalised HSC line. Various combinations of insults and the fibrotic score of the liver tissue of origin generated different levels of cell activation, metabolic activity and ECM deposition with striking differences in both composition and structure, indicating the suitability of our model to mimic patient- and aetiology-specific fibrotic features. **Conclusion:** Here we present the potential of personalised patient-derived cells to investigate ECM remodelling in different fibrotic settings. Our study reveals that patient-derived HSCs, but not LX-2 cells, maintain a unique capacity to produce a highly bundled ECM upon induction of fibrosis. In particular, the use of the CDM analysis allows for mechanistic studies in the field of ECM deposition and remodelling upon different stimuli, an aspect often overlooked in fibrotic models. The information on fibrillar quantity and alignment between patients and upon different pro-fibrotic insults provides crucial information on the molecular mechanisms of ECM deposition in chronic liver disease and could pave the way to the discovery of novel therapeutic strategies.
Selective RNF41 restoration in hepatic macrophages from thioacetamide-induced fibrotic mice reduces liver fibrosis and inflammation

Alazne Moreno-Lanceta1,2, Mireia Medrano-Bosch2, Ylliam Fundora1,2,3, Meritxell Perramón1,4, Jessica Aspas3, Marina Parra-Robert1, Sheila Baena3, Constantino Fondevila1,3, Elazer Edelman4,6, Wladimiro Jiménez1,2,4, Pedro Melgar-Lesmes1,2,5.

1Institut d’Investigacions Biomèdiques August Pi-Sunyer (IDIBAPS), Spain; 2Department of Biomedicine, School of Medicine, University of Barcelona, Spain; 3Liver Transplant Unit, Institut Clinic de Malalties Digestives i Metaboliques, Hospital Clinic, Spain; 4Biochemistry and Molecular Genetics Service, Hospital Universitari Sant Joan de Déu, Spain; 5Institute for Medical Engineering and Science, Massachusetts Institute of Technology, United States; 6Cardiovascular Division, Brigham and Women’s Hospital, Harvard Medical School, United States.

Email: pmelgar@ub.edu

Background and aims: Macrophages play a crucial role during the progression of chronic liver disease. They actively participate in the response to liver damage and in the balance between fibrogenesis and regression. Indeed, macrophage activation is a prognostic of survival in patients with liver cirrhosis. RNF41 E3 ubiquitin ligase has been associated with negative regulation of pro-inflammatory signals and M2 macrophage polarization in muscle injury, but its role in liver fibrosis remains unclear.

Method: RNF41 expression was quantified using real-time PCR in CD11b+ macrophages isolated from the liver of cirrhotic (n = 12) and healthy subjects (n = 8), and from fibrotic (n = 6) and healthy mice (n = 6). Fibrosis was induced in mice with i.p. injections of thioacetamide (200 mg/Kg) twice a week for 9 weeks. Macrophage selective RNF41 induction was achieved with i.v. injections of dendrimer-graphite nanoparticles delivering a plasmid encoding RNF41 (RNF41-DGNP) or control scrambled plasmid every 3 days for 9 days (n = 12). The therapeutic effect of RNF41 restoration on fibrosis, liver function, and inflammation was evaluated via Real-time PCR and histological techniques.

Results: RNF41 expression was significantly lower in macrophages isolated from the liver of cirrhotic patients regardless of cirrhosis aetiology (1.1 ± 0.2 vs 0.3 ± 0.1, fold change (fc), p < 0.001), and from the liver of fibrotic mice (1.0 ± 0.1 vs 0.5 ± 0.1 fc, p < 0.001). Selective restoration of macrophage RNF41 in fibrotic mice using RNF41-DGNP promoted remarkable hepatic repair with 56% reduction in liver fibrosis area, and recovery of parenchymal structure. In concert, macrophage RNF41 restoration reduced the hepatic expression of pro-inflammatory genes and increased the expression of anti-inflammatory genes, denoting a beneficial macrophage switch on liver fibrosis. These anti-fibrotic and anti-inflammatory effects translated into a significant reduction in liver injury (AST: 592.6 ± 93.9 vs. 243 ± 46.15 U/L, p < 0.01; ALT: 182.7 ± 22.54 vs. 91.09 ± 12.51 U/L, p < 0.01). RNF41-DGNP therapy similarly orchestrated fibrosis regression at cellular level with reduced hepatic stellate cell activation, highlighted by a decrease in the hepatic expression of collagen-I (1.0 ± 0.1 vs 0.5 ± 0.1 fc, p < 0.001), alpha-SMA (1.0 ± 0.1 vs 0.6 ± 0.1 fc, p < 0.001) and TIMP-1 (1.0 ± 0.1 vs 0.5 ± 0.1 fc, p < 0.001). These effects were attributed to a reduction in the hepatic expression of macrophage pro-fibrogenic factors (TGF-beta, PDGFB, and OSM). RNF41-DGNP also promoted an increase in the expression of the collagenase MMP-9, suggesting an active participation of macrophage RNF41 on extracellular matrix remodelling.

Conclusion: RNF41 plays a major role in the regulation of macrophages in hepatic inflammation and fibrosis. This study highlights the potential of macrophage RNF41 as a novel therapeutic target for patients with cirrhosis.
Background and aims: Hepatic sympathetic nerves (HSN) are critically involved in hepatic metabolism. These nerve fibres innervate around hepatic artery, portal vein, and bile duct. Disorganization or degeneration of the HSN is known to alter hepatic metabolism, however, its role in progression of liver disease and the associated molecular changes are not fully elucidated. Our aim is to identify liver proteins that are altered after hepatic sympathetic neuronal damage and are associated with the progression of liver injury.

Method: Liver-specific sympathetic neuronal damage/denervation [sympathectomy (Sx)] was performed by intraportal injection of 6-OHDA hydrobromide on 8–10-week-old male Sprague Dawley rats. Study groups were divided as Group-1 (GR-1), control rats with intact HSN; (BDL/Sx; n = 9); Group-2 (GR-2) sympathectomized rats with intact HSN (Veh; n = 12); Group-3 (GR-3) Bile duct ligation vehicle with intact HSN; (BDL/Veh; n = 9); and Group-4 (GR-4) sympathectomized rats with BDL (BDL/Sx; n = 9), respectively. All groups were subjected to histological, confocal microscopy, plasma AST/ALT, and proteomic analysis at baseline, Day-7 (D7), D15, and D30.

Results: Liver-specific sympathectomy was validated in GR-2 and GR-4 by observing the change in urine colour (orange red), ptosis (droopy eyelid) and absence of sympathetic nerves marker (tyrosine hydroxylase; TH) in the liver samples. Mild steatosis and inflammation were observed in GR-2 at D7 and D15 with no significant difference in AST and ALT levels when compared to GR-1. Liver histology analysis showed significant increase in liver fibrosis in GR-4 as compared to GR-3 (p < 0.05). Interestingly, the level of fibrosis was significantly higher at D15 in GR-4 and it was comparable to the fibrosis seen in D30 in GR-3 (p < 0.05). Concordantly, we found significant increase in the AST and ALT values in GR-4, as compared to GR-3 (p < 0.05). In GR-3, we observed a significant progressive disorganization of sympathetic nerves that correlated with the severity of fibrosis and inflammation. PLS-DA (Partial least squares-discriminant analysis) analysis of the liver proteome showed clear differences between the study groups. 462 proteins were differentially expressed (227 upregulated and 235 downregulated) in GR-4 as compared to GR-3, showing significant activation of both the fibrogenic (TNFR2, Wnt, FGF) and inflammatory (NLRP3, MAPK, PDGF) pathways (p < 0.05).

Discussion: 462 proteins were differentially expressed (227 upregulated and 235 downregulated) in GR-4 as compared to GR-3, showing significant activation of both the fibrogenic (TNFR2, Wnt, FGF) and inflammatory (NLRP3, MAPK, PDGF) pathways (p < 0.05). Interestingly, the level of fibrosis was significantly higher at D15 in GR-4 and it was comparable to the fibrosis seen in D30 in GR-3 (p < 0.05). Concordantly, we found significant increase in the AST and ALT values in GR-4, as compared to GR-3 (p < 0.05). In GR-3, we observed a significant progressive disorganization of sympathetic nerves that correlated with the severity of fibrosis and inflammation. PLS-DA (Partial least squares-discriminant analysis) analysis of the liver proteome showed clear differences between the study groups. 462 proteins were differentially expressed (227 upregulated and 235 downregulated) in GR-4 as compared to GR-3, showing significant activation of both the fibrogenic (TNFR2, Wnt, FGF) and inflammatory (NLRP3, MAPK, PDGF) pathways (p < 0.05).

Conclusion: Recombinant extracellular 6His-CYGB exhibits a promising anti-fibrotic property for chronic liver diseases.
Results: We have observed that LncRNA-C1 was significantly upregulated in liver samples from patients with primary biliary cirrhosis (PBC) and primary sclerosing cholangitis (PSC), and that its expression was consistently elevated in three different mice models of cholestasis, including bile duct ligation (BDL), mice fed with a cholic acid diet, and MDR2-KO mice. In addition, levels of this IncRNA were also upregulated in other mice models of hepatic fibrosis, including toxic-induced fibrosis by CCl4 (6 weeks), or mice fed with methionine-choline deficient diet (MCDD), methionine-choline deficient and high fat diet (MCDD-HFD), choline deficient and high fat diet (CD-HFD), and high fructose and high fat diet (HF-HFD). In vivo hepatic targeting of IncRNA-C1 a exacerbated liver damage after BDL (as seen by elevated levels of transaminases and enhanced number of necrotic areas), increased NOS2 expression and decreased FXR levels. Using primary cells isolated from MDR2-KO mice, we found that, IncRNA-C1 was upregulated in hepatocytes and in hepatic stellate cells (HSC). Furthermore, both primary hepatocytes isolated from BDL mice, and activated HSC (including LX-2 cells or primary human HSC treated with TGF-beta, or HSC isolated from MCDD, CD-HFD, CCl4 mice models) showed increased levels of IncRNA-C1. Surprisingly, when IncRNA-C1 was silenced in TGF-beta-treated LX2 cells, phosphorylation levels of Smad2, and the mRNA expression levels of col1a1, col1a2 and acta2 were increased, suggesting an antifibrotic role of IncRNA-C1. Finally, in cholestatic mice models, we observed a positive correlation between the levels of IncRNA-C1 in serum and the hepatic expression of coll1a1 and colla2 mRNA, suggesting an antifibrotic role during liver fibrosis development, and that IncRNA-C1 could represent a clinically relevant novel target in liver fibrosis.

Conclusion: Altogether, our data suggest that IncRNA-C1 could play a protective role during liver fibrosis development, and that IncRNA-C1 could represent a clinically relevant novel target in liver fibrosis.

Evaluation of anti-fibrotic compounds effect in 3D human NASH model using quantitative digital pathology
Radina Kostadinova, Simon Ströbel, Louis Petitjean, Agnieszka Pawlowska-Pawłowska, Li Chen, Francisco Verdeguer, Mathieu Petitjean. 1Insphero AG, Liver disease discovery, Schlieren, Switzerland; 2PharmaNest, Princeton, NJ, United States

Background and aims: Non-alcoholic steatohepatitis (NASH) is a progressive and severe liver disease characterized by lipid accumulation, inflammation and, later, fibrosis. The development of novel anti-fibrotic therapies has been hindered, in part, by the limitations of existing fibrosis analysis techniques of the histology samples from in vivo and in vitro preclinical models. The novel digital pathology quantitative AI platform, FibroNest, was used previously to generate automatic, and direct fibrosis end points to quantify fibrosis severity and compound treatment response in clinical NASH samples. Here, we established an algorithm for quantification of fibrosis in an in vitro 3D human liver microtissue (hLiMT) NASH model using FibroNest imaging.

Method: The NASH hLiMT model consists of primary human hepatocytes, Kupffer cells, liver endothelial cells and hepatic stellate cells (HSC). Upon exposure to defined lipotoxic and inflammatory stimuli such as free fatty acids and LPS in media containing high levels of sugar and insulin the 3D NASH model displayed key disease pathophysiological features within 10 days of treatment. Quantifiable markers were established for anti-NASH drug efficacy testing such as secretion of pro-collagen type I/III and TIMPs/MMPs as well as quantification of fibrosis using FibroNest platform based on the Sirius Red staining of histology slides. Next generation sequencing (NGS) was also used for the assessment of the gene expression changes and pathways perturbation in the NASH model upon compounds treatment.

Results: The FibroNest algorithm for NASH hLiMTs was first validated using reference anti-fibrotic compounds, ALKS and anti-TGF-β antibody. The quantification of fibrosis using the “phenotypic fibrosis quantification score” demonstrated that both reference compounds decreased the deposition and degradation of fibrosis. An efficacy study extended the evaluation to include clinical compounds, Firsocostat, Selonsertib, and Resmiteron, and a combination of Firsocostat and Selonsertib. When the anti-fibrotic effects of these were evaluated using the same panel of end points, there was a disconnect between the functional assays with gene-expression data and the phenotypic quantification of fibrosis using FibroNest. With few exceptions, none of the clinical single drugs or the combination of Firsocostat and Selonsertib decreased the secretion of pro-collagen type I and III, TIMPs or MMPs. Of the clinical compounds, only 10 μM Selonsertib decreased the pro-collagen type I secretion on day 7. By contrast, the quantification of fibrosis using FibroNest platform demonstrated that all the tested clinical compounds had antifibrotic effects, which were in accordance with clinical observations.

Conclusion: In summary, the use of NASH hLiMTs and FibroNest imaging combined with transcriptomics and functional assays represents a promising drug discovery tool for the evaluation of the efficacy of different modalities of anti-fibrotic drug candidates and their combinatorial treatment.

Bulk and single cell RNA sequencing profiling of human hepatic stellate cells and the potential biomarkers for liver cirrhosis
Xu Liu, Heming Ma, Qingtian Guan, Huan Wang, Guangyi Wang, Yanhang Gao, Guoyue Lv, Junqi Niu. 1First Hospital of Jilin University, Department of Hepatology, Changchun, China; 2First Hospital of Jilin University, Center of Infectious Diseases and Pathogen Biology, China; 3First Hospital of Jilin University, Bioinformatics Laboratory, Changchun, China; 4Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, Department of Infectious Diseases, Wuhan, China; 1First Hospital of Jilin University, Department of Hepatobiliary and Pancreatic Surgery, Changchun, China

Background and aims: Liver cirrhosis, which presents with the distortion of hepatic architecture, is a significant global health burden. However, its exact mechanisms remain incompletely established. Hepatic stellate cells (HSCs) participate in the core regulation of fibrotic occurrence and reversion. Here, we used single-cell and bulk RNA sequencing (RNA-seq) to analyze the changes in the transcriptional patterns of patient-derived HSCs, revealing the diagnostic and therapeutic targets for cirrhosis.

Method: Primary HSCs were isolated from human liver tissues by recirculating perfusion. Bulk mRNA-seq of HSCs was performed by two comparative schemes [scheme A: Group_Cir (n = 9) versus Group_Noncir (n = 6); scheme B: Group_Act (n = 7) versus Group_Fre (n = 7)]. The dysregulated mRNAs of HSCs induced by hepatic cirrhosis were identified, and enrichment analyses were depicted. Protein-protein interaction (PPI) networks were constructed to search for candidates, which were verified by quantitative real time PCR. Then, the upstream transcription factors (TFs) were predicted using the KnockTF database. Cells from seven livers were obtained for single-cell RNA sequencing (scRNA-seq) and myofibroblastic HSCs were identified and analyzed. Ligand-receptor interactions in scRNA-seq were applied to predict the intercellular crosstalk.

Results: In the bulk RNA-seq, we observed 3828 and 2262 differentially expressed genes (DEGs) in scheme A and B, respectively.
According to the functional annotations of these two schemes, the DEGs were significantly enriched in ‘focal adhesion’, ‘retinol metabolism’, and ‘formation, assembly, or degradation of collagen or extracellular matrix’. By PPI analysis, CAV1, ESR1, APP, SHC1, BCR, and LPL were screened as hub genes. Through the TFs-DEGs networks, POUS1F1, ZFX, RARA, and MXD3 were considered the most important TFs that significantly regulate our DEGs. The scRNA-seq revealed myofibroblastic HSCs were at the end stage of differentiation and were regulated by cirrhosis-related endothelial cells through key ligand-receptor pairs, including PDGFs-PDGFs, ANGPTL4-SDC2/SDC4/ITGA5+ITGB1, and NAMPT-ITGA5+ITGB1. Finally, we found that 38 upregulated genes of myofibroblastic HSCs in scRNA-seq were shared in bulk RNA-seq.

**Conclusion:** Our study offers multiple sequencing data; reveals the changing characteristics of human HSCs; and investigates potential targets associated with liver cirrhosis. It therefore sheds light on the molecular mechanisms underlying liver cirrhosis and provides information for its detection and treatment.

**WED-226**

**Novel natural killer cell immunotherapy through synthesized Neuroligin-4 peptides improved liver fibrosis**

Baker Saffouri1, Johnny Amer1, Ahmad Salhab1, Rifaat Safadi1.

1Hadassah-Hebrew University Hospital, Liver Institute, Jerusalem, Israel

Email: johnnyamer@hotmail.com

**Background and aims:** NK cells lose their antifibrotic potential in advanced liver fibrosis particularly in patients with non-alcoholic fatty liver disease (NAFLD). Neuroligin-4 (NLGN4) receptor, a postsynaptic neuroinhibitory signalling, recently found overexpressed on NK cells and influence their killing potentials in NAFLD patients with advanced liver fibrosis. NLGN4 and its ligand β-neurexin (β-NRXN) expressed on activated hepatic stellate cells (HSCs) showed to exert a synergistic inhibitory effect on NK cells. β-NRXN overexpression in activated HSCs indicated its role in fibrogenesis. Herein, we developed a newly synthesized NLGN4 peptides to assess their effects on NK cells and HSCs activities in an in vitro and in vivo liver fibrosis model.

**Method:** Three synthesized peptides were used and incubated for two hours at concentration of 2, 4, 8 μg/ml with LX2 cells prior to cocultures with NK cells for 24-hours. NK cells were obtained from NAFLD patients with F3/F4 scores. Flow cytometry was used for assessing NK cell activity through CD107a; lysosomal-associated membrane protein-1 and LX2 activations through α-SMA expressions. For the in vivo study, C57/B1 mice were ip injected with CCl4-induced liver fibrosis (0.5 μl/g body weight) and synthesized peptides (8 μg/mice) twice a week for 6 weeks. Serum and livers were assessed for pro-inflammatory cytokines and histopathological staining, respectively.

**Results:** In an in vitro setting, HSCs pre-incubated with NLGN4 peptides, reduced their activations (αSMA expressions 1.53 and 1.55-folds in peptide 1 and peptide 2 respectively, P < 0.001) with a further prominent reduction in αSMA expressions following incubations with NK cells (2.85 and 2.3-folds in peptide 1 and peptide 2, respectively, P < 0.001). Moreover, the studied peptides downregulated expressions of both NLGN4 and β-NRXN in liver extracts isolated from CCl4 liver fibrosis mice model. NLGN4 peptides showed a delayed progressions of liver fibrosis through improving liver histological findings of inflammatory and fibrotic lesions and reducing liver injury enzymes (ALT). Fibrotic markers (αSMA, Collagen, CREB and MMP4) assessed via western blot and RT-PCR were also alleviated following treatment with peptides, and these results were associated with elevated NK cells activations assessed by the CD107a and F-actin expressions through the flow cytometry and confocal microscopy, respectively.
Conclusion: Interruption of NK/myofibroblast cellular synapse by targeting the NLGN4/β-NRXN axis with NLGN4 peptides achieved a synergistic antifibrotic effect through (1) cytotoxic NK cell stimulation against myofibroblasts; either directly via NLGN4 inhibition and indirectly by blocking the NK inhibitor β-NRXN, (2) directly inhibit β-NRXN of myofibroblasts and decreased their activation. Thus, immunotherapy targeting the NLGN4/β-NRXN axis represent a potential novel immune therapeutic strategy in NK cell-mediated diseases.

WED-227 Multimodal decoding of the mesenchymal landscape of human biliary fibrosis

David Wilson1, Neil Henderson 1, 1Centre for Inflammation Research, University of Edinburgh, United Kingdom

Email: d.h.wilson@ed.ac.uk

Background and aims: Primary Biliary Cholangitis (PBC) is a fibrosing cholangiopathy of the liver that is increasing in prevalence globally. Currently, there are no effective antifibrotic therapies available with which to treat patients with liver fibrosis. In end-stage disease, transplantation is the only treatment option, however, less than 10% of global transplantation needs are met. Therefore, effective antifibrotic therapies are urgently required. To advance our understanding of human liver fibrosis and to inform design of antifibrotic therapies, we have used multimodal single cell genomics approaches to generate single-cell, pan-lineage atlases of human primary biliary cholangitis and mouse models of biliary fibrosis.

Method: To deepen our understanding of the cellular and molecular mechanisms driving human liver fibrosis, and to inform design of effective antifibrotic therapies, we performed single nucleic RNA sequencing (snRNA-seq) of healthy and PBC explant livers to generate a single-cell, multi-lineage atlas of human biliary fibrosis. Following this, we established a single-nuclei pan-lineage atlas of mouse biliary fibrosis and used this mouse model to interrogate the function of corollary subpopulations observed in both human and mouse biliary fibrosis.

Results: We uncovered multiple, disease-associated mesenchymal and cholangiocytes subpopulations in human biliary fibrosis and using newly generated markers we have comprehensively characterised the topography of these subpopulations in the human biliary fibrotic niche. Moreover, ligand-receptor analysis of pathogenic mesenchymal subpopulations has identified a distinct set of putative therapeutic targets, which we are currently functionally interrogating using genetic approaches in mouse biliary injury models, and small molecule approaches in human biliary, multi-lineage organoids.

Conclusion: Multimodal single cell genomic approaches, in conjunction with functional interrogation of corollary cellular subpopulations in mouse models of biliary fibrosis, have allowed us to uncover novel cell states and unanticipated aspects of biliary fibrogenesis. Our ongoing work is currently assessing the feasibility and tractability of these newly identified therapeutic targets to treat patients with biliary fibrosis.

WED-228 Composition of the bile salt pool critically modulates liver fibrosis—towards humanization of murine models of liver disease

Jingguo Li1,2, Sebastian Zimny1, Dennis Koob1, Ralf Wimmer1, Gerald Denk1, Biguang Tuo2, Simon Hohenester1, 1Ludwig Maximilian University of Munich, Department of Medicine II, University Hospital, LMU Munich, Germany; 2Department of Gastroenterology, Affiliated Hospital of Zunyi Medical University, China, China

Email: simon.hohenester@med.uni-muenchen.de

Background and aims: Accumulation of hydrophobic bile salts is believed to promote liver fibrosis in human cholestatic liver disease. An important difference between mice and man in regard to liver pathophysiology is their different composition of the bile salt pool with hydrophilic bile salts predominating in mice, and hydrophobic bile salts such as (glyco-) chenodeoxycholate ((G)CDC) in man. We have previously shown that humanization of the bile salt pool by GCDC-feeding is crucial for development of liver fibrosis in chronic hepatocellular cholestasis and hypothesized that direct activation of hepatic stellate cells (HSC) may be involved. Here, we further explored the capability of various bile salts to activate HSC in vitro and tested the role of a humanized bile salt pool in development of CCl4-induced liver fibrosis.

Method: C57BL/6 mice were fed a control diet or a diet enriched with GCDC (0,1% w/w) for 6 weeks to humanize their bile salt pool. For the last 4 weeks, mice were treated with CCl4 (0.93 g/kg) 3 times per week. Liver fibrosis was quantified by hydroxyproline measurement and Sirius red staining. The human HSC line LX2 was stimulated with bile salts in standard culture medium at a slightly acidic pH (7.3) to account for the acidic microenvironment known to be present in the perisinusoidal space. Activation of cells was quantified by Western blotting for αSMA (normalized for GAPDH).

Results: LX2 were stimulated with GCDC (100–500 μM), CDC, taurocholate (TC) and deoxycholate (DC) at 10–100 μM, respectively. Among those, only GCDC (minimal concentration 100 μM) and CDC (minimal concentration 10 μM) specifically led to an increased αSMA expression by 1.9 ± 0.4- and 1.4 ± 0.1-fold respectively, compared to control (n = 4, p < 0.05). In vivo, CCl4 led to development of liver fibrosis, as expected. Supplementation with GCDC aggravated this phenotype, as evidenced by liver hydroxyproline (CCl4+GCDC vs. CCl4+Control: 383.6 ± 35.4 vs. 284.6 ± 68.5, n = 5, p < 0.05), sirius red staining (9.5% ± 3.3% vs. 5.9% ± 0.7%, n = 5, p < 0.05) and αSMA expression (0.9 ± 0.3 vs. 0.5 ± 0.1, n = 4, p < 0.05). ALT serum levels were unaltered by GCDC feeding in both control and CC14-treated animals, excluding a direct co-toxic effect of GCDC. Identical results in regard to liver fibrosis were seen when unconjugated CDCA was used. In control animals without CC14-treatment, bile salt feeding was without pro-fibrotic effects.

Figure: UMAP delineating a single-nuclei pan-lineage atlas of healthy and PBC human liver (n = 10) showing major cell lineage cluster annotations.
**Background and aims:** One of the standard treatments of unresectable hepatocellular carcinoma (HCC) is transarterial chemoembolization (TACE), using cisplatin or doxorubicin. However, chemotherapy is considered as a double-edged sword through activating hepatic stellate cells (HSCs) which can promote tumour growth and chemoresistance. With a better understanding of the molecular mechanism mediated HSC activation in response to chemotherapy, novel potential targets could be revealed for improving the treatment efficacy of liver cancer.

**Method:** Cancer associated fibroblasts (CAFs) in HCC patients with or without TACE treatment were analysed using a single cell RNA sequencing dataset. The effect of chemotherapeutic drugs on HSC activation was examined in two in vitro models, mixed-cell spheroids and treatment of conditioned medium (CM) of cisplatin- or doxorubicin-pretreated Huh7 cells in LX2 cells. LX2 cells were transfected by a pFRET HSP33 plasmid for monitoring reactive oxygen species (ROS) levels of LX2 cells cultured in Huh7-CM. RNA sequencing was conducted to profile gene expression of primary oxygen species (ROS) levels of LX2 cells cultured in Huh7-CM. Consistent with in vitro results, PI3K pathway related-molecules were significantly increased in HSCs cultured in cisplatin CM. Consistent with in vitro results, PI3K pathway related-molecules were significantly increased and its downstream molecules, AKT and ERK, were activated in the tumour tissues of HCC-bearing mice treated by cisplatin. Finally, the expressions of alpha-SMA and PI3K were increased in patient liver tumour samples after TACE treatment.

**Conclusion:** Our data add to the growing body of evidence, that human, hydrophobic bile salts can directly activate hepatic stellate cells to promote liver fibrosis. Composition of the bile salt pool in mice may impact on the fibrotic phenotype not only in cholestasis, but on development of liver fibrosis in general. This way of ‘humanization’ of murine models should thus be further explored when studying liver pathophysiology or exploring novel pharmacological therapies in chronic liver disease.

**Figure:**

**Conclusion:** Liver cancer patients with TACE or chemotherapy had a higher level of HSC activation. We have confirmed HSCs can be activated through paracrine factors from cisplatin- but not doxorubicin-treated liver cancer cells through a ROS-mediated pathway. Finally, we concluded that the activation of PI3K pathway contributes to ROS mediated-HSC activation in response to platinum-drug treatment. Understanding the HSC activation mechanism induced by chemotherapy could provide potential therapeutic targets as a complement to chemotherapy against liver cancer.

**Figure:**
After induction of hepatic fibrosis (CCl4 and Western diet), zonation is lost as zone 1-HSC migrate into zones 2 and 3. Surprisingly, zone 1-HSC do not become myofibroblasts (as shown by lack of αSMA and col1a1 expression) but rather appear to engage in the capillarization of sinusoids. As expected, regular HSC (not tdTomato-labeled by SMMHC-Cre) can be shown to engage in the fibrotic reaction as αSMA-expressing myofibroblasts.

Conclusion: Our data allow to differentiate HSC into the regular central HSC that become myofibroblasts under fibrotic conditions, and zone 1-HSC which do not transform into myofibroblasts in two different fibrosis models. Thus, HSC are not a group of cells that are uniformly involved in fibrosis but rather subdivide into mediators of capillarization and myofibroblast precursors.

**WED-231**

**Role of the hepatocyte Epidermal Growth Factor Receptor (EGFR) pathway on the cellular interactome within the liver fibrotic niche**

Esther Gonzalez-Sanchez1,2, Javier Vaquero1,2, Daniel Caballero-Díaz1,2, Jan Grzelak2, Esther Bertran1,2, Josep Amengual2, Juan García-Sáez3,4, Pilar Valdecantos5,6, Angela Martinez Valverde5,6, Aranzazu Sanchez3,4, Blanca Herrera3,4, Isabel Fabregat1,2, 1CIBER de Enfermedades Hepáticas y Digestivas-CIBEREHD, Spain; 2Bellvitge Biomedical Research Institute-IDIBELL, L’Hospitalet, Barcelona, Spain; 3Faculty of Pharmacy, Complutense University of Madrid (UCM), Madrid, Spain; 4Health Research Institute of the ‘Hospital Clínico San Carlos’ (IdISSC), Madrid, Spain; 5“Alberto Sols” Biomedical Research Institute, Spanish National Research Council and Autonomous University of Madrid (IIBM, CSIC-UAM), Madrid, Spain; 6Biomedical Research Networking Center in Diabetes and Associated Metabolic Disorders of the Carlos III Health Institute (CIBERDEM-ISCIII), Madrid, Spain

Email: ifabregat@idibell.cat

**Background and aims:** Liver fibrosis is the consequence of chronic liver injury in the presence of an inflammatory component. Although the main executors of this activation are known, the mechanisms that lead to the inflammatory process that mediates the production of profibrotic factors are not well characterized. The Epidermal Growth Factor Receptor (EGFR) signaling in hepatocytes is essential for the regenerative process of the liver; however, its potential role in regulating the fibrotic niche is not yet clear.

**Method:** Our group generated and validated a mouse model that expresses an inactive truncated form of the EGFR in hepatocytes (ΔEGFR mice). Here, we have analyzed the role of the hepatocyte EGFR pathway in the fibrotic niche cell interactome in WT and ΔEGFR mice subjected to CCl4-induced liver fibrosis.

**Results:** The analysis of the in vivo model indicated that the hepatocyte-specific EGFR activity may be contributing to the proinflammatory response, activated due to the liver damage. Indeed, the absence of EGFR activity in hepatocytes induces changes in the pattern of immune cells in the liver, with a notable change in the population of macrophages that display a bias toward an M2 phenotype more related to fibrosis resolution, as well as an increase in the population of lymphocytes related to eradication of the damage. The hallmarks of liver fibrosis are attenuated in CCl4-treated ΔEGFR mice when compared to WT mice, coinciding with a faster resolution of the fibrotic process and an ameliorated damage. **In vitro** studies have revealed that hepatocytes may directly regulate the macrophage phenotype by inducing the secretion of specific factors,

![Figure: (abstract: WED-231): Transgenic model Alb-Δ654-1186EGFR (ΔEGFR) mice (up) and experimental model of CCl4-induced liver fibrosis (bottom).](image-url)
whose expression depends on the activation of the EGFR pathway. Transcriptomic and proteomic studies, currently being performed, will allow to elucidate the specific molecular mechanisms regulated by EGFR that are responsible for the observed changes in the hepatocyte secretory phenotype.

Conclusion: EGFR inactivation specifically in hepatocytes leads to a profound alteration in the liver inflammatory response in experimental fibrosis, with a clear immune cell switch into a pro-restorative phenotype. Besides supporting a pro-fibrogenic role for EGFR activity, our study provides new mechanistic insights on EGFR kinase-dependent actions during chronic liver damage. This work has been supported by the Ramon Areces Foundation: 20th National Competition for Scientific and Technical Research in Life and Matter Science (2020), grant CIVP20A6593. We help the initial contribution of Drs. Lluis Montoliu and Jose Carlos Segovia in the generation of the transgenic mice.

**WED-232**

**Discovery of novel small molecule inhibitors of HDAC6 that suppress liver fibrosis**

Maria Teresa Borrello1, Dusan Ruzic2, Fiona Oakley1, Katarina Nikolic2, Jelena Mann1, Derek Mann1, 1Biosciences Institute, 4th Floor, William Leech Building, Newcastle University, Medical School, Newcastle Fibrosis Research Group, Newcastle upon Tyne, United Kingdom; 2University of Belgrade, Faculty of Pharmacy, Department of Pharmaceutical Chemistry, Belgrade, Serbia

Email: jelena.mann@newcastle.ac.uk

**Background and aims:** Liver fibrosis is a dynamic process characterized by deposition of scar tissue within hepatic parenchyma. At a molecular level, fibrosis is associated with perturbations in expression of histone deacetylases, therefore specific HDAC inhibitors (HDACis) could have a role as therapeutic agents for liver fibrosis. HDAC6, a microtubule-associated deacetylase, is increased in expression in fibrotic liver. Recent studies have shown that HDAC6 enzyme could be selectively targeted, mostly because of its cytoplasmic localisation. Selective HDAC6 inhibitors have shown promise in diverse number of fibrotic diseases, which led us to investigate novel HDAC6i as potential therapeutic agents for liver fibrosis.

**Method:** Structure-based molecular modelling studies were conducted in order to rationalise selective HDAC6i inhibitory profiles. The biological activities of the hydroxamic acid derivatives DR-3 and FDR-2 were profiled in an enzymatic assay and their anti-fibrotic potential evaluated in *vivo* and *in vivo* in human and murine models.

**Results:** The novel compounds FDR-2 and DR-3 were found to be nM inhibitors of HDAC6 enzymatic activity with high selectivity towards HDAC6 over HDAC1/8. Biological and biochemical evaluation demonstrated that DR-3 and FDR-2 were capable of suppressing the activation of primary rat hepatocyte stellate cells, significantly decreasing the expression of profibrogenic markers. Both compounds markedly reduced TGF-β1-induced SMAD3 activation. Finally, the compounds demonstrated anti-fibrotic pharmacological activities at 5 μM in human precision cut liver slices (hPCLS). hPCLS retain structure and cellular composition of the native human liver and represent a state-of-art preclinical model to study liver fibrosis. The antibiogenic activity of DR-3 and FDR-2 in hPCLS was assessed by Picrosirius Red, α-smooth muscle actin staining and soluble ELISAs. Both FDR2 and DR-3 blunted the progression of fibrosis in hPCLS with no obvious signs of toxicity.

**Conclusion:** Combining structural analyses and molecular modelling efforts, we generated a series of novel, highly selective HDAC6 inhibitors named DR-3 and FDR-2. Both compounds demonstrate synthetic accessibility, high potency and interesting preliminary pharmacological profile, including low toxicity in hPCLS. These results emphasised the important role that HDAC6 inhibition plays in liver fibrosis. This evidence was further confirmed by the attenuation of TGF-β1-dependent fibrogenesis in hepatic stellate cells as well as reduction in histological and protein markers of fibrosis in human PCLS after culturing with compounds DR-3 and FDR-2. Overall, this work provides robust evidence for HDAC6 inhibitors as potential therapeutic tools for the treatment of liver fibrosis and paves the way for the development of novel lead compounds.

**WED-233**

**MCPIP1 inhibits hepatic stellate cell activation in autocrine and paracrine manner**

Natalia Pydym1, Anna Ferenc2, Katarzyna Trzosi1, Piotr Major1, Mateusz Wilamowski1, Tomasz Hutshcz1, Andrzej Budzynski1, Jolanta Jura1, Jerzy Kotlinowski1, 1Jagiellonian University, Poland; 2Veterinary Diagnostic Laboratory ALAB Bioscience, Poland

Email: j.kotlinowski@uj.edu.pl

**Background and aims:** Hepatic fibrosis is characterized by enhanced deposition of extracellular matrix (ECM) which results from the wound-healing response to the chronic, repeatable injury of any etiology. Upon injury hepatic stellate cells (HSCs) activate and secrete ECM proteins, forming a scar tissue, which results in liver dysfunction. Monocyte-chemoattractant protein-1 encoded by ZC3H12A gene is a protein which possesses anti-inflammatory activity. It is an RNase that degrades a wide plethora of transcripts for example coding for proinflammatory cytokines like IL-1β or IL-6. MCPIP1 overexpression reduces liver injury in septic mice. Also, mice with deletion of Mcpip1 in liver epithelial cells, develop features of primary biliary cholangitis. In this study, we analyzed MCPIP1 level in human fibrotic livers and hepatic cells isolated from murine fibrotic livers. We also investigated MCPIP1 impact (coculture of murine primary cells and Mcpip1 in vivo overexpression) on HSCs activation.

**Method:** We analyzed MCPIP1 level in patients’ fibrotic livers and hepatic cells isolated from fibrotic murine livers. We used both CCl4 treated mice and livers from Mcpip1 knockout animals (Mcpip1fl/flAlbCre). Paracrine effect of Mcpip1 on HSCs activation was studied by coculture of Mcpip1 KO or WT primary hepatocytes with HSCs. Silencing and overexpression of ZC3H12A in LX-2 cell line was used for analysis of autocrine effects of MCPIP1. In vitro experiments were conducted on primary HSCs, cholangiocytes and hepatocytes. To overexpress Mcpip1 in vivo, we used AAV8 vectors encoding GFP (control) or Mcpip1 injected to tail vain at the dose of 1 x 10^11 cfu.

**Results:** MCPIP1 level is induced in patients’ fibrotic livers in comparison to non-fibrotic counterparts. Similarly, both mRNA and protein Mcpip1 levels were induced in primary HSCs isolated from murine fibrotic livers in comparison to control cells. Mcp1 KO hepatocytes were characterized by increased expression of Ctgf protein in comparison to control cells. High level of Ctgf produced by Mcpip1 KO hepatocytes resulted in enhanced activation of HSCs cocultured with these cells. Overexpression of MCPIP1 in LX-2 cells led to decreased mRNA expression of HSCs activation markers e.g. Acta2, Tgfb, Col1a1 and α-SMA protein level. Contrary, MCPIP1 silencing in LX-2 cells resulted in their increased activation status. In vivo overexpression of Mcpip1 in corn-oil treated mice reduced hepatic expression of Tgfb1, Acta2, Mmp3, Col2a1 and amount of IL-6 and Tgfb proteins, although did not impact degree of fibrosis after CCl4 administration.

**Conclusion:** MCPIP1 is induced in human fibrotic livers and regulates activation of HSCs cells in both autocrine and paracrine manner. Our results indicate that MCPIP1 could have a potential role in development or resolution of liver fibrosis.

**Acknowledgments:** This study was supported by National Science Centre, grant number K/PO4B/000672 and 2021/42/E/NZ5/00169.
Background and aims: Epigenetic regulation of gene expression has been implicated in liver fibrosis and is an important mechanism underlying hepatic stellate cell (HSC) activation. Polycym repressor complexes (PRC) are a key class of epigenetic regulators. Whilst PRC2 components have been implicated in HSC activation, the role of PRC1 in liver fibrosis has not been explored. The proto oncogene B-cell specific Moloney murine leukemia virus integration site 1 (Bmi1) is a key component of the PRC1 complex. Bmi1 is implicated in hepatocellular carcinomas (HCC) and cholangiocarcinomas (CCA) but its role in liver fibrosis and HSC biology is unknown. We have utilized in vivo and ex vivo murine models to examine the role of Bmi1 in liver fibrosis.

Method: The murine Schistosomiasis mansoni (S. mansoni) model of liver fibrosis was used for in vivo detection of Bmi1 by immunoblotting. HSCs were extracted by enzyme mediated perfusion of isolated mouse livers and activated on tissue culture. The small molecule inhibitor PTC-209 was used to inhibit Bmi1 in mouse livers and activated on tissue culture. The small molecule inhibitor PTC-209 was used to inhibit BMI1 in mouse livers and activated on tissue culture. HSC prolif- eration and cell cycle analysis were conducted using immunoblotting and qPCR. HSC fibrosis markers and HSC activation markers were assessed with immunocytochemistry (ICC), immunoblotting and qPCR. HSC prolif- eration and cell cycle analysis were conducted using immunoblotting for proliferating cell nuclear antigen (PCNA) and propidium iodide flow cytometry. Statistical analyses were carried out using Student’s t-test (Graphpad Prism 8).

Results: In vivo expression of Bmi1 is significantly increased in S. mansoni infected livers versus uninfected controls (p < 0.05). Ex vivo HSC culture reveals Bmi1 is upregulated in activated HSCs (aHSCs) at day 7 compared to quiescent HSCs (qHSCs) at day 0 (p < 0.01). This is associated with increased expression of alpha-smooth muscle actin, (Asma), collagen I (Col1a1), Yes associated protein 1 (Yap1) and SRY-Box Transcription Factor 9 (Sox9), all established markers of the aHSC phenotype. ICC staining confirms nuclear localisation of Bmi1 in the aHSC. PTC-209 mediated BMI1 inhibition in aHSCs was associated with reduced levels of Bmi1 protein in HSCs and reduced levels of H2AK119ub, reflecting diminished PRC1 ubiquitin ligase activity. Bmi1 inhibition diminished the profibrotic phenotype of aHSCs. Significant reduction in protein and mRNA levels of collagen I (p < 0.01), a fibrillar collagen that is a hallmark of liver fibrosis was detected. Markers of HSC activation were also diminished, with reduced levels of platelet derived growth factor receptor-beta (PDGFRB) protein (p < 0.01) and reduced transcript levels of Pdgfrb (p < 0.001) and Asma (p < 0.01). These observations are unlikely due to diminished cell survival, as no significant changes in PCNA or cell cycle kinetics were detected at PTC-209 doses utilized in this study.

Conclusion: In this study, we provide proof-of-concept data demonstrating ex vivo inhibition of Bmi1 abrogates the profibrotic phenotype of activated HSCs. Moreover, we have identified a potentially new target linked to epigenetic mechanisms in the ongoing search for anti-fibrotic therapies in chronic liver disease.

WED-235
3D engineered perihepatic endothelial cell implants reduce fibrosis and inflammation, boosting liver regeneration in fibrotic hepatocitized mice

Mireia Medrano-Bosch1, Alazne Moreno-Lanceta1,2, Blanca Simón-Codina1, Laura Macías-Muñoz1, Elazer Edelman1,4, Vladimiro Jiménez1,2, Pedro Melgar-Lesmes1,2,3, School of Medicine, University of Barcelona, Department of Biomedicine, Barcelona, Spain; 1Institut d’Investigacions Biomèdiques August Pi-Sunyer (IDIBAPS), Centro de Investigación Biomédica en Red de Enfermedades Hepáticas y Digestivas (CIBERehd); Spain, 2School of Medical Engineering and Science, Massachusetts Institute of Technology, United States; 3Cardiovascular Division, Brigham and Women’s Hospital, Harvard Medical School, United States; 4Biochemistry and Molecular Genetics Service, Hospital Clinic Universitari, Spain

Background and aims: Endothelial cells (ECs) display a myriad of protective effects that contribute to the minimization of liver injury and the restoration of hepatic function. Embedding healthy ECs in a 3D collagen-based scaffold shields their immunogenicity and maximizes their protective roles. Indeed, a previous study has shown that matrix-embedded endothelial cells (MEEC) can protect the liver against ischemic injury. Here, we evaluate whether perihepatic implantation of MEECs might be of therapeutic interest in the context of fibrosis with liver resection.

Method: Fibrosis was induced in BALB/c mice (n = 12) by i.p. injection of CCl4 twice weekly for 8 weeks. Acellular matrices or MEECs were implanted between the median and right lobe in fibrotic mice with partial hepatectomy (40% resection, HP40). After 7 days, serum and hepatic samples were collected for fibrosis (Sirius Red staining) and liver function analysis. The expression of genes associated with extracellular matrix turnover, hepatic stellate cell (HSC) activation, or inflammation were quantified by Real-time PCR. Liver restoration rate, proliferating cell nuclear antigen (PCNA) immunostaining and the expression of different growth factors were also studied.

Results: Perihepatic implantation of MEECs in HP40 fibrotic mice promoted a 27% reduction in hepatic fibrosis area and significant improvement in liver function (2-fold reduction in transaminases-AALT 139 ± 19.5 vs 60 ± 10.4 U/L, p < 0.01; AST, 608 ± 105 vs 253 ± 37 U/L, p < 0.01). HSC activation was similarly mitigated with concomitant 2-fold reduction in expression of extracellular matrix turnover genes (Collagen 1, 1.0 ± 0.1 vs 0.65 ± 0.1, fold change (fc), p < 0.01; alpha-SMA, 1.1 ± 0.1 vs 0.51 ± 0.1 fc, p < 0.01; TIMP1, 1.0 ± 0.1 vs 0.6 ± 0.1 fc, p < 0.05). MEECs also promoted a significant down-regulation of macrophage-derived HSC activators and pro-inflammatory genes, and a parallel increased expression of anti-inflammatory genes. Beneficial anti-fibrotic and anti-inflammatory effects of MEECs implantation in HP40 fibrotic mice were associated with restoration of liver mass (7.0 ± 0.1 g/body weight, BW vs. 7.9 ± 0.1 g/BW, p < 0.05). Indeed, tissue preservation correlated with induced cell growth as the number of proliferating cells in livers from mice implanted with MEECs was three times higher than in mice receiving acellular implants (PCNA positive cells, 5.3 ± 0.3 vs. 15.4 ± 1.5%, p < 0.001). This hepatic proliferation correlated with an upregulation of hepatocyte growth factor expression (1.0 ± 0.1 vs 1.7 ± 0.2 fc, p < 0.001) but not with insulin growth factor 1 induction (1.0 ± 0.1 vs 1.1 ± 0.1 fc).

Conclusion: 3D engineered perihepatic ECs implants reduce fibrosis and inflammation and induce hepatic regeneration in fibrotic mice with hepatectomy. This study emphasizes the therapeutic potential of MEECs to improve the recovery of patients with fibrosis and liver resection.

WED-236
Artificial Intelligence analysis of liver biopsies in pre-cirrhotic NASH: qFibrosis explained

Dean Tai1, Elaine Chng1, Kuthbuddin Akbar1, Yayan Ren2, Pol Boudes1
1Histoidnex Pte Ltd, Singapore; 2Galectin Therapeutics, United States

Background and aims: Liver histopathology is a primary outcome for non-alcoholic steatohepatitis (NASH) candidate drugs registration. Besides biopsy size, tissue homogeneity, and staining quality, intra and inter observer variability confound the interpretation of available semi-quantitative scales for fibrosis. We designed an innovative
Improvements in liver histology is the goal in phase 2 trials to help stratify patient inclusion criteria for accuracy in fibrosis assessment. qFibrosis has been used in the evaluation of NASH candidate treatments and offers additional insights such as identification of the most potent fibrosis response in baseline F3 patients in some trials. Increasingly, qFibrosis is included in prospective studies, first as exploratory end point to supplement analysis done by pathologists (NCT03900429), then as a secondary end point in a NASH phase 2b study (NCT040904621), and most recently as a primary end point in another phase 2 NASH study (NCT05519475).

Conclusion: qFibrosis has the potential to provide a quantitative understanding of subtle morphological changes due to treatment-induced fibrosis regression, allowing it to be more sensitive to changes within the timeframes of typical phase 2 and 3 NASH trials. This can be used for better stratification of patient inclusion criteria, which is crucial for efficacy evaluation during drug development, as well as for diagnosis once the drug is approved. This clearly demonstrates the utility of AI in digital pathology in a real-world clinical setting.

WED-238
Repeatability and reproducibility assessment and its acceptable standard error of means for qFibrosis system in multi-site NASH clinical trials

Jason Pik Eu Chang1, Claudia Filozof2, Dean Tai3, Kutbuddin Akbary3, Yayun Ren3, Elaine Chng1, 1HistoIndex Pte Ltd, Clinical Research, Singapore; 2Labcorp Drug Development, Israel; 3HistoIndex Pte Ltd, Singapore; 4Peking University Hospital, Beijing. Email: akbary.kutbuddin@histoindex.com

Background and aims: Accurate quantification of fibrosis is critical in clinical trials in NASH. In recent years, the application of digital pathology with artificial intelligence (AI), including qFibrosis has gained increased attention due to the potential to quantify fibrosis features from liver biopsies with better inter-/intra observer agreements as compared to conventional reads. Our group has recently reported the inter-system (repeatability) and intra-system (reproducibility) of qFibrosis. In this study, we aim to describe an acceptable standard error of means for the qFibrosis system in NASH clinical trials.

Method: The study included 41 core biopsies with confirmed NASH, of which 9, 9, 13 and 10 samples were staged F1, F2, F3 and F4, respectively. Scanning was conducted with 3 Genesis200® machines, using second harmonic generation/two-photon excitation fluorescence (SHG/TPEF) microscopy on unstained slides. 3 repeated scans were conducted for each sample by each machine (repeatability) and by three different machines (reproducibility) at different time points, and a qFibrosis continuous value (qFC) is generated based on an AI algorithm for each sample per scan. The standard error of means
POSTER PRESENTATIONS

WED-239
The anti-HIV drug Rilpivirine downregulates migration and proliferation of activated hepatic stellate cells: relevance for the purpose of drug repurposing in liver fibrosis

Ana Benedicto1,2, Isabel Fuster-Martínez1,4, Aleksandra Gruevska1,2, Eduardo Carbonell1, Alessandra Caligiuri3, Fabio Marra2, Elena Muñoz2, Dimitri Dorcaratto2, Juan V. Esplugues1,2,3, Ana Blas-García1,2,5, Nadezda Apostolova1,2,5. 1Department of Pharmacology, University of Valencia, Valencia, Spain, Spain; 2FISABIO, University Hospital Dr. Peset, Valencia, Spain, Spain; 3Department of Experimental and Clinical Medicine, University of Florence, Florence, Italy; 4Department of Surgery, Liver, Biliary, and Pancreatic Unit, Biomedical Research Institute INCLIVA, Hospital Clinico University of Valencia, Valencia, Spain, Spain; 4Biomedical Research Networking Center in Hepatic and Digestive Diseases (CIBERehd), Valencia, Spain, Spain; 5Department of Physiology, University of Valencia, Valencia, Spain, Spain.

Email: nadezda.apostolova@uv.es

Background and aims: Liver fibrosis, a common denominator in most liver diseases, lacks specific pharmacological treatment. Rilpivirine (RPV), a widely used anti-HIV drug, has shown antifibrotic properties in several murine models of hepatic injury. Specifically, it reduces the activation of hepatic stellate cells (HSCs) and induces cell death in activated HSCs. Nevertheless, the exact mechanisms behind these actions are still unknown.

Method: Primary human HSCs were activated with the profibrogenic cytokine TGF-beta or with PDGF-beta and co-treated with clinically relevant concentrations of RPV for 48h. For RNA sequencing transcriptomic analysis, mRNAs libraries were obtained using total RNA, their size was assessed and sequencing was performed through a single read of 75 bp. After differential gene expression analysis, over-representation analysis was performed using the databases Gene Ontology (GO), KEGG pathways and Reactome. Then, we validated the implication of RPV on PDGF-beta-induced chemotaxis and cell proliferation (transwell chemotraction assay in Boyden chamber and counting the cells with trypan blue). The involvement of several protein kinases downstream of PDGF was analysed by Western Blot.

Results: In the transcriptomic analysis, 2309 genes were differentially expressed by RPV’s treatment. When analyzing the pathways and processes changed, RPV showed several effects in accordance with the previous published studies, including downregulation on collagen biosynthesis and upregulation of apoptosis. Nonetheless, in the comparison of RPV at highest concentration + TGFbeta vs TGFbeta novel pathways were revealed, being the top 5 downregulated reacotne pathways with highest strength of the enrichment: “unwinding of DNA,” Smooth Muscle contraction,” “XBPI (S) activates chaperone genes;” “Signaling by PDGF” and “Collagen biosynthesis and modifying enzymes”; and the top upregulated: “OAS antiviral response,” “keratan sulfate degradation,” “STING mediated induction of host immune responses,” “interferon α/β signaling” and “stabilization of p53.” Similar results were obtained when analysing GO terms. Downregulation of the activated cell migration capacity and the PDGF signaling pathway stood out in the different analysis. These findings were validated in PDGF− treated HSCs in which RPV inhibited both PDGF-beta-induced chemotaxis and cell proliferation. Moreover, RPV downregulated PDGF downstream signaling pathways of AKT and JNK, but not of p38 and ERK1/2.

Conclusion: RPV reduces the PDGF-beta-induced chemotaxis and proliferation of HSCs, which may be relevant for the antifibrotic properties of this drug already shown in mouse models of hepatic fibrosis. These finding might shed more light on the HSCs pathophysiology and give hints for novel pharmacological targets of chronic liver diseases.

WED-240
Is the fibrosis phenotype in pre- and post-menopausal F2/F3 women the same?

Isabel Fernández-Lizaranzu1, Emilio Gomez-Gonzalez1, Helena Pastor2, Rocío Gallego-Durán3, Rocío Montero-Vallejo2, Louis Petitjean1, Mathieu Petitjean2, Manuel Romero Gomez2.

Background: Several studies have reported differences in the fibrosis progression between pre- and post-menopausal women. This is of particular interest given that fibrosis is a common denominator in most liver diseases, and lacks specific pharmacological treatment. Rilpivirine, a widely used anti-HIV drug, has shown antifibrotic properties in several murine models of hepatic injury. Specifically, it reduces the activation of hepatic stellate cells (HSCs) and induces cell death in activated HSCs. Nevertheless, the exact mechanisms behind these actions are still unknown.

Method: Primary human HSCs were activated with the profibrogenic cytokine TGF-beta or with PDGF-beta and co-treated with clinically relevant concentrations of RPV for 48h. For RNA sequencing transcriptomic analysis, mRNAs libraries were obtained using total RNA, their size was assessed and sequencing was performed through a single read of 75 bp. After differential gene expression analysis, over-representation analysis was performed using the databases Gene Ontology (GO), KEGG pathways and Reactome. Then, we validated the implication of RPV on PDGF-beta-induced chemotaxis and cell proliferation (transwell chemotraction assay in Boyden chamber and counting the cells with trypan blue). The involvement of several protein kinases downstream of PDGF was analysed by Western Blot.

Results: In the transcriptomic analysis, 2309 genes were differentially expressed by RPV’s treatment. When analyzing the pathways and processes changed, RPV showed several effects in accordance with the previous published studies, including downregulation on collagen biosynthesis and upregulation of apoptosis. Nonetheless, in the comparison of RPV at highest concentration + TGFbeta vs TGFbeta novel pathways were revealed, being the top 5 downregulated reacotne pathways with highest strength of the enrichment: “unwinding of DNA,” Smooth Muscle contraction,” “XBPI (S) activates chaperone genes;” “Signaling by PDGF” and “Collagen biosynthesis and modifying enzymes”; and the top upregulated: “OAS antiviral response,” “keratan sulfate degradation,” “STING mediated induction of host immune responses,” “interferon α/β signaling” and “stabilization of p53.” Similar results were obtained when analysing GO terms. Downregulation of the activated cell migration capacity and the PDGF signaling pathway stood out in the different analysis. These findings were validated in PDGF− treated HSCs in which RPV inhibited both PDGF-beta-induced chemotaxis and cell proliferation. Moreover, RPV downregulated PDGF downstream signaling pathways of AKT and JNK, but not of p38 and ERK1/2.

Conclusion: RPV reduces the PDGF-beta-induced chemotaxis and proliferation of HSCs, which may be relevant for the antifibrotic properties of this drug already shown in mouse models of hepatic fibrosis. These finding might shed more light on the HSCs pathophysiology and give hints for novel pharmacological targets of chronic liver diseases.
Background and aims: While several teams have hypothesized that the hepatic phenotype of pre- and post-menopausal women should be different, current histological methods (semi-quantitative categorical stages) do not have the analytical sensitivity to address the question. Here we use high-resolution, single-fiber digital pathology quantitative pathology and AI (FibroNestTM) to distinguish different phenotypes of fibrosis between pre- and post-menopausal patients with moderate (F2/F3 stages) fibrosis.

Method: This study was performed on a retrospective cohort of 28 biopsy-proven patients recruited between 2010 and 2018 at seven different Spanish hospitals. The overall cohort consisted of female patients with two different stages of fibrosis, 11 (39%) were F2 and 17 (46%) were F3.

Results: F2 cases had lower Ph-FCS than F3 cases with a significant difference between them independently of the menopause state (Student’s t-Test p = 0.0003) (Figure, A). When F2/F3 cases were compared considering the menopause stage, there was no significant difference between pre-/post-menopause (p = 0.15 for F2 and p = 0.38 for F3) (Figure, B). Yet, we found 55 phenotypes that changed significantly in both cases (pre-/post-menopause), among them perimeter and filled to area ratio of assembled collagen phenotypes. We found 16 phenotypes changed significantly for only post-menopause cases and 75 phenotypes changed significantly only for pre-menopause cases.

Conclusion: Quantitative Digital Pathology analysis, using FibroNestTM, was able to distinguish severity groups in concordance with NASH CRN stages in this limited cohort, as reported elsewhere. In pregnant women, elevated liver enzymes, apoptosis, and decreased liver markers expression and proliferation. Treatment with BMSCs-L-NLC enhanced liver state effectively. It significantly decreased the elevated liver enzymes (bilirubin, ALT, AST, and LDH), apoptosis (measured via p53, Bax, Caspase-3 expression), and immunosuppression of annexin V and increased liver markers (measured via ALB, AFP, and IGF-1), proliferation (measured via Ki-67, PCNA and TOP2A expression), antioxidants and immunoexpression of liver marker ALB. Histopathological studies confirmed the therapeutic effects of BMSCs-L-NLC.
Method: PSC-derived HSCs and LSECs (differentiated from hESC line H1 and iPSC lines WTC-11, WTSi28-A and WTSi1013-A) were cultured in vitro for 14 days post-differentiation. Cell-specific phenotypes were evaluated by cell morphology, immune fluorescence, gene- and protein expression. Functionality was assessed in HSCs by their capacity for intracellular storage of vitamin A and response to pro-fibrotic stimuli induced by TGF-beta 1 and in LSECs by nitric oxide- and factor VIII secretion as well as endocytic uptake of bioparticles and acetylated low density lipoprotein. Notch pathway inhibition by treatment with DAPT and co-culturing HSCs and LSECs were separately tested as options for enhancing long-term stability and maturation of the PSC-derived NPCs.

Results: Both cell types exhibited significant changes in their phenotype and functionality during the long-term culture, acquiring signs of activation and decline in functionality. Notch pathway inhibition modestly improved the stability of both PSC-derived HSCs and LSECs in a cell line-dependent manner. Long-term co-culturing of PSC-derived HSCs and LSECs showed signs of improved HSC function as judged by vitamin A storage and responsiveness to pro-fibrotic stimuli.

Conclusion: PSC-derived HSCs and LSECs show a deteriorating phenotype and functionality during extended post-differentiation culture. Choice of PSC line and a limited experimental timeframe is crucial when designing in vitro platforms involving PSC-derived HSCs and LSECs. While Notch inhibition offers a promising approach to extend post-differentiation monoculture, co-culturing PSC-derived HSCs and LSECs could be used for both prolonged phenotypic and functional stability as well as HSC maturation.

WED-243
3D Extracellular matrix human liver hydrogels for the investigation of genetic variants in hepatic stellate cells
Elisabetta Caan1, Philipp Schwabi1, Luca Frengueli2, Hannah Evans1, Margarita Papatehodori1, Zalike Keskin-Erdogan2, Nicola Mordan1, Jonathan Knowles1, Giuseppe Mazza1, Massimo Pinzani1, Krista Rombouts1, Krista Rombouts1, 1University of London, Royal Free Campus, Dentistry, London, United Kingdom; 2University College of London, Royal Free Campus, Biomaterials and Tissue Engineering Division, Eastman Dental Institute, United Kingdom
Email: elisabetta.caon.17@ucl.ac.uk

Background and aims: Liver fibrosis is a crucial pathophysiological step in chronic liver diseases (CLD). Activated hepatic stellate cells (HSCs) are the key mediators of fibrogenesis and, therefore, research has been focusing on identifying and addressing pro-fibrogenic mechanisms in HSCs for the development of new drug candidates to treat fibrogenic liver diseases. This process has been hampered by the lack of appropriate in vitro models. In addition, only recently attention has been given to the importance of genetic polymorphisms for the onset of CLD, with numerous new variants being discovered, although their molecular role is still largely unclear. In this project, the synergic impact of the PNPLA3 I148M and TM6SF2 E156K SNP variants on the pro-fibrogenic behaviour of HSCs has been investigated, utilizing a newly developed platform of 3D hydrogels obtained from the decellularized extracellular matrix (ECM) of healthy and diseased human livers.

Method: Healthy or cirrhotic decellularized human liver ECM 3D scaffolds were lyophilized and solubilized to yield liver ECM solution. The ECM solution was mixed with a nanocellulose-based gelling agent to form hydrogels for culturing primary human HSCs or mutant for the PNPLA3 I148M and TM6SF2 E156K genetic variants in a 3D setting. Following evaluation of the ECM hydrogels mechanical properties by Dynamic Mechanical Analysis (DMA) and SEM, cell behaviour of HSCs cultured in ECM hydrogels and treated with/without TGFβ1/Endothelin-1 was investigated using various molecular biology techniques.

Results: Hydrogels made with human liver ECM proved to be mechanically stable and with a stiffness comparable to that of healthy human livers. Both healthy and cirrhotic ECM liver hydrogels supported HSC viability and responsiveness to pro-fibrogenic agents such as TGFβ1, with an increase in COL1A1, TIMP1 and TGFβ1 gene expression. Furthermore, HSCs showed similar behaviour when cultured in an established model of 3D ECM scaffolds or ECM hydrogels and featured a less activated phenotype (lower expression of ACTA2, COL1A1, TIMP1 and higher CYGB) compared to 2D plastic culture. HSCs carrying the PNPLA3 I148M and TM6SF2 E156K variants showed an increased basal contraction and activation (increased COL1A1 and TIMP1) compared to WT HSCs. This effect was strongly increased by the presence of cirrhotic ECM.

Conclusion: This study introduces and provides a technical characterization of liver ECM hydrogels as high throughput 3D cell culture models recapitulating the cellular microenvironment of normal or fibrotic human liver, to be employed in unravelling the pro-fibrogenic behaviour of HSCs in presence of different genetic variants and their role in the progression of CLD.

WED-244
Analysis of alpha adrenoblocker as antifibrotic and hepatoprotective agent in a Wistar rat model of cirrhosis
Mariana Yazzmin Medina Pizana1, Maria de Jesus Loera Arias2, Roberto Montes de Oca Luna2, Odila Saucedo Cardenas1, Javier Ventura Juarez2, Martin Muñoz Ortega2, 1Autonomous University of Nuevo Leon, Histology, Monterrey, Mexico; 2Autonomous University of Aguascalientes, Morphology, Aguascalientes, Mexico; 3Autonomous University of Aguascalientes, Chemistry, Aguascalientes, Ags., Mexico
Email: mariana93medina@gmail.com

Background and aims: Liver cirrhosis is a major public health problem and a significant source of morbidity and mortality. Cirrhosis is the histological development of regenerative nodules surrounded by fibrous bands in response to chronic liver injury. In the liver, damage-activated stellate cells or hepatic myofibroblasts play a key role in the initiation and progression of the disease. The liver has a cellular compartment with neuroendocrine characteristics composed of progenitor cells and hepatic stellate cells. There is increasing evidence that the sympathetic and parasympathetic nervous systems influence this cellular compartment. Evaluation of the effects of alpha and beta adrenoblockers on a murine cirrhosis model concludes that the reduction of type I collagen after the treatment is achieved by reducing the profibrotic activities of TGF-β, a decrease in fibrotic tissue and increase of liver function. In this study, we aimed to analyze tamsulosin’s antifibrogenic and hepatoprotective capacity in a Wistar rat model of cirrhosis.

Method: Wistar rats were injected twice per week with thioacetamide to induce liver cirrhosis. Rats were treated with tamsulosin, an alpha adrenoblocker, five times per week, and samples were taken after 4 weeks. The serum was collected and tested for the activity levels of aminotransferases (AST or GOT and ALT or GPT) and alkaline phosphatase (ALP). Collagen deposition was analyzed on Hande, Masson’s trichrome, and Sirius red staining. The expression of molecular markers of collagen deposit and hepatoprotective effect were evaluated by RT-qPCR (collagen I, PPAR γ, α-SMA, Nrf2 and HO-1). To study the interaction between stellate cells and tamsulosin, a stellate cell line (LX2) was co-cultured using viability assays (calcein-AM and SYTOX Green), and oxidative stress was analyzed at 24 h using dihydroethidium (DHE). The activation of HSCs was observed by Oil Red O Staining and the migratory response of HSCs by scrape wound healing assay.

Results: Masson’s trichrome and Sirius red staining showed a significant decrease in collagen deposition with tamsulosin treatment compared to controls. Liver sections of the control group exhibited normal lobular architecture, whereas liver sections of the thioacetamide-intoxicated group exhibited typical architectural...
POSTER PRESENTATIONS

distortions with regenerative nodules surrounded by proliferative connective tissue; co-treatment with tamsulosin improved the architecture of liver parenchyma. Study results indicated that the activity of the aminotransferases (AST and ALT) and ALP increased significantly in thioacetamide-treated rats compared to control animals. However, tamsulosin showed a decrease in activity. Treatment with tamsulosin regulates the oxidative stress through mRNA expression of hepatoprotector markers (Nrf2, PPARγ and HO-1) and decrease the expression of collagen I and α-SMA. Tamsulosin treatment significantly inhibits the LX2 cell proliferation activation and migration (without affecting its viability).

Conclusion: The present study demonstrated that tamsulosin may enhance hepatic efficiency in Wistar rats by a decrease of collagen synthesis and an increase of liver function. Therefore, tamsulosin retards the proliferation, activation, and migration of LX2 cells without inducing cytoxicity and oxidative stress.

WED-245
MicroRNA-29b involves in the progression of NAFLD to liver fibrosis
Qihua Duan1, Qiaozhu Su2. 1Institute for Global Food Security, School of Biological Sciences, Queens University Belfast, Belfast, United Kingdom; 2Institute for Global Food Security, School of Biological Sciences, Queens University Belfast, United Kingdom
Email: q.su@qub.ac.uk

Background and aims: Liver fibrosis, a pathological consequence of multiple injurious insults in liver, is the late stage of Non-alcoholic fatty liver disease (NAFLD) that can lead to liver failure. MicroRNAs (miRNAs) are small non-coding RNAs that can regulate their target mRNAs and impact diverse cellular processes by complementary base-pairing the 3’-UTR of the target mRNAs. miR-29 family has been implicated in the pathogenesis of pulmonary fibrosis and cardiac fibrosis, however, its role in liver fibrosis is unclear. In this study, we investigated the mechanism of miR-29b in the progression of NAFLD to liver fibrosis.

Method: In vivo, a mouse model was established by feeding high-fat diet (HFD) and treating the mice with miR-29 mimics. In vitro, the Murine hepatocytes cell line AML12, and Hepatic stellate cells (HSC) were used treated with inflammatory cytokine TNFα and free fatty acid Palmitic acid (PA), Hedgehog Inhibitors MBD5 and/or miR-29b mimics.

Results: Q-RT-PCR analysis revealed that HFD induced liver injury from NAFLD to liver fibrosis, which was associated with the significant decrease of miR-29b in the liver tissues of the HFD feeding mice. Treated the mice with nanoparticles encapsulated with miR-29b mimics significantly improved liver fibrosis and enhanced insulin sensitivity. In vitro, TNFα or PA treatment inhibited miR-29b in the mouse hepatocytes, AML-12, whereas, incubation with a hedgehog inhibitor MDB5 upregulated miR-29b expression, suggesting the crucial role of miR-29b in Hedgehog pathway and liver fibrosis. Moreover, upregulated cellular miR-29b by transient transfection improved expression of genes involved in mitochondrial energy homeostasis and fatty acid β-oxidation. mRNA levels of PPARα and CPT1α were increased in AML12 cells treated with miR29 mimics (p < 0.001).

Conclusion: Novel findings from demonstrate the essential role of miR-29b in preventing the progression of NAFLD to liver fibrosis.

WED-246
Novel Pathways implicated in the seladelpar-mediated reductions of established liver fibrosis are identified from RNA-SEQ data using plex search and two independent mouse pharmacology datasets
Edward Cable1, Doug Selinger2, Yun-Jung Choi3, Charles McWherter1.
1CymaBay Therapeutics Inc., Newark, United States, 2Plex Research, Inc, Cambridge, United States
Email: ecable@cymabay.com

Background and aims: Seladelpar is a selective peroxisome proliferator delta (PPARD) agonist that reduced established liver fibrosis in the Amlyn-diet NASH and CCl4 chemical injury models. In each model, an induction period for fibrosis is followed by a treatment period during which the fibrotic stimuli is maintained. End points include evaluation of fibrosis and RNA-seq analysis. The aim of our analysis is to uncover novel aspects of seladelpar's anti-fibrotic mechanism using liver RNA-seq datasets from these models together with the Plex AI-analytical platform to search relevant large public data bases. Unlike bioinformatics methods that insinuate biological importance with the magnitude of change, Plex allows the use of an omics data set as a search query in a search engine interface against aggregated data from publicly available databases. The search results can suggest novel associations as hypotheses not evident in bioinformatic evaluation of the original omics data set.

Method: RNA-seq from the livers of mice treated in the Amlyn-diet model (43w induction, 12w Tx; [n = 12 (V), n = 11 (Tx)]) and CCl4 (5w induction, 3w Tx; [n = 20]) were analyzed and the top 100 differentially expressed genes were used as query gene lists in Plex’s search platform (www.plexresearch.com). Liver tissue samples were obtained after sacrifice at 2 (Amlyn diet) and 24 hours (CCl4) post last dose. Plex queries with the RNA-seq data sets identified enrichment of the differentially expressed genes in multiple data domains. Gene family results were obtained by this analysis.

Results: The lipocalin family members (transporters of small hydrophobic molecules) were reduced in both models with amongst the highest observed scores. Lipocalins have not been associated with PPARD but levels are correlated with fibrosis. Decreases in lipocalin-2 have been accompanied by decreased inflammation in disease models. In addition, the clade A serpin protease inhibitors were reduced in both models whereas serpins from clades B-D were minimally changed. The reduction of serpin
protease inhibitors could implicate proteolytic fibrolysis contributing to the decrease in fibrosis. Seladelpar treatment also led to decreases in protein families related to hedgehog signaling, intracellular chloride channels, glutathione reductase transferases, and rhodopsin-like GPCRs, gene families that have been previously associated with fibrosis. Shown in the graph below are the three highest expressing genes in the lipocalin and serpin families.

**Conclusion:** The use of a novel search platform along with transcriptomics data sets produced consistent findings for two different fibrosis models. The results identified several pathways to investigate for their role in the reduction of fibrosis by seladelpar observed in mice. Understanding the roles of these pathways will assist in our understanding of the relevance of mechanisms for human disease.

**WED-247**

**Cathepsin D expressed in hepatocytes does not participate in the development of liver fibrosis after chronic CCl4 administration**

Valeria Pistorio3,4, Susana Núñez 2, M. Carmen Garcia-Ruiz 1,2,5,6, Paloma Ruiz-Blazquez1,2, Maria Fernandez-Fernandez 1,2,5,6, Anna Moles 1,2,5.

**Method:** We generated a novel knock-out mouse strain by breeding Albumin-Cre (hepatocytes) mice with CtsD floxed mice. CtsDΔHep mice was validated by CtsD WB in primary mouse hepatocytes and dual IF (F4/80-CtsD) in liver sections. Fibrosis was established for 8 weeks by CCl4 administration. CtsD deletion in CtsDΔHep livers was confirmed by CtsD IHP and gene expression. CtsD deletion in hepatocytes did not affect liver damaged (ALT) and liver fibrosis as determined by Sirius red staining, α-SMA IHP and hepatic α-SMA, ColIa1 and TGF-β gene expression. Furthermore, liver inflammation was also not significantly affected in CtsDΔHep mice after CCl4 as assessed by NIMP and F4/80 and TNF-α, CCL2 and CCL3 gene expression. In agreement, no significant changes in liver damage, fibrosis and inflammation were observed after 14 days BDL between CtsDΔF and CtsDΔHep mice supporting our results in the CCl4 model.

**Conclusion:** CtsD expressed in hepatocytes does not play an essential role in liver fibrosis development.

**WED-248**

**Myeloperoxidase from neutrophile granulocytes accomplish destruction of Schistosoma mansoni eggs**

Ricarda Sölter1, Verena von Buelow 1, Dorothee Dreizler 1,

**Method:** Male C57BL/6 mice were infected with 100 cercariae of the species *Schistosoma mansoni*. Histologic grading, myeloperoxidase activity assay, WB, IF and RTPCR. Fibrosis was analyzed by Sirius Red staining, liver hydroxyproline, α-SMA IHP and α-SMA, ColIa1 and TGF-β RTPCR. Liver inflammation was determined by NIMP and F4/80 IHP and TNF-α, CCL3 and CCL4 RTPCR.

**Results:** CtsD cell-specific deletion in hepatocytes was validated by CtsD WB in primary mouse hepatocytes and dual IF (F4/80-CtsD) in liver section from CtsDF/F and CtsDΔHep mice. Of note, CtsD expression remained unaffected in liver non-parenchymal cells. Next, fibrosis was established for 8 weeks by CCl4 administration. CtsD deletion in CtsDΔHep livers was confirmed by CtsD IHP and gene expression. CtsD deletion in hepatocytes did not affect liver damaged (ALT) and liver fibrosis as determined by Sirius red staining, α-SMA IHP and hepatic α-SMA, ColIa1 and TGF-β gene expression. Furthermore, liver inflammation was also not significantly affected in CtsDΔHep mice after CCl4 as assessed by NIMP and F4/80 IHP and TNF-α, CCL2 and CCL3 gene expression. In agreement, no significant changes in liver damage, fibrosis and inflammation were observed after 14 days BDL between CtsDΔF and CtsDΔHep mice supporting our results in the CCl4 model.

**Conclusion:** CtsD expressed in hepatocytes does not play an essential role in liver fibrosis development.
in vitro cultivation of S. mansoni eggs with MPO significantly reduced their viability compared to the control eggs cultivated with heat-inactivated MPO.

Conclusion: Our results suggest that neutrophil granulocyte derived MPO is able to devitalize and to remove S. mansoni eggs from mouse liver in vivo and in vitro.

WED-249
Identification of pseudo-immune tolerance for chronic hepatitis B patients: development and validation of a non-invasive prediction model
Shuo Li1,2, Zhiguo Li3, Xiaoke Li1,2, Xiaobin Zao1,2, Yufeng Xing4, Yong’an Ye1,2, 1Dongzhimen Hospital, Beijing University of Chinese Medicine, China; 2Institute of Liver Diseases, Beijing University of Chinese Medicine, China; 3Beijing Fengtai Hospital of Integrated Traditional and Western Medicine, China; 4Shenzhen Traditional Chinese Medicine Hospital, China
Email: yeongan@vip.163.com

Background and aims: Patients with chronic hepatitis B (CHB) in the immune tolerant (IT) phase were thought to have no or slight inflammation or fibrosis in the liver. Indeed, some patients with normal ALT levels still experience liver fibrosis. This study aimed to develop and validate a non-invasive model for identifying pseudo-immune tolerance of CHB by predicting significant liver fibrosis.

Method: This multi-center study enrolled a total of 445 IT-phase patients who had undergone liver biopsy for the training cohort (n = 289) and validation cohort (n = 156) during different time periods. A risk model (IT-3) for predicting significant liver fibrosis (Ishak fibrosis score ≥3) was developed using high-risk indicators that were identified using multivariate stepwise logistic regression. Next, an online dynamic nomogram was created for the clinical usage. The receiver operating characteristic (ROC) curve and the area under the ROC curve (AUC) were used to assess the discrimination of the model. Calibration curves were used to evaluate the models’ calibration. The clinical practicability of the model was evaluated using decision curve analysis and clinical impact curves.

Results: Aspartate aminotransferase (AST), hepatitis B e-antigen (HBeAg) and platelet (PLT) were included in the IT-3 model. The IT-3 model showed good calibration and discrimination both in the training and validation cohorts (AUC = 0.888 and 0.833, respectively). At a cut-off value of 106 points, the sensitivity and specificity were 91.7% and 70.2%, respectively. The decision curve analysis and clinical impact curves indicated that the IT-3 model had good clinical application.

Conclusion: The IT-3 model proved an accurate non-invasive method in predicting significant liver fibrosis for CHB patients with pseudo-immune tolerance, which can help to formulate more appropriate treatment strategies.

WED-250
The anti-fibrotic efficacy of Adelmidrol depends on the level of hepatic PPAR γa
Huanyu Xiang1, Jing Xiao1, Zilin Sun1, Zongyang Liu1, Junhao Zhang1, Hongyan Xiang1, Hong Ren1, Peng Hu1, Ming-Li Peng1, 1The Second Affiliated Hospital, Chongqing Medical University, Key Laboratory of Molecular Biology for Infectious Diseases (Ministry of Education), Institute for Viral Hepatitis, Department of Infectious Diseases, Chongqing, China
Email: peng_mingli@hospital.cqmu.edu.cn

Background and aims: Effective anti-inflammatory therapy is beneficial to delay the progression of liver fibrosis. Adelmidrol, a potent anti-inflammatory small-molecule compound, has been reported to treat inflammatory diseases like arthritis and colitis. The study is aimed to investigate the effect of adelmidrol on hepatic fibrosis.

Method: Experimental liver fibrosis was induced by chronic CCL4 exposure or choline-deficient, L-amino acid-defined, high-fat diet (CDAA-HFD). Histopathological signs and serum markers were used to evaluate the pharmacological activity of adelmidrol.

Results: Firstly, adelmidrol had different anti-fibrotic effects in these two liver fibrotic models. In the CCL4 model, serology and liver pathology showed adelmidrol significantly improved liver injury and fibrosis by significantly reducing ALT, AST, and the deposition of extracellular matrix. While adelmidrol exhibited limited anti-fibrotic effect in CDAA-HFD-induced fibrosis, instead, aggravated the hepatic steatosis and TG content. Secondly, the inconsistencies of expression trend in liver PPARγa were observed in both models. The CCL4 injury led to the continuous decrease of hepatic PPARγa levels, and the CDAA-HFD diet induced the increased PPARγa level. Long-time adelmidrol administration significantly increased hepatic PPARγa levels of both models. Interestingly, GW9662 (a specific PPARγa antagonist) pretreatment prevented the up-regulation of PPARγa induced by adelmidrol in both models, which counteracted the anti-fibrotic effect of adelmidrol in the CCL4 model, and reversed the aggravating steatosis effect of adelmidrol in the CDAA-HFD model. Thirdly, liver RNA-Seq analysis and immunohistochemistry demonstrated adelmidrol markedly inhibited the activation of hepatic macrophages and stellate cells (HSCs) in the CCL4 model, and vitro and vivo experiments confirmed adelmidrol aggravated steatosis in hepatocytes by activating the PPARγ/CD36 pathway in the CDAA-HFD model.

Conclusion: Adelmidrol significantly up-regulates the level of PPARγa in liver tissue, which is mainly expressed in hepatocytes, macrophages, and HSCs. The anti-fibrotic effect of adelmidrol finally depends on the synergistic interactions among hepatocytes,
patients with high HBV DNA and normal ALT levels

↓

liver biopsy

significant fibrosis (pseudo-immune tolerance)

no or minimal fibrosis

↓

develop and validate a non-invasive model

discrimination  calibration  decision curve analysis  clinical impact curve

Liver fibrosis induced by CCl4 injection

NASH related fibrosis induced by CDAA-HFD

Characterized by insufficient agonism of PPARy

Characterized by excessive agonism of PPARy

Figure: (abstract: WED-249).

Figure: (abstract: WED-250).
macrophages, and HSCs in different pathological states. For liver injury characterized by insufficient agonism of PPARγ, ademindol tends to inhibit macrophage and HSCs activation to improve fibrosis. Conversely, it may aggravate steatosis.

**Gut microbiota and liver disease Liver-organ crosstalk**

**WEDNESDAY 21 TO SATURDAY 24 JUNE**

**TOP-038**

Gut viral and bacterial alterations modulate the presence and dynamics of minimal hepatic encephalopathy at baseline and longitudinally

Thananya Jinato¹, Andrew Fagan², Masoumeh Sikaroodi¹, Patrick Gillevet¹, Jasmohan S. Bajaj².¹ George Mason University, United States; ²Virginia Commonwealth University, United States

Email: jasmohan.bajaj@vcuhealth.org

**Background and aims:** Minimal hepatic encephalopathy (MHE) is associated with an altered gut-brain axis. However, most recent data are focused on bacteria but viruses, especially phages could affect brain dysfunction in cirrhosis. Aim: Determine linkage of cognitive function with MHE and bacteria and viruses cross-sectionally and longitudinally.

**Method:** Outpts with cirrhosis underwent cognitive testing using psychometric hepatic encephalopathy score (PHEs) to diagnose MHE using local norms cross-sectionally. A subset was followed over time and MHE dynamics were determined over time. Stool was collected for metagenomics at all time points. Bacteria and viruses were evaluated and linked with MHE/no at baseline and over time using DESeq2. Correlation networks between cognitive testing, viruses and evaluated and linked with MHE/no at baseline and over time using DESeq2. Correlation networks between cognitive testing, viruses and bacteria were created and compared using R.

**Results:** Clinical: Cross-sectional: 138 cirrhosis pts; 46% MHE, 52% prior HE, (50 HCV, 49 alcohol, 23 both and rest NAFLD). MHE pts were older (62 vs 58, p = 0.04) but had similar prior HE (51 vs 53%) and MELD (10.7 vs 10.9) as no-MHE pts. PPI (40 vs 40), lactulose (40 vs 31) and rifaximin use (27 vs 24) were similar between groups. **Longitudinal:** 36 pts were followed for 9 ± 4 mths, when testing was repeated. 23 had MHE at baseline. Over time, MHE status changed in 9 pts; 5 pts developed new MHE and 4 resolved their MHE. Rest were stable from an MHE perspective. α-diversity: Cross-sectional: Shannon index for bacteria (2.6 ± 0.5 vs 2.5 ± 0.8) and viruses (1.2 ± 0.6 vs 1.3 ± 0.6, p = 0.8) was similar in MHE vs no-MHE. Cha01 for bacteria was similar (79.4 ± 20.0 vs 82.8 ± 20.1, p = 0.4) but higher in MHE vs no-MHE for viruses (19.6 ± 8.9 vs 14.5 ± 9.6, p = 0.03). **Longitudinal:** Shannon for resolved (2.6 ± 0.6 vs 2.8 ± 0.3 developed MHE, p = 0.9) for bacteria and viruses (1.4 ± 0.8 vs 1.1 ± 0.7 developed, p = 0.5). Cha01 for resolved (86.6 ± 21.8 vs 88.2 ± 17.9 developed MHE, p = 0.9) for bacteria and viruses (20.6 ± 12.8 vs 14.6 ± 12.2 developed, p = 0.3). Individual taxa: Cross-sectional: No-MHE had higher commensals (Lachnospiraceae, Ruminococcus, Anaerostipes and Eubacterium spp) while potential pathobionts (Escherichia, Klebsiella) and lactate producers (Streptococcus and Lactobacillus spp) were higher in MHE pts (FigA). CrAssphage and Siphoviridae were lower and Streptococcus Javan and Azobacteroides phage were higher in MHE pts, Longitudinal: Commensals were ↑ in resolved MHE (Ruminococcaceae and Lachospiraceae spp) while pathobionts were ↑ in MHE developers (Enterococcus, Enterobacteraceae spp). Bacteroides phage were lower and Lactobacillus phage LfeSau and Phage-DP 2017a was higher in those whose MHE resolved vs those who developed it (FigB). Correlation network characteristics: MHE pts had ↑ network heterogeneity (1.08 vs 0.94) and centralization (0.20 vs 0.13) than no-MHE pts. Resolved MHE pts had ↑ network heterogeneity (0.65 vs 0.53) and centralization (0.29 vs 0.18) than those who developed MHE.

**Conclusion:** In addition to bacteria, changes in viruses such as phages linked with Streptococcus and Lactobacillus are associated with MHE at baseline and in those followed over time for MHE resolution and those who developed new-onset MHE. Viral-bacterial correlation characteristics with cognitive function are also different between MHE and no-MHE and change over time. Viral and bacterial interactions are important to study in the modulation of brain function in cirrhosis.

**TOP-039**

Tissue resident NK NTCP-transplanted to immunosuppressed mice exhibiting liver fibrosis and fed with high fat diet (HFD) alleviate intestinal fibrosis

Johnny Amer, Ahmad Salhab, Rifaat Safadi. Hadassah Hebrew University Hospital, Liver Institute, Jerusalem, Israel

Email: johnnyamer@hotmail.com

**Background and aims:** NOD-scid IL2rγnull (NSG) mouse is one of the most widely used immunosuppressed mouse strains. We adapted this model as it exhibits absent T, B, and NK cells and allowed us to study the effects of transplanted NK cells expressing or not expressing the sodium taurocholate co-transporting polypeptide (NTCP); a transmembrane protein highly expressed in human hepatocytes that mediates the transport of bile acids.

---

**Figure:** (abstract: TOP-038).
Method: Tissue resident (tr) NK cells obtained from livers of naïve C. B–17 scid (having NK cells while lacking T and B cells) were sorted according to NTCP expressions and transplanted to the CCL−4-induced liver fibrosis immunosuppressed mice fed with HFD. Inflammatory (HandE staining, and pro-inflammatory panel of cytokines), fibrosis (Sirius red staining, a-smooth muscle actin, collagen, and fibronectin) and metabolic (BAs, cholesterol, triglyceride, glucose tolerance test (GTT) and fasting blood sugar (FBS)) profiles were assessed.

Results: Our data showing trNK NTCP− displaying higher expressions of exhaustion markers of PD-1, TIGIT and LAG-3 as compared to their trNK NTCP+ counterparts. Moreover, these populations showed a reduction in their activation markers profile of NKP46, NKP30 and CD107a expressions. HandE staining from non-treated mice (NT) intestines showed swelled cells with large necrotic areas of high infiltrating inflammatory cells with steatosis while mice transplanted with trNK NTCP+ showed a delayed in these histological findings with a significant reduction in micro- and macrovascular steatosis. Sirius Red staining in NT demonstrated increased collagen deposition in perisinusoidal areas; transplantation with trNK NTCP+ resulted in a remarkable reduction in the fibrous dense tissue of the stained area and significant reductions in aSMA and Coll III in the trNK NTCP− transplanted mice (1.8-fold and 3.1-fold, respectively; p < 0.0002) as compared to NT mice. These results were associated with reductions in pro-inflammatory (TNF-α, IL-1β, IL-6 and IL-10) and pro-fibrotic (IL-4 and MCP-1) cytokines and amelioration lipid profile in the mice group receiving the trNK NTCP+ while further significant reductions were obtained following the trNK NTCP− transplantsations (p < 0.05). Moreover, IL-2 and INF-γ showed substantial increase in the mice receiving the trNK NTCP− cells.

Conclusion: Our data clearly indicate effects of transplanted trNK NTCP− in intestinal fibrosis amelioration and improving intestine histology of inflammation and fibrosis sections.

THURSDAY 22 JUNE

THU-225

Impact of human gut microbiota from PSC patients on a mouse model of biliary disease

Petra Hradicka1,2,3, Henrik Rasmussen3,4, Georg Schnidtiz1,2,3, Kristian Holm1,2,3, Iargen Bjørnholm1,2,3, Espen Melum1,2,3,6,7, Johannes R. Hov1,2,3,6, 1Oslo University Hospital, Rikshospitalet, Norwegian PSC Research Centre, Oslo, Norway; 2Oslo University Hospital, Rikshospitalet, Research Institute of Internal Medicine, Oslo, Norway; 3University of Oslo, Institute of Clinical Medicine, Faculty of Medicine, Oslo, Norway; 4Oslo University Hospital, Rikshospitalet, Department of comparative medicine, Oslo, Norway; 5Oslo University Hospital, Rikshospitalet, Department of microbiology, Oslo, Norway; 6Oslo University Hospital, Rikshospitalet, Department of transplantation medicine, Oslo, Norway; 7University of Oslo, Hybrid Technology Hub-Centre of excellence, Faculty of medicine, Oslo, Norway.

Email: petra.hradicka@medisin.uio.no

Background and aims: The gut microbiota composition differs between primary sclerosing cholangitis (PSC) and healthy controls (HC). Transfer of PSC microbiota to mice with biliary disease has previously been reported to cause more severe disease with TH2 activation, associated with bacterial translocation of Klebsiella pneumoniae, Enterococcus gallinarum and Proteus mirabilis. In the present study, we further investigated the direct role of PSC microbiota in a gnotobiotic mouse model.

Method: Stool samples from HC (n = 4) and PSC patients (n = 3) were collected into a sterile pot containing an anaerobic generator. Fecal microbiota transplant (FMT) was prepared anaerobically and stored in 10% glycerol solution at −80°C. Germ-free 8-week old gender matched C57BL/6j mice were kept in individually ventilated cages and divided into 2 groups: HC-microbiota group colonized by FMT from HC (n = 10) and PSC-microbiota group colonized by FMT from PSC patients (n = 11). Mice were colonized for 3 weeks, after which cholestasis disease was induced in all animals by feeding 0.1% 3,5-diethoxy carbonyl-1,4-dihydrocollidine (DDC)-enriched diet for 2 weeks. Animals were then sacrificed and samples for plasma biochemistry, cytokine tissue analysis and microbiota profiling by 16s rRNA sequencing were collected. Mesenteric lymph nodes were cultured.

Results: PSC-microbiota mice had an increased inflammatory response, e.g., increased levels of TNF-alpha and IL-17 in liver tissue (p < 0.05) accompanied by increased relative liver weight (p < 0.01), suggesting disease worsening. There were no significant differences in plasma enzyme liver enzymes between the experimental groups. Mesenteric lymph node cultures were mainly positive for Escherichia coli and E. faecalis, which were found in both groups. Microbiota profiling of mucosa and fecal/cecal material showed distinct clustering of the experimental groups, using both unweighted UniFrac and Jaccard distance analysis (p < 0.01, p < 0.001, respectively). Differential abundance testing identified several altered genera, including significant decreases in Akkermansia and Anaerostipes in the PSC-microbiota group, which are observed to be depleted in PSC and ulcerative colitis (Figure).

Figure: Differential abundance test showing log fold change (LogFC) in bacterial genera significantly decreased in PSC-microbiota group in various sample types. p values are displayed for each sample type.

Conclusion: We demonstrated an association between PSC microbiota and increased liver inflammation in the gnotobiotic DDC model. In addition, differences in microbiota composition in PSC and HC colonized mice were observed, while microbial translocation was common irrespective of microbiota source. Further experiments are necessary to verify the effect on disease severity and whether these can be linked to bacterial translocation or other mechanisms.

THU-227

Pasteurized Akkermansia muciniphila inhibits fibrosis progression in mouse cirrhosis model and induces changes in the gut microbiome

Sung-Min Won1, Jin-Ju Jeong1, Satya Priya Sharma1, Raja Ganesan1, Haripriya Gupta1, Mi Ran Choi1, Ki Kwang Oh1, Young Lim Ham2, Ki Tae Suk1, 1Institute for Liver and Digestive Diseases, Rep. of South Korea; 2Daewon Univ Coll, Dept Nursing, Rep. of South Korea.

Email: ktsuk@hallym.ac.kr

S343 Journal of Hepatology 2023 vol. 78(S1) | S100–S1212

POSTER PRESENTATIONS
Background and aims: Cirrhosis is the final stage of chronic liver disease, and the gut microbiome acts as one of the key factors in the development and progression of disease. There is evidence that some probiotic microorganisms contribute to the recovery of gut dysbiosis in patients with cirrhosis and help treatment of complications due to cirrhosis. We identified the specific relative abundance of Akkermansia muciniphila in the gut microbiome of patients with cirrhosis and evaluated the molecular mechanisms and effects of live or pasteurized Akkermansia muciniphila on the gut microbiome in a mouse model of liver cirrhosis.

Method: 57 healthy controls and 93 cirrhotic patients were enrolled for microbiome analysis. Six-week-old male C57BL/6J mice were divided into 4 groups (n = 5/group; control, 3,5-Diethoxycarbonyl-1,4-Dihydrocollidine diet-fed [DDC, 0.05%], and 2 DDC diet-fed + Akkermansia muciniphila [10^9 CFU/200 μl for 8 weeks; live Akkermansia muciniphila, pasteurized A. muciniphila]). The gut microbiome of mice was initialized by administering antibiotics cocktail (ampicillin [100 mg/kg], vancomycin [50 mg/kg], metronidazole [100 mg/kg], neomycin [100 mg/kg], amphotericin B [1 mg/kg]) before strain treatment. The weight, pathology, molecular analysis, and microbiome analysis were examined.

Results: The significant relative abundance differences of akkermansia muciniphila in the gut microbiome of healthy and cirrhosis patients was identified. In a cirrhosis model in which liver damage with fibrosis was induced over 8 weeks by feeding mice DDC diet, supplementation with akkermansia muciniphila inhibited disease progression. In particular, supplementation with pasteurized A. muciniphila effectively ameliorated the decrease in tumor necrosis factor-alpha and liver fibrosis markers more effectively than supplementation with live strains. In gut microbiome analysis, shifts in alpha and beta diversity and microbial composition were observed in pasteurized A. muciniphila group compared to live A. muciniphila group.

Conclusion: The significant relative abundance differences of akkermansia muciniphila in the gut microbiome of healthy and cirrhosis patients was identified. In a cirrhosis model in which liver damage with fibrosis was induced over 8 weeks by feeding mice DDC diet, supplementation with akkermansia muciniphila inhibited disease progression. In particular, supplementation with pasteurized A. muciniphila effectively ameliorated the decrease in tumor necrosis factor-alpha and liver fibrosis markers more effectively than supplementation with live strains. In gut microbiome analysis, shifts in alpha and beta diversity and microbial composition were observed in pasteurized A. muciniphila group compared to live A. muciniphila group.

THU-228 Investigating the correlation of a poly-metabolic risk score to clinical features in non-alcoholic fatty liver disease patients throughout a faecal microbiota transplant clinical trial

Nadeen Habboub1, Benjamin H. Mullish1, Celia Moore1, Maria Lanoria1, Benjamin Challis2, Roberta Forlano1, Mark Thursz1, Marc-Emmanuel Dumas1,3, Pinelopi Manousou1,1 Imperial College

Figure: (abstract: THU-227).
Background and aims: Gut microbiota changes contribute to the pathogenesis and progression of non-alcoholic fatty liver disease (NAFLD) by increasing intestinal permeability and facilitating the translocation of gut microbiome-modulated metabolites and bacterial products to the liver. Faecal microbiota transplant (FMT) may restore pre-morbid microbiome-metabolome interactions and mitigate NAFLD. We aimed to develop a plasma metabolite scoring model that distinguished NAFLD from healthy patients, and which allowed longitudinal tracking of the impact of FMT upon NAFLD patients’ metabolism in a clinical study. Furthermore, we aimed to examine whether this ‘polymetabolic risk score (PRS)’ correlates with clinical parameters of the NAFLD/NASH FMT recipients throughout the clinical trial.

Method: Untargeted 1H-NMR spectroscopy was used to obtain metabolic profiles of plasma samples from biopsy-proven NASH patients (n = 54) and NAFLD patients (n = 213) recruited from the specialist NAFLD clinic, St Mary’s Hospital (London, UK) and healthy controls (n = 534), selected from the AIRWAVE population study, to build a polymetabolic scoring model by OPLS-DA multivariate analysis (0 = Healthy, 1 = NAFLD/NASH). Plasma samples from NAFLD patients (n = 13) were collected serially (approximately fortnightly, week 0–24) throughout an ongoing longitudinal trial in which they received up to three healthy donor capsulised FMT. Fasted plasma samples from the trial’s FMT recipients collected thus far (n = 82) were examined by 1H-NMR spectroscopy and scored based on their full metabolic profiles. The NAFLD FMT recipients calculated polymetabolic risk scores were compared to their clinical features at each timepoint of the trial using Spearman correlation; p values were adjusted using the Benjamini-Hochberg method.

Results: Triglycerides (p = 4.2E-9), HOMA-IR (p = 0.001), ALT (p = 0.008), waist-hip ratio (p = 0.009), glucose (p = 0.015), AST (p = 0.025), cholesterol (p = 0.026) and ALP (p = 0.026) showed significant positive correlations to the PRS towards the NAFLD phenotype, while WBC (p = 4.14E-5), HDL (p = 0.015), and unexpectedly, BMI (p = 0.006) showed significant negative correlations to the PRS. In contrast, weight (p = 0.306), insulin (p = 0.103), creatinine (p = 0.115), albumin (p = 0.366), bilirubin (p = 0.366), LDL (p = 0.366), GGTL (p = 0.398), C-reactive Protein (p = 0.572) and HbA1c (p = 0.672) did not exhibit correlation with the PRS thus far throughout the trial.

Conclusion: We have demonstrated that the pre-calculated 1H-NMR plasma PRS developed for predicting the NAFLD phenotype strongly correlates to routinely-measured hepatic enzymes and common clinical markers of dysmetabolism measured longitudinally throughout the trial. This gives further insight into the potential contribution of the gut microbiome to metabolic perturbations in NAFLD. This also shows potential for a multi-profile risk assessment based on clinical parameters and the plasma 1H-NMR PRS.

THU-229
Identifying the role of gut-vascular barrier associated macrophages in liver cirrhosis
Lena Smet1, Maria Viola1, Hannelie Korf1, Frederik Nevens2, Guy Boeckxstaens1, Schalk van der Merwe1,2. 1KULeuven, CHROMETA, Belgium; 2UZ Leuven, Belgium
Email: lena.smet@kuleuven.be

Background and aims: During cirrhosis where progressive liver dysfunction prevails, there is a simultaneous breach in intestinal barrier integrity. Failure of either the intestinal epithelial- and/or gut-vascular barrier (CVB) allows pathological bacterial translocation to the circulation and liver, driving a gut-liver crosstalk that perpetuates systemic inflammation and hepatic injury. The mechanisms for intestinal barrier failure during cirrhosis remain incompletely understood. In this project, we investigated the importance of...
specialized macrophages in maintaining vascular barrier integrity and consequently in protecting the host against pathological bacterial translocation during the development of experimental cirrhosis.

**Method:** Liver cirrhosis was induced in genetically modified mice by subcutaneous injection of CCl₄ for 20 weeks. Bacterial translocation was evaluated in ileal loop experiments by injecting fluorescent E. coli bioparticles into closed-off ileal loops of animals with progressive cirrhosis, followed by the microscopic fluorescence quantification in the liver. We performed single-cell transcriptomics of the lamina propria macrophage population from cirrhotic and control animals.

**Results:** Exposing Cx3cr1CreERT2.Rosa26-LSL-YFP mice (a state-of-the-art tool to identify intestinal long-lived GVB-associated macrophages) to CCl₄, resulted in a decrease and/or possible dysfunction of YFP⁺ cells lining the vasculature. The loss or dysfunction of YFP⁺ macrophages coincided with the breach in intestinal barrier integrity and bacterial translocation to the cirrhotic liver. In addition, we established a causal link between the absence of GVB-associated macrophages and the breach of GVB integrity. Hereto, we used tamoxifen injected Cx3cr1CreERT2.Rosa26-iDTR mice to allow the specific depletion of long-lived macrophages by the injection of diphtheria toxin. Following depletion of these macrophages, bacterial translocation to the circulation was evaluated using ileal loop experiments. The data revealed that even at early disease time points (with intact barrier integrity), elevated fluorescein signal in the liver sections of long-lived macrophage-depleted mice could be detected, pointing towards an accelerated vascular barrier breach. Currently, we are mapping the single cell transcriptomes of these long-lived GVB-associated macrophages along with all other lamina propria myeloid cells in experimentally induced cirrhosis versus control animals, to pinpoint the reason for their defective functionality in supporting vascular barrier integrity.

**Conclusion:** We provide novel insights into the role of long-lived GVB-associated macrophages in supporting intestinal barrier integrity and in bacterial translocation in an experimental model of liver cirrhosis.

**THU-230**

**THU-230**

**Altered gut microbiome and stool bile acids in sarcopenia in cirrhosis**

Benard Aliwa1,2, Angela Horvath3,4, Nicole Feldbacher3,4, Julia Traub5, Günter Fauler6, Vanessa Stadlbauer3,4, 1Medical University of Graz, Gastroenterology and Hepatology, Graz, Austria; 2University of Nairobi, Food Science, Nutrition and Technology, Kenya; 3Medical University of Graz, Gastroenterology and Hepatology, Graz, Austria; 4Centre of Biomarker Research in Medicine (CBmed), Austria; 5University Hospital Graz, Clinical Medical Nutrition, Austria; 6Medical University of Graz, Austria; Email: benard.aliwa@medunigraz.at

**Background and aims:** Sarcopenia in cirrhosis is associated with low quality of life and high mortality risk. The pathogenesis is not fully understood yet. We previously showed that secondary bile acids (sec-BAs) such as deoxycholic acid (DCA) and lithocholic acid (LCA) were significantly elevated in serum samples of cirrhotic patients with sarcopenia compared to cirrhotic patients without sarcopenia. Since sec-BAs are produced by the gut microbiome, we hypothesize that stool BAs composition differs between cirrhotic patients with and without sarcopenia and is related to stool microbiome composition and abundance of genes involved in BAs transformation.

**Method:** Sarcopenia was diagnosed according to the European working group on sarcopenia in older people. Fecal BAs composition was determined by ultra-high-performance liquid chromatography-tandem mass spectrometry (UPLC-MS/MS) in cirrhotic patients with (n = 78) and without (n = 38) sarcopenia. Microbiome composition was analyzed by 16s rDNA sequencing and stool BAs gene abundances were analyzed by qPCR.

**Results:** We observed that cholic acid (CA) and cholic acid to chenodeoxycholic acid (CA: CDCA) were significantly reduced in the stool of cirrhotic patients with sarcopenia compared to cirrhotic patients without sarcopenia (p = 0.02 and p = 0.03, respectively). Compared to cirrhotic patients without sarcopenia, the ratios of deoxycholic acid to cholic acid (DCA: CA) and lithocholic acid to chenodeoxycholic acid (LCA: CDCA) were significantly elevated in the stool of cirrhotic patients with sarcopenia (p = 0.014 and p = 0.042, respectively) indicating an enhanced transformation of primary to secondary bile acids by the gut microbiome. Furthermore, bacterial species linked to sarcopenia in cirrhosis (Bacteroides fragilis, Blautia marseill, and Sutterella spp) clustered together and correlated positively with DCA: CA and LCA: CDCA indicating that Bacteroides fragilis, Blautia marseill, and Sutterella spp may individually or collectively enhance the transformation of primary to secondary BAs. Despite alterations in BAs composition in stool, the gene abundances of bile salt hydrolase (BSH) and 7 alpha-dehydroxylase (7 alpha-HSDH) were comparable between cirrhotic patients with and without sarcopenia.

**Conclusion:** Changes in BAs composition occur in sarcopenic cirrhotic and are linked to compositional changes in the gut microbiome; however, we observed no difference in BAs transforming genes between sarcopenic and non-sarcopenic microbiomes in cirrhosis. Thus, the study demonstrated a potential functional gut microbiome-host interaction linking sarcopenia with the changes in the gut microbiome and stool BAs profiles pointing towards a potential mechanistic interplay in understanding sarcopenia pathogenesis.

**THU-231**

**THU-231**

**The gut (and its microbiota)-liver axis in liver disease associated with alpha-1-antitrypsin deficiency**

Francesco Annunziata, Nunzia Pastore. Telethon Institute of Genetics and Medicine, Pozzoli, Italy. Email: f.anunniata@tigem.it

**Background and aims:** Alpha-1-Antitrypsin Deficiency (AATD) is an inherited genetic disorder caused by mutations in the SERPINA1 gene. The most common variant is the Z allele (ATZ), which leads to improper protein folding causing retention of the polymeric ATZ protein in the hepatocytes inducing a cascade of hepatotoxic events resulting in chronic liver inflammation, fibrosis, cirrhosis and increased risk of hepatocellular carcinoma (HCC). Despite the common genetic mutation, patients suffer from different onset and severity of the liver disease; of note, most of the patients with the homozygous ATZ mutation will never develop any liver disease. The reason for this phenotypic variability is unknown. Several studies have been carried out to investigate the involvement of genetic and environmental modifiers and their influence on the expression and severity of the liver disease among patients. The aim of our study is to investigate the gut-liver axis in AATD, focusing in particular on the gut functionality and the possible connection between AATD-associated liver disease and the gut microbiota as modulator of the liver phenotype.

**Method:** Methods for the characterization of the gut and its functionality: Bulk- and single cell-(sc)RNA sequencing, Immunohists and Immunostainings,Organoid forming assays. Methods for the analysis of the intestinal microbiota composition: Metagenomic sequencing.

**Results:** PiZ mice (an AATD mouse model) show a reduction in body weight compared to age-matched controls. We hypothesized defects in gut functionality and nutrient absorption. Interestingly, we found high ATZ mRNA and protein levels in the intestine of PiZ mice, particularly in the ileum, the region where the majority of microbes resides. Single cells RNA (scRNA)-sequencing analysis revealed that ATZ mRNA is expressed in all the intestinal cell types. We confirmed this data by co-immunostaining for human ATZ and cell-specific markers. Of note, we found ATZ polymers in Goblet, Enteroendocrine and Paneth cells, responsible for the secretion of the gut protective mucus layer, of hormones reflecting dietary intake, of factors necessary for stem cell function, and molecules with antimicrobial...
properties. In addition, we observed differences between WT and PiZ intestinal crypts-derived organoids, with the latter showing impaired differentiation, likely due to accumulation of the toxic polymeric ATZ. Lastly, from metagenomic analyses we observed that WT and PiZ mice have a well distinguished intestinal microbiota composition with many bacterial strains up-regulated in PiZ mice demonstrated to be increased in many liver diseases.

Figure:

**Conclusion:** Our preliminary data suggest that ATZ expression and accumulation in intestinal cells may affect the gut and its microbiota, thus affecting the continuous bidirectional crosstalk between gut and liver and being a candidate for the different onset and severity of liver disease in AATD.

**THU-232**

**Intestinal dysbiosis exacerbates gut barrier dysfunction via inhibiting FXR-FGF15 in intra-abdominal sepsis**

Shuwen Qian1, Xiaomei Wang2, Qiaohao Hou2, Zehua Su3, Haobing Shi2, Lijun Liao2, Xiangrui Wang3, 1Yangpu Central Hospital affiliated to Tongji University, Shanghai, China; 2Shanghai East Hospital, School of Medicine, Tong ji University, Shanghai, China; 3Shanghai East Hospital, School of Medicine, Tong ji University, China

Email: Shuwen_Qian@tongji.edu.cn

**Background and aims:** Intestinal barrier dysfunction due to intestinal dysbiosis is considered a major cause of initiation and development of intra-abdominal sepsis and multiple organ dysfunction. Farnesoid X receptor (FXR) plays an important role in enteroprotection, but the exact mechanism is still unclear. This study was to determine whether intestinal dysbiosis aggravate intestinal barrier impairment by inhibiting FXR-FGF15 in intra-abdominal and its probable mechanism.

**Method:** Caecal ligation and puncture (CLP) and fecal microbiota transplanted (FMT) from septic mice constructed a model of intestinal flora dysbiosis, intestinal FXR and FGF15 expressions and the gut barrier function were examined and compared. INT-747, an agonist of FXR, was assessed whether improve the phenotype of CLP mice or gut barrier. The relevance of intestinal epithelial cell-sepecific deletion of Myd88 (Myd88ΔEC) on FXR-FGF15 axis as well as microbiota and barrier were studied. The role of probiotics on FXR was also discussed. Intestinal flora was analyzed by 16S rRNA metagenomic sequence.

**Results:** In intra-abdominal sepsis model, FXR and FGF15 in ileum displayed significantly decreased, along with cholestasis, impairment barrier function and flora dysbiosis. Upregulation of FXR by INT-747 and significantly improved survival, barrier function and other phenotypes in septic mice. In FMT, septic intestinal flora activated intestinal myd88 expression and reduced intestinal FXR and FGF15 expression. After myd88 knockdown in intestinal epithelial villi, the index of FXR was elevated, ZO-1 was improved, IL-6 and IL-1β were reduced, and the abundance and diversity of flora were increased. Strikingly, Probiotics boost FXR-FGF axis to improve intestinal function.

**Conclusion:** Intestinal dysbiosis triggers over activation of MyD88 in intestinal epithelial cells in intra-abdominal septic mice, and subsequent inhibited the FXR-FGF15 signalling associated with gut barrier function deteriorated.

**THU-233**

**Viral like particle analysis shows changes with PPIs and may be more sensitive than metagenomics to study PPI modulation of virome in cirrhosis**

Marcela Peña Rodríguez1,2, Masoumeh Sikaroodi2, Patrick Gillevet3, Jasmohan S. Bajaj4, 1University of Guadalajara, Mexico; 2Laboratory for the Diagnosis of Emerging and Reemerging Diseases (LaDEER), Microbiología y Patología, Guadalajara, Mexico; 3George Mason University, United States; 4Virginia Commonwealth University, United States

Email: jasmohan.bajaj@vcuhealth.org

**Background and aims:** In addition to bacteria, gut microbiota has viruses, which could impact outcomes in cirrhosis. Current cirrhosis studies have analyzed metagenomics but not direct viral like particle (VLP) analysis. These could reflect changes with proton pump inhibitor (PPI) therapy. Aim: Determine the changes in VLPs in cirrhosis vs controls, changes with addition/removal of PPI and compare VLP to metagenomics.

**Method:** Healthy controls (not on PPI) and cirrhotic outpatients underwent stool collection. A group of cirrhotics on PPI underwent PPI withdrawal for 14 days while in another group not on PPI Omeprazole 40 mg was added for 14 days. Stools were collected at baseline and day 14 for PPI addition and removal. Demographics, medications, cirrhosis details and PPI use were recorded. Virome analysis: Stool analysis was performed using VLP enrichment. Only abundant contigs were analyzed, those with at least 100 (transcripts per million) tpm in the dataset and with a threshold of at least 5 tpm mapped to the contig by Kallisto and at least 5 tpm present in 3% of samples. Mean log10 scaled abundances were analyzed for control vs cirrhosis and between controls and pts with cirrhosis ± PPI use. A subset was sent for metagenomics in addition to VLP and viruses detected by both techniques were compared. a diversity and DESeq2, using raw read counts. A p value <0.05 and a log2 fold change >2 was
Results: Clinical data: 110 subjects (20 controls and 90 cirrhosis) were enrolled. Controls (60.8 ± 6.9 years, 13 men) and cirrhotic outputs (62.1 ± 7.0 yrs, 72 men with 15 HCV, 29 alcohol, 12 both, 17 NAFLD and 3 other etiologies) had similar demographics. 38 had HE, 41 ascites and 38 were on omeprazole 31 ± 17 mg/day. PPI users had similar MELD (11.7 ± 5.4 vs 11.0 ± 6.3, p = 0.52), HE pts (37% vs 46%, p = 0.38) and lower ascites (29% vs 52%, p = 0.006) than non-users. 27 cirrhotics (14 on and 13 not on PPI had) both VLP and metagenomics done. PPI trials: 8 compensated pts (age 58 yrs) underwent addition and 8 other compensated pts (age 59 yrs) underwent PPI withdrawal and addition respectively over 14 days. No clinical changes were found. VLP changes (Fig): Cirrhotics had lower viral α-diversity. No change in PPI cross-sectionally or before/after addition or withdrawal was seen on viral α-diversity. DESeq2 showed higher Bacteroides phages in controls and higher Siphoviridae, Gokushovirinae and Drulisviruses (Enterobacterial phages) in cirrhotics. PPI linked with higher Siphoviridae, mastadenovirus and lower CrAss-like viruses and Microviridae. PPI addition reduced Bacteroides phage and some crasslike viruses while removal reduced other CrAss-like viruses. VLP vs metagenomics: Metagenomics did not differentiate between PPI use but VLP showed that CrAss-like viruses cat8522, Przondovirus spp, unclassified Siphoviridae and Podoviridae sp_ctfa10 were higher in the PPI group while Microviridae, Gokushovirinae, Bacteroides phages were higher in no-PPI group.

Conclusion: Viral-like particle analysis shows important phage and eukaryotic viral changes in patients with cirrhosis vs controls and especially those with PPI use. A direct comparison of these analysis with metagenomics shows that VLP may be more sensitive to the role of PPIs in cirrhosis.

THU-234
Edible exosomes oral administration restores gut homeostasis and reduces systemic ammonia level in rodent model
P. Debishree Subudhi1, Jitendra Kumar1, Anupama Parasara1, Shivani Gautam1, Ashmit Mittal1, Varun Suriyola2, Shrutir Sureshan2, Dinesh Mani Tripathi1, Chhagan Bihari1, Shiv Kumar Sarin1, Sukriti Sukrit1. 1Institute of Liver and Biliary Sciences, Molecular and Cellular Medicine, New Delhi, India; 2Institute of Liver and Biliary Sciences, Genome Sequencing Laboratory, India; 3Institute of Liver and Biliary Sciences, Department of Pathology, India; 4Institute of Liver and Biliary Sciences, Department of Hepatology, India
Email: sukritibiochem@gmail.com

Background and aims: Elevated plasma ammonia is attributed to hepatic dysfunction and gut dysbiosis along with systemic inflammation. There is an urgent need of agents which can reinstate the gut commensals and reduce ammonia levels. We investigated the effects of Carrot Edible Exosomes (CEE) on gut microbiome and hepatic injury.

Method: CEE were fractioned from black carrots [Dacus carota] by differential ultracentrifugation and characterized by transmission electron microscopy and nanoparticle tracking assay. Proteomics was performed to evaluate cargoes. Stability, viability were assessed using in-vitro stomach/intestine like digestion and also by co-culture with hepatocytes. Prophylactic oral administration of CEE was done in Thioacetamide (TAA) induced acute hyperammonemia model, compared with vehicle and lactulose. Behavioral, biochemical markers of hepatic injury, ammonia, intestinal permeability and liver histology were investigated. Gut microbiota were assessed by 16s metagenomics.

Results: The size of CEE ranges (52 nm–331 nm) with concentration of 2.65 × 10^9 ± 0.65/ml with zeta potential −17.7 ± 2.4 mV. Total 647 proteins were identified as CEE cargoes, highly enriched with superoxide dismutase, ferritin and aspartate aminotransferase. After stomach like in-vitro digestion, no changes in concentration were found with particle size reduced (p = 0.02) with intact zeta potential. Upon CEE co-culture with hepatocytes after LPS injury, ornithine transcarbamylase (otc; p = 0.0004) and Arginosuccinate synthetase (ass; p = 0.0331) were upregulated and IL-1b and Caspase3 (p < 0.001) mRNA levels reduced within 30 mins than controls. CEE administration in TAA compared to vehicle and lactulose reduced the plasma ammonia levels [Vehicle-145.3 ± 43.6; CEE-92.2 ± 23.2; lactulose-124.8 ± 12.5 μmol/L (p = 0.03)]. ALT and bilirubin (p = 0.006; p = 0.007). CEE improved sensory motor activity (p < 0.001), hepatic necrosis and inflammation. ZO-1 expression was...
higher in CEE than lactulose or vehicle (p < 0.001). CEE enhanced abundance of Firmicutes [Peptococcaceae, Lachnospiraceae, Ruminococcaceae (p < 0.001)] provides energy to maintain gut epithelia, aid in SCFA production. CEE increased growth of Desulfovibrio responsible for acetic acid levels and reduced inflammation by producing α-synuclein protein.

**Conclusion:** CEE potentiate the hepatic urea cycle and lower plasma ammonia levels in acute hyperammonemic rodent model. The CEE carry strong hepatoprotective cargoes which help restore the gut homeostasis and restore gut permeability and can be considered as therapeutic nutritional tools.

**THU-235**

Microbiota-targeted interventions in the gut-liver axis for chronic liver disease of DUAL etiology

Raquel Benedé1,2, Olga Estévez3, Hector Leal1, Salvador Iborra1,3, Ana Redondo2,4, José María Herranz2,5, Alexander Tyakht3, Viktoria Odintsova4, Beatriz Gómez Santos3, Patricia Aspichueta3,7,8, Johanna Reißing9, Tony Bruns9, Andreea Ciudin10,11, Juan M. Pericas6,12, Javier Vaquero1,5,14, Christian Trautwein9, Christian Liedtke9, Rafael Bañares1,5,14, Matias A. Avila4,5,15, Francisco Javier Cubero1,5,11, Yulia Nevzorova1,5,13.

1Complutense
Method:

C57BL/6 male mice received 10% alcohol in drinking water in DUAL model.

Results:

Healthy donor. Microbiota modulation after: (i) Short-term (10 days) oral administration of antibiotics to 10 weeks DUAL-fed mice resulted in decreased accumulation of triglycerides in the liver, collagen accumulation in the liver. The implementation of FMT with mild alcohol consumption revealed reduced overall microbiota diversity and increase in gram-negative LPS producing Bacteroides. Similarly, 16S rRNA sequencing of stool samples from obese patients comprised bile salts that are N-amidated with non-canonical amino acids by gut microbes, was recently reported. The function of these microbial bile salt conjugates (MBSCs) and their relevance for human (patho)physiology is unresolved. Initial disease associations were made for Crohn's disease and dysbiotic states. Here, we sought to determine if MBSCs can activate the main host bile salt receptors FXR and TGR5, and assessed their entrance into the circulation.

Method:

N-aminates of cholic acid (CA) and chenodeoxycholic acid (CDCA) and leucine, tyrosine and phenylalanine were synthesized, and assayed for binding to FXR and TGR5 using coactivator and Gαq, recruitment assays, respectively. Activation of FXR by MBSCs, and requirement for an uptake transporter, was further studied by reporter assays in 293 embryonic kidney cells using a transcriptional read-out. For initial explorations, levels of aforementioned MBSCs were determined using LC-MS in relevant patient cohorts in chyme and blood samples, including mesenteric venous blood.

Results:

CDCA-based MBSCs elicited dose-dependent recruitment of SRC1 coactivator peptide to the ligand-binding domain of FXR, with Tyrinosine-CDCA having the highest affinity (EC50 = 2.8 μM). Treatment of HuH7 cells with CA- or CDCA-based MBSCs resulted in elevated mRNA levels of FXR target genes (e.g. SHP, OSTA), in a manner dependent on the bile salt uptake transporter NTCP. Both intestine- and liver-predominant FXR isoforms (α4 and α2, resp.) were activated by MBSCs in luciferase reporter assays, provided that a bile salt uptake
transmitter (ASBT or NTCP) was present. MBSCs were also ligands of TGR5 as evidenced by dose-dependent recruitment of the stimulatory Gαs subunit in a nanobRET assay. CDCA-based MBSCs displayed higher affinity than their CA-based counterparts. Moreover, MBSCs induced downstream activation of a cAMP-driven reporter in a TGR5-dependent manner. Using a LC-MS assay with nanomolar range sensitivity, MBSCs were readily detected in chyme of patients with intestinal failure (n = 12), where MBSCs comprised a minor fraction (up to 40 ppm) of total bile salts. MBSCs could not be detected in matched systemic blood of these patients, or in systemic blood of patients with morbid obesity (n = 8) or PSC (n = 6), or mesenteric and portal blood of patients with a pancreatic malignancy with/without cholestasis (n = 6).

Conclusion: MBSCs are agonists of FXR and TGR5, and substrates for the intestinal and hepatic bile salt uptake transporters. Initial pilot data indicates that absorption and entry into the host circulation of MBSCs, is unsubstantial. Degradation of MBSCs by host carboxypeptidases and bacterial bile salt hydrolases may contribute to this. Follow-up studies are required to unravel the function of MBSCs and their relevance for human disease.

THU-237
The bile acid chenodeoxycholic acid increases muscle insulin sensitization via FOXO1
Aileen Shi Qi Zhong1, Maria Cortián1, Raphael Chevré2, David Castano Mayan1, Blake Cochran1, Bert Groen1, Kerry Ann Rye2, Hong Chang Tan1, Roshi Rebecca Singaraja1. 1National University of Singapore, Singapore; 2Agency for Science Technology and Research, Singapore; 3University of New South Wales, Australia; 4University of Amsterdam, Netherlands; 5Singapore General Hospital, Singapore
Email: mdcrrs@nus.edu.sg

Background and aims: CYP8B1 acts in the bile acid (BA) synthesis pathway to generate 12α-hydroxylated BAs which were associated with insulin resistance in humans. We identified the first carriers of mutations in CYP8B1, a bile acid (BA) synthesis gene. These carriers showed increased circulatory primary BA cholic acid (CA):chenodeoxycholic acid (CDCA) ratio and peripheral insulin sensitivity. In vitro, CDCA increased glucose uptake in myotubes. However, it's unclear whether CDCA alone increases insulin sensitization and if MBSCs with/without cholestasis (n = 6).

Method: We generated Cyp8b1−/− and Cyp2c70−/− mice with increased circulatory CDCA.

Results: Cyp8b1−/− mice showed increased insulin sensitivity and muscle insulin signaling, while β-cell insulin secretion was decreased and hepatic glucose metabolism remained unchanged. Muricholic acids (MCAs) were also increased in Cyp8b1−/− mice. In mice, Cyp2c70 generates MCAs from CDCA. To exclude contributions by MCAs to insulin sensitivity, we generated Cyp2c70−/− mice with almost absent MCAs. These mice showed increased circulatory CDCA, increased muscle insulin sensitivity and increased muscle-specific glucose uptake, despite the near absent MCAs. Wild-type mice administered CDCA reproduced these phenotypes, confirming that CDCA increases muscle insulin sensitization. In Cyp8b1−/−, Cyp2c70−/−, and CDCA-administered wild-type mice, muscle Insulin receptor expression increased, as did activity of its transcription factor Forkhead Box O1 (FOXO1). The CDCA-mediated increase in muscle insulin signaling was attenuated by inhibition of FOXO1.

Conclusion: Our study demonstrates that CDCA signals in skeletal muscle through the FOXO1 pathway to increase whole organism insulin sensitization.

THU-238
Characterization of pattern recognition receptor expression for regulating myeloid cell responses in the gut-liver axis in non-alcoholic fatty liver disease and cholangiopathies
Alix Bruneau, Simon Widowinski, Linda Hammerich, Burcin Özdirik, Michael Sigal, Münevver Demir, Frank Tacke. Charité Universitätsmedizin Berlin, Department of Hepatology and Gastroenterology, Berlin, Germany
Email: alix.bruneau@hotmail.fr

Background and aims: The gut-liver axis is a key pathogenic circuit in the progression of liver diseases. Changes in the composition of the gut microbiota in patients with Primary Sclerosing Cholangitis (PSC) and Non-Alcoholic Fatty Liver Disease (NAFLD) have been reported, suggesting a role of microbiota in their pathogenesis. Microbial signals can be recognized by immune cells in the circulation and in the liver via Pattern Recognition Receptors (PRRs), mainly Toll-like receptors (TLRs). Here, we characterized PRR/TLR expression patterns on immune cells of these patients in order to understand relevant (dys)regulations and determine their potential as therapeutic targets.

Method: We performed multiplex immunofluorescence staining on liver and colon samples of patients as well as mouse models of PSC and NAFLD. A panel with 16 different antibodies was used to characterise TLR expression on immune cells of PSC/NAFLD patients as well as in the mdr2 −/− PSC-like model (in the presence or absence of dysbiosis) as well as in mice subjected to western diet (NAFLD model). In parallel, we developed a 26-colour panel for full spectrum flow cytometry on peripheral immune cells isolated from patients. This study included 140 samples divided in 4 cohorts: healthy donors, PSC, NAFLD and inflammatory bowel disease.

Results: We observe unique variations in TLR9 expression in myeloid populations for NAFLD and PSC patients compared to controls in both liver and peripheral blood. Moreover, in PSC a decrease in lymphoid cell populations can be observed, which is associated with an overexpression of several PRRs, as well as bile acid and chemokine receptors. PRR/TLR expression data correlate with parameters indicating disease severity and/or progression, supporting their potential as novel biomarkers.
Gut microbial proteomic changes from commensal bacteria are associated with development of first decompensation in cirrhosis

Katarzyna Tyc, Xixian Jiang, Jinze Liu, Akash Kumar Mourya 1, Michael Trauner 2, Shiv Kumar Sarin 3, Dinesh Mani Tripathi 1, Savneet Kaur 1, Jasmohan S. Bajaj 1, Virginia Commonwealth University, United States

Email: jasmohan.bajaj@vcuhealth.org

Background and aims: Prediction of who will develop their first decompensation in cirrhosis is difficult using clinical biomarkers. Microbiota composition is related to cirrhosis change but proteomics could offer a deeper understanding. Aim: Determine microbial proteomics in patients with compensated cirrhosis who remain stable versus those that develop their first decompensation. Method: Compensated outpatients with cirrhosis underwent stool collection and were followed for a similar time period (435 [429] vs 426 [321] days). Inferred Protein analysis: We found 3,120 proteins changed greater than 1 between groups, MetaWIBBLE priority score >0.9 and p value <0.05 were selected and characterized proteins were closely investigated.

Results: We enrolled 68 patients with compensated cirrhosis, of whom 19 decompensated on follow-up for 429 [391] days. The 19 who decompensated developed ascites (n = 10), hepatic encephalopathy (HE, n = 6) or both (n = 3). At baseline, there was no difference in age (59 vs 59 yrs), MELD (8.9 vs 9.2, p = 0.87), albumin level (3.8 vs 3.5, p = 0.62), or medication use (PPI, statins and opioids). Both groups were followed for a similar time period 435 (429) vs 426 (321) days. Inferred Protein analysis: Baseline comparison: We found 3,120 proteins significantly different between groups (158 down/2962 up in unstable vs stable). Fig. 1A shows the top 10 proteins and linked bacterial species. Several proteins related to cell-wall integrity (blue color), and virulence/anti-bacterial resistance (red color) were seen in those who ultimately decompensated. Proteins related to bioenergetics (yellow highlights) in commensals belonging to Firmicutes were over-represented in those who remained stable. Pre and post-1st decompensation: We found 3,086 proteins changed over time (up 3/078 days in post compared to pre). Fig. 1B shows the E.coli and S.pyogenes expressing sulfur-reducing enzymes and resistance-associated proteins were higher post-decompensation. Commensal Firmicutes-associated proteins involved in energy metabolism were higher at baseline.

Conclusion: Inferred microbial proteomics in patients with compensated cirrhosis show significant difference that span several important processes such as bioenergetics, cell wall, and antibiotic resistance between those who ultimately developing their first decompensation as well as after the development of decompensation compared to their baseline. Microbial function through proteomics could be promising to predict first decomposition in stable outpatients with compensated cirrhosis.

THU-240

Altered levels of secondary bile acids in enterohepatic circulation impairs liver regeneration in a rat model of partial hepatectomy

Impreet Kaur 1, Rajnish Tiwari 1, Pinky Juneja 1, Ashwini Vasudevan 1, Akash Kumar Mourya 1, Michael Trauner 2, Shiv Kumar Sarin 3, Dinesh Mani Tripathi 1, Savneet Kaur 1

1Institute of Liver and Biliary Medicine, King Edward Medical University, Lahore, Pakistan

Email: dr_kaurimpreet@yahoo.com

Background and aims: We found 3,086 proteins changed over time (up 3/078 days in post compared to pre) and 3,120 proteins showed significant difference between groups (158 down/2962 up in unstable vs stable). Proteins related to bioenergetics (yellow highlights) in commensals belonging to Firmicutes were over-represented in those who remained stable.

Conclusion: Altered levels of secondary bile acids in enterohepatic circulation impairs liver regeneration in a rat model of partial hepatectomy.
Background and aims: Liver is exposed to gut-derived components via portal vein that regulates host metabolism and tissue homeostasis. Here, we aim to explore gut microbiota-associated metabolites during liver regeneration in response to 70% partial hepatectomy (PHx).

Method: Liver regeneration was studied in PHx and compared to gut microbiota-modulated PHx, achieved by 3-week antibiotic (Abx) treatment prior to PHx (Abx+PHx). Sham without Abx served as controls and were compared to Abx+controls. Relative abundance of dominant gut phyla was evaluated in faeces by RT-PCRs. Primary hepatocytes and liver sinusoidal endothelial cells (LSECs) were isolated by collagenase perfusion. Liver regeneration was assessed by proliferating cell nuclear antigen (PCNA) in liver tissues by immunohistochemistry and cell cycle gene expression in primary hepatocytes by RT-PCRs. Untargeted metabolomics of portal and peripheral serum was performed and differentially abundant metabolites (DAMs) were identified between different study groups. In vitro effects of few DAMs were studied on viability and proliferation of hepatocytes and secretory factors of LSECs.

Results: We observed reduction in bacterial phyla, Firmicutes (2-fold), Actinobacteria (2.4-fold) and Bacteriodetes (2.3-fold) (p < 0.0001 each) post Abx treatment in controls and PHx. Compared to controls (13.4 ± 3.2%) PHx showed an increase (44.6 ± 6.9%) (p < 0.001) in PCNA positivity in livers that correlated with cell cycle genes involved in hepatocyte proliferation at day 2 post-PHx. In Abx-treated PHx, there was reduced PCNA (9 ± 3%); (p < 0.001) and cyclins' gene expression in hepatocytes as compared to PHx (cyclin B1 = 8-fold, cyclin D1 = 4-fold, cyclin E = 20-fold; p < 0.0001 each). In both portal and peripheral serum, we obtained about 800 total metabolites each, where we identified 224 DAMs between PHx and controls while 189 DAMs between Abx+PHx vs PHx in portal serum at day 2 post-PHx. 70 common metabolites showed exactly opposite levels between PHx vs controls and Abx+PHx vs PHx in portal serum. 3-hydroxysebacic acid and secondary bile acids such as deoxycholic (DCA) and lithocholic acid (LCA) were enhanced in PHx vs controls while decreased in Abx+PHx vs PHx. In vitro treatment with DCA (10 μM) significantly enhanced PCNA-positivity in hepatocytes (52.6 ± 7.3% vs 32.4 ± 7.9%, p < 0.05) and secretion of angiocrine factors, HGF (122.06 ± 9.7 pg/ml vs 77.8 ± 7.2 pg/ml) and Wnt 2 (74.5 ± 6.8 pg/ml vs 57 ± 5.3 pg/ml); (p < 0.001 each) in LSECs as compared to DMSO treatment.

Conclusion: We report that altered levels of secondary bile acids such as DCA in portal serum or enterohepatic circulation in Abx-treated rats lead to impaired hepatocyte proliferation, angiocrine factor secretion by LSECs and hence liver regeneration post 70% PHx. The study underscores a crucial role of secondary bile acids in liver regeneration through varied cellular mechanisms.

THU-241
Gut-liver crosstalk in hepatocellular carcinoma and non-selective beta-blockers: is there a link?
Tasnim Mahmoud1, Olfat Hammam2, Mahmoud Khattab3, Aiman El-Khatib3, Yasmeen Attia4. 1The British University in Egypt, Pharmacology and Biochemistry, Egypt; 2Theodor Bilharz Research Institute, Pathology, Egypt; 3Faculty of Pharmacy, Cairo University, Pharmacology and Toxicology, Egypt; 4The British University in Egypt, Pharmacology, Egypt

Background and aims: The bidirectional relationship between the gut and liver orchestrated by the portal vein and dubbed the “gut-liver axis” is becoming increasingly recognized. The interest in its impact on disease onset and severity has also surged recently. Microbial dysbiosis, intestinal permeability, and compromised tight junctional proteins are manifestations in the gut that hugely provoke immune remodeling in the liver. Likewise, hepatocellular carcinoma (HCC) and its ensuing alterations on the liver microenvironment were found to govern the inflammatory milieu in the gut. An intriguing bridge linking both edges of the gut-liver axis seems to be presented in the toll-like receptor 4 (TLR4) signaling. Non-selective beta blockers (NSBBs) are known for their protective effect against intestinal permeability and dysbiosis, especially in cirrhotic patients.
Phascolarctobacterium as a predictor for survival in cirrhotic patients

Method: Male Sprague Dawley rats received weekly intraperitoneal injections of 50 mg/kg of diethyl nitrosamine (DEN) for 16 weeks. Daily treatment with CAR started at week 18 for a period of 4 weeks, at a dose of 10 mg/kg/day, p.o. After sacrifice, livers, ileums, and colons were collected for further analysis. Histopathological examination was performed on harvested tissues. TLR4, occludin, and claudin-1 intestinal immunoreactivities were investigated using immunohistochemistry. Liver and intestinal phosphorylated nuclear factor kappa B (p-NF-kB) along with hepatic TLR4 were also estimated using ELISA.

Results: Our findings showed epithelial hyperplasia apparent as elongated crypts along with increased inflammatory infiltrates in the intestinal sections of the DEN-treated group. These results were coupled with increased pleomorphic hepatocytes with a high nuclear-to-cytoplasmic ratio in the livers of the control untreated group. These effects were, however, abrogated by CAR treatment. The DEN-treated group also demonstrated increased TLR4 hepatic levels along with surged p-NF-kB, as compared to normal animals. These effects paralleled an increase in TLR4 intestinal immunoreactivity and NF-kB levels along with altered occludin and claudin-1 levels. CAR treatment was capable of reversing both the hepatic and intestinal changes observed in the untreated DEN-treated group with significant reductions in TLR4 levels (Fig. 1) and restoration of tight junctional protein expression.

Conclusion: These findings, therefore, suggest a likely protective role of CAR in the gut-liver crosstalk in an HCC setting.

Phascolarctobacterium as a predictor for survival in cirrhotic patients

Rosa Haller1, Stefan Fürst1, Johannes Wolsche1, Lukas Gulden1, Jakob Schwarzl1, Julia Traub1, Nicole Feldbacher1,2, Benard Aliwa1,2, Tobias Madl1, Günter Fauler5, Angela Horvath1,2, Vanessa Stadlbauer1,2, Medical University of Graz, Institute of Gastroenterology and Hepatology, Graz, Austria; 1Medical University of Graz, Clinical Institute of Medical and Chemical Laboratory Diagnostics, Graz, Austria

Email: rosa.haller@medunigraz.at

Background and aims: Previously we linked zonulin, a marker for intestinal permeability, to an increased risk of mortality in cirrhosis and subsequent microbiome analysis identified Phascolarctobacterium to be associated with improved zonulin levels and better survival over 36 months. We aim to verify the role of Phascolarctobacterium in liver cirrhosis.

Method: Stool, serum, and urine samples from 92 cirrhotic patients (62 ± 11 years, 24 female) were obtained. Phascolarctobacterium abundance was extracted from 16s rRNA sequencing data. Kaplan-Meier survival analysis, group comparisons and correlation analyses were performed.

Results: A higher abundance (>50 counts per 8000 sequences) of Phascolarctobacterium was associated with a higher chance of survival over 36 months (log rank mantel cox, p = 0.027). In accordance with the previous analysis, higher abundance of Phascolarctobacterium was associated with better liver function (higher total protein (p = 0.025), higher fibrinogen levels (p = 0.0011) lower international normalized ratio (p = 0.016), lower bilirubin levels (p = 0.009)) and better intestinal permeability (higher zonulin levels (p = 0.047)), but not with etiology (p = 0.29). In addition to the previous study we found higher Phascolarctobacterium abundance in men (p = 0.011), higher age (p = 0.0055), patients with higher neutrophil (p = 0.031), monocyte (p = 0.044) and thrombocyte counts (p = 0.0096) and lower lymphocyte counts (p = 0.028).

Conclusion: Higher Phascolarctobacterium abundance in the gut microbiome of cirrhotic patients is again linked to better survival, better hepatic function and decreased intestinal permeability in this validation cohort. Phascolarctobacterium is associated with stool, serum and urine metabolic changes, as well as changes in stool bile acid composition, indicating a potential role of Phascolarctobacterium in short chain fatty acid, glucose, amino-acid and bile acid metabolism in cirrhosis. Increasing Phascolarctobacterium could therefore be a therapeutic target to modulate the gut-liver axis.

THU-243

Long-term benefit of direct-acting antivirals on gut dysbiosis and microbial translocation in HCV-infected patients with and without HIV coinfection

Nattaya Chuaypen, Thananya Jinato, Pisit Tangkijvanich. Faculty of Medicine, Chulalongkorn University, Biochemistry, Bangkok, Thailand

Email: pisittkvn@yahoo.com

Background and aims: Emerging evidence indicate that direct-acting antivirals (DAAs) could alleviate gut dysbiosis in patients with hepatitis C virus (HCV) infection who achieve sustained virological response (SVR). However, limited data are available regarding the long-term effect of DAAs on gut microbial composition, short-chain fatty acids (SCFAs) and microbial translocation in patients with chronic HCV infection.

Method: A prospective longitudinal study of 50 patients with HCV monoinfection and 19 patients with HCV/HIV coinfection received DAAs were conducted. Fecal specimens collected at baseline and at
week 72 after treatment completion (FUw72) were analyzed for gut microbiota by 16S rRNA sequencing and estimation expression of butyryl-CoA:acetateCoA transferase (BCoAT) in microbiota using real-time PCR. Plasma lipopolysaccharide binding protein (LBP) and intestinal fatty acid binding protein (I-FABP) were quantified by ELISA assays.

**Results:** In this study, SVR rates in mono- and coinfect patients were comparable (94% vs. 100%). The improvement of gut dysbiosis and microbial translocation was found in responders but was not in non-responders. Among responders, significant restoration of alpha-diversity, BCoAT and LBP were consistently observed in HCV-monoinfected patients with low-grade fibrosis (F0-F1), while HCV/HIV-coinfected patients exhibited partial improvement at FUw72. Plasma I-FABP was not declined significantly in responders. Treatment-induced microbiota changes were associated with increasing abundance of SCFAs-producing bacteria, including Blautia, Fusicatenibacter, Subdoligranulum and Bifidobacterium.

**Conclusion:** Our results provided a perspective regarding long-term effect of successful DAAs in restoration of gut dysbiosis and microbial translocation. However, early initiation of DAAs possibly required an alteration in gut microbiota, especially enhanced SCFAs-producing bacteria, toward the reduction of HCV-related complications.

THU-244

The intestinal immune barrier is associated with bile acid pool modifications in mice suffering from non-alcoholic steatohepatitis

Simon Peschard¹, Margaux Nawrot¹, Olivier Molendi-Coste¹, Emmanuelle Vallez², Amandine Descat³, Véronique Touche⁴, Joel Haas¹, Anne Tailleux¹, David Dombrowicz², Bart Staels¹, Sophie Lestavel¹. ¹Univ. Lille, Inserm, CHU Lille, Institut Pasteur de Lille, U1011, EGID, Lille, France; ²Univ. Lille, PSM-ULR7365 GRITA, Lille, France Email: simon.peschard@univ-lille.fr

**Background and aims:** Obesity and insulin resistance are usually associated with metabolic liver injuries such as non-alcoholic steatohepatitis (NASH). To go deeper into the alterations of the gut-liver crosstalk in this pathology, we used a well characterized diet-induced NASH mouse model to study the intestinal immune barrier and the intra-caecal bile acid (BA) composition.

**Method:** Eight-week-old C57Bl6/J male mice were fed for 24 weeks with a high fat/high sucrose diet supplemented with cholesterol to induce histological NASH and impaired glucose sensitivity, and were compared to their littermate controls under chow diet. Liver and gut samples were collected for histological analysis. Immunophenotyping was performed on alive cells purified from the lamina propria of the small intestine. A panel of 18 antibodies was used to identify immune cell subtypes by flow cytometry (Fortessa X20). Results were analyzed using FlowJo software. Caecal content of NASH and control mice were collected, freeze-dried prior to bile acid extraction and dosage by tandem mass spectrometry.

**Results:** As expected, liver of mice under NASH diet were consistent with histological features of the human disease, with hepatic steatosis, inflammation and fibrosis in a context of obesity. Serum alanine aminotransferase levels and oral glucose intolerance were also induced by the diet. Despite no histological remodeling of the small intestine, the intestinal immunological barrier was found altered in NASH animals. In particular, a decrease of CD8+ T lymphocyte proportions was found and regardless of TCR and CD8 subtypes. Proportions of B lymphocytes and myeloid-derived cells seem not to be affected by the diet. NASH mice display an overall increase of BA with an increase of primary to secondary BA ratio. More interestingly, BA described as functional regulators of immune cells such as isodeoxycholic acid, leucine-, phenylalanine- or tyrosine-conjugated cholic acid were also found increased in the intestine of NASH mice.

**Conclusion:** We have shown that in parallel to diet-induced histological features of NASH, intestinal immunity and bile acid homeostasis are altered. Whether specific BA could modulate the intestinal immune barrier in NASH remains to be elucidated, as well as the importance of these data and the molecular mechanisms involved in the intestine that may participate to the hepatic histological development of NASH.
THU-245
Identification of gut microbiota signature for differentiating between viral- and non-viral related hepatocellular carcinoma

Nattaya Chuaypen, Thananya Jinato, Pisit Tangkijvanich, Faculty of Medicine, Chulalongkorn University, Biochemistry, Bangkok, Thailand
Email: pisittkv@yahoo.com

Background and aims: Altered gut microbiota have been associated with the development of hepatocellular carcinoma (HCC). In this report, our aim was to identify gut microbiota signature in differentiating between viral-related HCC (Viral-HCC) and non-hepatitis B-, non-hepatitis C-related HCC (NBNC-HCC).

Method: Fecal samples obtained from 16 healthy controls, 33 patients with Viral-HCC (17 and 16 patients with HBV and HCV infection, respectively) and 18 patients with NBNC-HCC were analyzed using 16S rRNA sequencing. Bioinformatic analysis was performed with the dada2 pipeline in R program. The 16S data were classified between Viral- and NBNC-HCC by using Random Forest machine learning algorithm.

Results: The mean age of patients with NBNC-HCC was significantly older than the Viral-HCC group. However, there was no significant difference between groups regarding sex, biochemical parameters, alpha-fetoprotein level, presence of cirrhosis and tumor stage. The HCC group showed reduced alpha-diversity and altered gut microbial composition compared with healthy controls. Within the top 50 relative abundance, there were 11 genera such as Faecalibacterium, Agathobacter and Coprococcus significantly enriched in the Viral-HCC subgroup, while 5 genera such as Bacteroides, Streptococcus and Erysipelotrichaceae UCG-002 were significantly increased in the NBNC-HCC subgroup (Table). Based on their distinct signatures, a high diagnostic accuracy to classify the HCC subgroups was achieved with an area under the curve (AUC) of 0.90 by Random Forest classifier. Compared to the Viral-HCC subgroup, we also demonstrated significant reduction of fecal butyrate levels but increased plasma surrogate markers of microbial translocation in patients with NBNC-HCC.

Figure: Top 50 relative abundance at the genus level

<table>
<thead>
<tr>
<th>Genus</th>
<th>Viral-HCC Median</th>
<th>IQR</th>
<th>NBNC-HCC Median</th>
<th>IQR</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacteroides</td>
<td>0.085</td>
<td>0.099</td>
<td>0.123</td>
<td>0.076</td>
<td>0.029</td>
</tr>
<tr>
<td>Faecalibacterium</td>
<td>0.081</td>
<td>0.063</td>
<td>0.031</td>
<td>0.061</td>
<td>0.04</td>
</tr>
<tr>
<td>Streptococcus</td>
<td>0.005</td>
<td>0.027</td>
<td>0.026</td>
<td>0.086</td>
<td>0.035</td>
</tr>
<tr>
<td>Agathobacter</td>
<td>0.028</td>
<td>0.034</td>
<td>0.000</td>
<td>0.023</td>
<td>0.014</td>
</tr>
<tr>
<td>Prevotella</td>
<td>0.000</td>
<td>0.057</td>
<td>0.000</td>
<td>0.000</td>
<td>0.049</td>
</tr>
<tr>
<td>Ruminococcus gnavus</td>
<td>0.002</td>
<td>0.023</td>
<td>0.028</td>
<td>0.038</td>
<td>0.001</td>
</tr>
<tr>
<td>group</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coprococcus</td>
<td>0.012</td>
<td>0.030</td>
<td>0.000</td>
<td>0.009</td>
<td>0.022</td>
</tr>
<tr>
<td>Subdoligranulum</td>
<td>0.017</td>
<td>0.029</td>
<td>0.000</td>
<td>0.000</td>
<td>0.001</td>
</tr>
<tr>
<td>Parabacteroides</td>
<td>0.003</td>
<td>0.006</td>
<td>0.010</td>
<td>0.021</td>
<td>0.034</td>
</tr>
<tr>
<td>Ruminococcus gauvreauii</td>
<td>0.004</td>
<td>0.011</td>
<td>0.000</td>
<td>0.002</td>
<td>0.041</td>
</tr>
<tr>
<td>group</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lachnospiraceae ND3007</td>
<td>0.005</td>
<td>0.010</td>
<td>0.000</td>
<td>0.003</td>
<td>0.006</td>
</tr>
<tr>
<td>group</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erysipelotrichaceae UCG-003</td>
<td>0.001</td>
<td>0.014</td>
<td>0.000</td>
<td>0.000</td>
<td>0.016</td>
</tr>
<tr>
<td>CAG56</td>
<td>0.002</td>
<td>0.010</td>
<td>0.000</td>
<td>0.000</td>
<td>0.001</td>
</tr>
<tr>
<td>Holdemanella</td>
<td>0.000</td>
<td>0.013</td>
<td>0.000</td>
<td>0.000</td>
<td>0.048</td>
</tr>
<tr>
<td>Erysipelotrichaceae UCG-004</td>
<td>0.000</td>
<td>0.001</td>
<td>0.005</td>
<td>0.013</td>
<td>0.001</td>
</tr>
<tr>
<td>Lachnospiraceae UCG-004</td>
<td>0.004</td>
<td>0.006</td>
<td>0.000</td>
<td>0.004</td>
<td>0.010</td>
</tr>
</tbody>
</table>

Conclusion: Our result demonstrated that gut dysbiosis was distinct regarding different etiological factors of HCC. Additionally, the NBNC-HCC subgroup appeared to have reduced fecal butyrate but increased microbial translocation compared with viral-related HCC. The gut microbiota signature might serve as a potential biomarker for the diagnosis and therapeutic options for HCC.

THU-246
Pemafibrate modulates microbiota profile in a dietary model of fatty liver in rat

Roger Bentanach1,2, Lluís Miro3,4, Cristina Rosell-Cardona3,4, Loncepò Amat3,4, Marta Alegret1,2,5, Núria Roglans1,2,5, Anna Pérez-Bosque3,4, Juan Carlos Laguna1,2,5. 1University of Barcelona, School of Pharmacy and Food Sciences, Pharmacology, Toxicology and Therapeutic Chemistry, Spain; 2Institute of Biomedicine of the University of Barcelona, Spain; 3University of Barcelona, School of Pharmacy and Food Sciences, Biochemistry and Physiology, Spain; 4Institute of Nutrition and Food Safety of the University of Barcelona, Spain; 5CIBER de Fisiopatología de la Obesidad y Nutrición, Instituto de Salud Carlos III, Spain
Email: alegret@ub.edu

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is a prevalent and progressive disease with no drug available for its prevention or treatment. Therefore, the aim of this study was to analyze the effect of pemafibrate on the microbiota profile in a dietary model of NAFLD, namely feeding a high-fat, high-fructose rat diet, described previously (Velaquez et al., Mol. Nutr. Food Res 2022, 2101115).

Method: The study has been conducted in female Sprague-Dawley rats, that were randomly distributed into 3 groups (n = 8); (1) control (CT; standard rodent chow); (2) high-fat diet with 10% w/v fructose in drinking water (HFHR); (3) HFHR plus pemafibrate at 1 mg/kg/day (PEMA). The experimental design consisted in feeding the rats with the HFHR diet or standard rodent chow for three months. Rats from the PEMA group were fed with the high fat diet supplemented with the drug pemafibrate for the last month. Hepatic triglycerides (TG) were determined at the end of experimental period. Fecal microbiota profile was analyzed by using 16S rRNA sequencing.

Results: NAFLD induced by HFHR produced profound changes in the microbiota profile (Figure 1A), which were partially attenuated by PEMA treatment. Specifically, HFHR rats showed an increase in Phylum Firmicutes and a reduction in Phylum Bacteroidetes, increasing the ratio between them (F/R ratio). PEMA treatment attenuated the effects on Firmicutes and F/R ratio (both p < 0.05). Furthermore, changes in Firmicutes abundance as well as F/R ratio correlated positively with liver TG concentration (Figure 1B). Within the phylum Firmicutes we find families such as Clostridiaceae, which contain genera associated with inflammatory processes. This bacterial family was increased in HFHR animals and decreased in PEMA-treated rats (both, p < 0.05).

Conclusion: In our dietary model of NAFLD in rat, pemafibrate treatment was able to modulate the microbiota profile. Some of these changes correlate with the reduction of liver TG. This work was supported by grants PID2020-112870RB-I00, funded by CIN/AEI/1013039/501100011033 and 2021SGR-00345.

THU-247
Culturomics study of gut microbiota in NASH patients and healthy controls

Babacar Mbaye1, Patrick Borentain 2, Matthieu Million1, René Gerolami1,2, 1IHU Méditerrénée Infection, Aix-Marseille Université, Marseille, France; 2CHU Timone. Assistance Publique Hopitaux de Marseille, Hepatologie, Marseille, France
Email: rene.gerolami@ap-hm.fr

Background and aims: The gut microbiota has been extensively studied in patients with NASH. Metagenomic studies have suggested a dysbiotic signature characterised by an increase in Proteobacteria at the phylum level, Enterobacteriaceae and Lactobacillaceae at the family level and Clostridium, Escherichia and Lactobacillus at the genus level. No large-scale bacterial culturomic studies have been published to date. In this study, we report the results of metagenomic and culturomic analysis of the gut microbiota in 41 NASH patients and 24 controls.

[Table containing culturomics data]
Method: Sequencing of 16S rRNA amplicons was performed on fecal samples from all patients using the Illumina MiSeq instrument. Bacterial culturing was performed on fecal samples from 14 NASH patients and 11 controls using COS and YCFA (Yeast Casitone Fatty Acids Broth with Carbohydrates) agar plates, under anaerobic and aerobic conditions. In a second approach, we used a liquid enrichment step with sterile rumen juice and defibrinated sheep blood. Each sample was inoculated for 30 days. On day 1, day 3, day 7, day 10, day 15, day 21 and day 30, the contents of the flask were sampled, followed by ten 10-fold serial dilutions and inoculation onto COS and YCFA agar. All colonies in each sample were identified by MALDI-TOF mass spectrometry. Unidentified colonies were subjected to genome sequencing to decipher new putative species.

Results: Analysis of the cultures identified 1446 bacterial strains, representing 371 different species including 5 new species. Seven bacterial species were significantly enriched in NASH: *Enterocloster bolteae*, *Facklamia hominis* and *Streptococcus constellatus*. In contrast, *Lentilactobacillus parabuchneri*, *Lacticaseibacillus casei* and *Phascolarctobacterium faecium*, which are known to be associated with health, were only found in controls. *Lactobacillus gasseri* and *Limosilactobacillus fermentum*, a species capable of producing ethanol, were found to be enriched in NASH. Only *L. fermentum* and *L. gasseri* (enriched in NASH), *P. faecium* and *Alistipes communis* (enriched in controls) were significantly different between NASH and controls in both culturomic and metagenomic analyses.

Conclusion: Here, we have confirmed a microbial signature associated with NASH, in particular bacteria known to produce ethanol. Culturomics has the unique advantage of providing bacterial strains which can be stored and subsequently analyzed. Further studies will evaluate their metabolic properties, including ethanol and triglyceride production in vitro, to confirm their role in the pathophysiology of NASH.

THU-248
Oral microbiome signature associated with liver graft dysfunction
Shruti Sureshan, Rosmy Babu, Varun Suroliya, Prince Garg, Pooja Rao, Vinyendra Pamecha, Chhagan Bihari, Shiv Kumar Sarin. Institute of Liver and Biliary Sciences, India
Email: drcbsharma@gmail.com

Background and aims: Stool and saliva dysbiosis in patients with cirrhosis incites changes in bacterial defences and higher risk for bacterial infections. As most of the studies have been conducted on gut microbiome from stool samples, here we profiled the salivary microbiome in pre-and post- LT patients along with their living donors to identify oral microbiome signature associated with early graft dysfunction.

Method: Saliva samples of cirrhosis patients between the age group 18–65 years admitted for living donor liver transplant and their
donors were collected at different time-point with the informed consent. V3-V4 Amplicon sequencing was performed on Illumina MiSeq instrument and microbiome analysis was performed using QIIME pipeline. Patient with Acute Liver Failure/Acute-on-chronic liver failure, pregnant, cancer, surgical liver complications post LT, on pro/symbiotic were excluded from the study.

**Results:** A total of 47 participants, 21 donors (Do) (32.4 ± 9 years) and 27 recipients (Re) (46.6 ± 10 years) were selected for this study. Recipient saliva samples were collected at 4 time-points: before transplant (n = 27), post-transplant 7 days, 30 days, and 180 days. On follow-up nine recipients had graft dysfunction (GD) based on transaminits and biopsy proven rejections and the remaining 18 patients were noted as non-GD. Any of the donor did not have any complications after LT.

Alpha diversity was higher (p < 0.00003, Fig. 1A) and beta diversity was lower at 180 days compared to baseline in GD recipient (p < 0.05, Fig. 1B). Differential abundance of family Prevotellaceae was high in patients with GD at baseline with a decreasing trend till 30 days and eventually increasing by 180 days. At genus level, the abundance of *Prevotella* was consistently higher across all time points, and *Lactocaseibacillus*, a probiotic was higher at baseline but was reduced after 7 days in GD recipients (p < 0.05, Fig. 1.C).

**Conclusion:** Oral bacteria was significantly altered at both genus and family level within 180 days in GD recipients in comparison to non-GD recipients. Abundance of *Prevotella* were noted to be elevated and could be a potential bacterial signature to identify liver GD.

**FRIDAY 23 JUNE**

**Hepatocyte biology**

**FRI-381**

*Insulin determines TGF-β effects on HNF4α transcription in liver injury and hepatocyte epithelial-to-mesenchymal transition*

Rilu Feng1, Chenhao Tong1, Tao Liu1, Hui Liu2, Chen Shao2, Yujia Li1, Carsten Sticht2, Kejia Kan1, Stefan Munker1,6, Hanno Nieß8,7,8, Roman Liebe9,10, Matthias Ebert11,12,13, Hua Wang1, Huiguo Ding1, Honglei Weng1, Steven Dooley1. 1Department of Medicine II, Section Molecular Hepatology, University Medical Center Mannheim, Medical Faculty Mannheim, Heidelberg University, Mannheim, Germany; 2Department of Pathology, Capital Medical University, Beijing, China; 3NCS Core Facility, Medical Faculty Mannheim, Heidelberg University, Mannheim, Germany; 4Department of Surgery, Medical Faculty Mannheim, Heidelberg University, Mannheim, Germany; 5Department of Pathology, Beijing You’an Hospital, Affiliated with Capital Medical University, Beijing, China; 6Biobank of the Department of General, Visceral and Transplant Surgery, Ludwig-Maximilians-University Munich, Munich, Germany; 7Clinic of Gastroenterology, Hepatology and Infectious Diseases, Heinrich Heine University, Düsseldorf, Germany; 8Department of Medicine II, Liver Centre Munich, University Hospital, Campus Großhadern, LMU Munich, Germany; 9Liver Centre Munich, University Hospital, Ludwig-Maximilians-University, Munich, Germany; 10Department of General, Visceral, and Transplant Surgery, Ludwig-Maximilians-University Munich, Munich, Germany; 11Department of Medicine II, Saarland University Medical Center, Saarland University, Saarbrücken, Germany; 12Mannheim Institute for Innate Immunoscience (MI3), Medical Faculty Mannheim, Heidelberg University, Mannheim, Germany; 13Clinical Cooperation Unit Healthy Metabolism, Center of Preventive Medicine and Digital Health, Medical Faculty Mannheim, Heidelberg University, Mannheim, Germany; 14Department of Oncology, The First Affiliated Hospital of Anhui Medical University, Hefei, China; 15Department of Gastroenterology and Metabolism, Medical Faculty Mannheim, Heidelberg University, Mannheim, Germany.
Background and aims: Loss of hepatic HNF4α expression is frequently observed in end-stage liver disease (ESLD) and associated with loss of vital liver functions and thus increases mortality. Details of how HNF4α is suppressed are largely unknown to date. It has been proposed that TGF-β inhibits HNF4α via SMAD2/3 complex and thus initiates hepatocyte epithelial-to-mesenchymal transition (EMT) in vitro. However, many patients express hepatic HNF4α despite the presence of high levels of TGF-β. To address this conundrum, we scrutinized how TGF-β regulates HNF4A transcription in different disease conditions.

Method: Expression of hepatic transcription factors was examined in 98 HBV-infected patients. The effects of TGF-β on HNF4A transcription and EMT were investigated in vitro.

Results: HNF4A transcription requires both SMAD2/3 and C/EBPα binding to the HNF4A promoter. Although SMAD2/3 binding does not directly influence HNF4A transcriptional activity, SMAD2/3-recruited acetyltransferase CBP/p300 is essential for C/EBPα binding. In vivo, 67 patients positive for hepatic HNF4α express both p-SMAD2 and C/EBPα, whereas 22 patients negative for HNF4α expression lack either p-SMAD2 or C/EBPα. Interestingly, TGF-β-activated SMAD2/3 represses CEBPA transcription. Thus, long-term TGF-β stimulation results in C/EBPα depletion, which eventually inhibits HNF4α expression. Insulin inhibits SMAD2/3 binding to the CEBPA, but not the HNF4A promoter. Maintaining insulin concentrations in culture medium not only sustains HNF4α expression, but also inhibits TGF-β-induced hepatocyte EMT, because insulin inhibits SMAD2/3 binding to the promoters of core EMT transcription factor SNAIL. ESLD patients lacking HNF4α usually demonstrate insulin resistance.

Conclusion: Insulin signalling is crucial to maintain HNF4α expression in hepatocytes.

Background and aims: 2D histopathology is a common technic for the diagnosis and study of diseases of the liver tissue as many of these diseases are directly linked to structural disorders at the micro- and mesoscale. However, the complexity of the liver organization calls for richer and more consistent data representation, hence for spatially resolved 3D visualization and analysis of histological images. This analysis, called here 3D histopathology, would enable better understanding and earlier diagnosis of liver disorders.

Method: A tissue of approximately 14 mm × 9 mm × 9 mm is taken from a patient liver from a surgical specimen removed for liver cell adenoma at the Centre Hépato-Biliaire/Paul-Brousse Hospital. After fixation and paraffin inclusion, 300 serial sections of 3 μm thick are individually labelled with the antibodies anti-EpCAM for the bile ducts, anti-CD31 for the vessels, and stained with haematoxylin for the nuclei. Due to the physical sectioning, misalignment and deformation of the tissue occur, hence the first step of the image analysis pipeline is the registration of the 300 images. The reconstructed tissue volume is further segmented for the sinusoids, hepatocyte nuclei, biliary ducts, portal venules, hepatic arteries and central venules, and post-processed. Besides, the liver primary units, called lobules, are automatically reconstructed using the morphological watershed algorithm.

Results: The vascular system and the bile ducts at the micro- and mesoscale were reconstructed and visualized in 3D. The topology of the vascular and biliary trees was described using the so-called
diameter-defined Strahler system. The morphology of the vascular and biliary trees was then computed, i.e. the mean diameter and length of the segments with respect to their order. The mean radius of the segments with respect to the Strahler order follows an exponential law (for the central and portal venules), which is coherent with the literature for larger liver vessels and other organs (e.g. heart and lungs). Moreover, a statistically representative number of entire lobules were automatically reconstructed. The sinusoids cross-section orientation significantly correlates with the reconstructed lobule borders: the sinusoids are rather radially directed in the pericentral region and orthoradially oriented at the periportal regions, where the center is chosen to be the closest central venules.

Conclusion: For the first time, a large human liver tissue volume is reconstructed in 3D and morphologically quantified from a stack 2D histological images i.e. from the micro- to the mesoscale. Such visualization at the micro- and mesoscale have not yet been obtained in the field of 3D imaging at the microscale, hence highlighting the innovation of this work. We proposed several quantification criteria which were evaluated on a healthy tissue which can serve as benchmark. This new digital histology approach can be readily applied to pathological cases where spatial and morphological abnormalities could be analyzed more consistently in three dimensions and bring new information on detailed morphological alterations of liver structures according the different liver disease stages.

Background and aims: It has been proposed that low magnesium (Mg) intake or depletion could be implicated in the pathogenesis and progression of chronic liver disease. A major Mg cellular transport mechanism is Transient Receptor Potential Melastatin-subfamily member 7 (TRPM7) chanzyme, also involved, in experimental studies, in hepatic necrosis, inflammation and fibrosis. The aim of this study is to measure, for the first time in human liver cirrhosis, the Mg content of the liver and in hepatocytes and the expression of TRMP7 in these cells, correlating these variables with indices of liver inflammation and disease prognosis.

Method: We analyzed 58 biopsies of cirrhotic livers and 16 of healthy donor livers before ischemia obtained at liver transplantation (LT). Atomic absorption spectrometry (AAS) and synchrotron-based X-ray microscopy (SXRM) were used to estimate the Mg content in the liver and within hepatocytes, respectively. Hepatocyte intracellular expression of TRPM7 was evaluated by immunohistochemistry and expressed as the percentage of stained hepatocytes per 500 cells. Delta-MELDNa was calculated as: \((\text{MELDNa at the time of transplant - MELDNa at the time of listing})/\text{time elapsed between listing and transplant expressed in days}\).

Results: At AAS Mg median content was significantly \((p < 0.001)\) lower in cirrhosis \([117.2 (IQR 110.5–132.9) \mu g/g]\) compared to healthy livers \([162.8 (IQR 155.9–169.8) \mu g/g]\). All cirrhosis samples were clearly positive for cytosolic expression of TRPM7 in hepatocytes, whereas this was barely detectable in normal liver tissue. Hepatocyte intracellular expression of TRPM7 was evaluated by immunohistochemistry and expressed as the percentage of stained hepatocytes per 500 cells. Delta-MELDNa was calculated as: \(((\text{MELDNa at the time of transplant-MELDNa at the time of listing})/\text{time elapsed between listing and transplant expressed in days})\).

Background and aims: It has been proposed that low magnesium (Mg) intake or depletion could be implicated in the pathogenesis and progression of chronic liver disease. A major Mg cellular transport mechanism is Transient Receptor Potential Melastatin-subfamily member 7 (TRPM7) chanzyme, also involved, in experimental studies, in hepatic necrosis, inflammation and fibrosis. The aim of this study is to measure, for the first time in human liver cirrhosis, the Mg content of the liver and in hepatocytes and the expression of TRMP7 in these cells, correlating these variables with indices of liver inflammation and disease prognosis.

Method: We analyzed 58 biopsies of cirrhotic livers and 16 of healthy donor livers before ischemia obtained at liver transplantation (LT). Atomic absorption spectrometry (AAS) and synchrotron-based X-ray microscopy (SXRM) were used to estimate the Mg content in the liver and within hepatocytes, respectively. Hepatocyte intracellular expression of TRPM7 was evaluated by immunohistochemistry and expressed as the percentage of stained hepatocytes per 500 cells. Delta-MELDNa was calculated as: \(((\text{MELDNa at the time of transplant-MELDNa at the time of listing})/\text{time elapsed between listing and transplant expressed in days})\).

Results: At AAS Mg median content was significantly \((p < 0.001)\) lower in cirrhosis \([117.2 (IQR 110.5–132.9) \mu g/g]\) compared to healthy livers \([162.8 (IQR 155.9–169.8) \mu g/g]\). All cirrhosis samples were clearly positive for cytosolic expression of TRPM7 in hepatocytes, whereas this was barely detectable in normal liver tissue. Hepatocyte intracellular expression of TRPM7 was evaluated by immunohistochemistry and expressed as the percentage of stained hepatocytes per 500 cells. Delta-MELDNa was calculated as: \(((\text{MELDNa at the time of transplant-MELDNa at the time of listing})/\text{time elapsed between listing and transplant expressed in days})\).

Background and aims: It has been proposed that low magnesium (Mg) intake or depletion could be implicated in the pathogenesis and progression of chronic liver disease. A major Mg cellular transport mechanism is Transient Receptor Potential Melastatin-subfamily member 7 (TRPM7) chanzyme, also involved, in experimental studies, in hepatic necrosis, inflammation and fibrosis. The aim of this study is to measure, for the first time in human liver cirrhosis, the Mg content of the liver and in hepatocytes and the expression of TRMP7 in these cells, correlating these variables with indices of liver inflammation and disease prognosis.

Method: We analyzed 58 biopsies of cirrhotic livers and 16 of healthy donor livers before ischemia obtained at liver transplantation (LT). Atomic absorption spectrometry (AAS) and synchrotron-based X-ray microscopy (SXRM) were used to estimate the Mg content in the liver and within hepatocytes, respectively. Hepatocyte intracellular expression of TRPM7 was evaluated by immunohistochemistry and expressed as the percentage of stained hepatocytes per 500 cells. Delta-MELDNa was calculated as: \(((\text{MELDNa at the time of transplant-MELDNa at the time of listing})/\text{time elapsed between listing and transplant expressed in days})\).

Results: At AAS Mg median content was significantly \((p < 0.001)\) lower in cirrhosis \([117.2 (IQR 110.5–132.9) \mu g/g]\) compared to healthy livers \([162.8 (IQR 155.9–169.8) \mu g/g]\). All cirrhosis samples were clearly positive for cytosolic expression of TRPM7 in hepatocytes, whereas this was barely detectable in normal liver tissue. Hepatocyte intracellular expression of TRPM7 was evaluated by immunohistochemistry and expressed as the percentage of stained hepatocytes per 500 cells. Delta-MELDNa was calculated as: \(((\text{MELDNa at the time of transplant-MELDNa at the time of listing})/\text{time elapsed between listing and transplant expressed in days})\).
and both MELDNa (B = −0.102 95% CI −0.207 to 0.005; p < 0.05) and serum AST activity (B = −0.824 95% CI−1.560 to −0.288 p < 0.01) at LT; (b) direct correlations between the percentage of hepatocytes intensely stained for TRPM7 and both MELDNa (B = 0.297 95% CI 0.175−0.578; p < 0.01) and serum AST activity (B = 3.256 95% CI 0.758−6.208 p < 0.05) at LT; (c) direct correlation between the percentage of hepatocytes intensively stained for TRPM7 and Delta-MELDNa (B = 0.436; 95% CI 0.179−0.670; p < 0.01). To test whether the severity of cirrhosis prognosis correlated with the Mg content within hepatocytes, the latter was measured in 15 cirrhotic liver samples using SXRM and confirmed the inverse correlation between Mg in hepatocytes and MELDNa a LT (r = −0.531; p < 0.05).

Figure: 3D single-cell atlas of liver tissue architecture: Central vein (dark blue), portal vein (orange). Upper part: sinusoids (magenta), bile canaliculus (green). Lower part: nuclei (not visible), hepatocytes (blue), stellate cells (yellow) and Kupffer cells (light blue).

**Conclusion:** These findings revealed novel characteristics of liver heterogeneity and have important implications for both the structural organization of liver tissue and its functional features. 3D single-cell atlas will provide a powerful tool for understanding liver tissue architecture, under both physiological and pathological conditions.

**FRI-385**

**Multomic profiling associated with lipid remodeling in senescent primary human hepatocytes**

Sin-Tian Wang1, Wei-Chia Chen1, Li-Chi Chi1, Yi-Hsuan Tsai1, Kung-Chia Young1,2. 1National Cheng Kung University, Department of Medical Laboratory Science and Biotechnology, Taiwan; 2National Cheng Kung University, Institute of Basic Medicine, Taiwan

Email: t7908077@mail.ncku.edu.tw

**Background and aims:** Metabolic associated fatty liver disease (MAFLD), also as non-alcoholic fatty liver disease, is characterized by the excessive lipid accumulation in liver with pathological progress, from simple steatosis, steatohepatitis, cirrhosis, to hepatocellular carcinoma. The development of MAFLD is long-term affected by multiple factors, including aging. However, the pathogenic changes in normal human hepatocyte during aging remained uncovered. In this study, we investigated the lipid remodelling from young to senescent primary hepatocytes by multomic analysis.

**Method:** First, we characterized the lipid metabolism of primary human hepatocytes (PHHs) with the expression of senescent biomarkers. Next, we analysed the changes of metabolic gene expression and lipid contents by transcriptomic and lipidomic analysis. Finally, we investigated the pathogenic mechanism of lipid remodeling in aging by PHHs and animal model treated with senolytic or senomorphics agents.

**Results:** The PHHs were monitored for the expression of senescence biomarkers of p16, p21 and p53, then classified into three stages by different passages, including young (passage (P)3 to P5), early to describe the morphological changes that occur in the mouse liver during post-natal early development and adulthood.

**Conclusion:** These findings revealed novel characteristics of liver heterogeneity and have important implications for both the structural organization of liver tissue and its functional features. 3D single-cell atlas will provide a powerful tool for understanding liver tissue architecture, under both physiological and pathological conditions.
**POSTER PRESENTATIONS**

**S362 Journal of Hepatology**

**Conclusion:** In conclusion, the transcriptional and lipidomic profiling of female mice by accumulation of excessive lipids with lipid quantification showed increased lipid contents were increased as compared to young hepatocytes, including triglyceride (TG; by 10 folds), free cholesterol (FC; by 3 folds) and cholesteryl ester (CE; by 2 folds). Additionally, it was confirmed in the liver of 50–62 weeks-old female mice by accumulation of excessive lipids with lipid quantification and oil red staining.

**Conclusion:** In conclusion, the transcriptional and lipidomic profiling associated with lipid accumulation in aging PHH were deciphered.

**FRI-386**

Tick-tock-Uncovering new aspects of circadian-regulated liver metabolism by kinetic modeling

Christiane Körner1,2, Madlen Matz-Soja 1,2, Fritzi Ott 1,2, Eugenia Marbach-Breitru¨ck2, Rolf Gebhardt3, Thomas Berg 3, Nikolaus Berndt4, 1Division of Hepatology, Department of Medicine II, Leipzig University Medical Center, Laboratory for Clinical and Experimental Hepatology, Leipzig, Germany; 2Rudolf-Schönheimer-Institute of Biochemistry, Faculty of Medicine, Leipzig University, Leipzig, Germany; 3Clinic of Gastroenterology, Hepatology, Infectious Diseases and Pneumology, Germany; 4Institute of Computer-Assisted Cardiovascular Medicine, Charité-Universitätsmedizin Berlin, Corporate Member of Freie Universität Berlin and Humboldt-Universität zu Berlin, Berlin, Germany

Email: christiane.rennert2@medizin.uni-leipzig.de

**Background and aims:** The circadian rhythm is a decisive regulator for metabolic homeostasis especially in the liver. The importance of diurnal control is highlighted by the increased risk of liver diseases, obesity and metabolic syndrome due to disturbance of circadian rhythms. However, time resolved in vivo studies of liver metabolism are rare and molecularly resolved, kinetic models can be used for metabolic phenotyping based on proteomic data, enabling linking circadian rhythmicity of protein abundances to metabolic regulation. We aim to investigate whether hepatic metabolism is regulated by central circadian mechanisms or nutrition availability in plasma.

**Method:** We investigated the rhythmicity of liver metabolism in male C57BL/6N mice in transcriptomic and proteomic data using liver samples isolated throughout a day. We incorporated the proteomic data of each time point in kinetic models to identify circadian rhythms of metabolic pathways. Additionally, we correlated plasma metabolite profiles with metabolic liver functions and validated the model predictions with biochemical assays.

**Results:** Our analysis revealed clusters of typical regulated expressions of various metabolic genes. The kinetic models showed circadian rhythms for lipid metabolism, ethanol detoxification and partly carbohydrate metabolism in the liver. However, gluconeogenic capacity, fructose and urea synthesis capacity were obviously not underlying circadian regulation. We could show a correlation between plasma fatty acid concentrations and fatty acid liver metabolism. Concerning detoxification capacities, ethanol utilization capacity was highly associated with plasma glucose concentrations, but no significant correlations with plasma metabolites could be found for urea synthesis and ammonia uptake capacities.

**Conclusion:** The model helps to better understand whether circadian rhythms are intrinsic and independent of nutrient availability or follow diurnal dietary patterns. By accounting for the circadian regulatory properties of all enzymes, our model integrates the accumulated knowledge from decades of biochemical research and allows quantitative predictions of system behavior as a function of circadian rhythmicity.

**FRI-387**

Dickkopf-1 inhibitor enhances the anti-tumor effects of sorafenib through inhibition of PI3K/Akt/Wnt signaling in hepatocellular carcinoma

Sang Hyun Seo1,2, Kyung Joo Cho3, Hye Jung Park3, Hye Mi Kim4, Jae Seung Lee4,5, Hye Won Lee3,5, Beom Kyung Kim3,5, Jun Yong Park3,5, Do Young Kim3,5, Sang Hoon Ahn4,5, Seung Up Kim3,5, 1Department of Internal Medicine, Graduate School of Medical Science, Brain Korea 21 Project, Yonsei University College of Medicine, Rep. of South Korea; 2Yonsei Liver Center, Severance Hospital, Rep. of South Korea; 3Yonsei Liver Center, Severance Hospital, Rep. of South Korea; 4Department of Microbiology and Immunology, Yonsei University College of Medicine, Rep. of South Korea; 5Department of Internal Medicine, Institute of Gastroenterology, Yonsei University College of Medicine, Rep. of South Korea

Email: ksukorea@yuhs.ac

**Background and aims:** Sorafenib prolongs overall survival in patients with advanced hepatocellular carcinoma (HCC). Dickkopf-1 (DKK1) is frequently overexpressed in HCC. This study investigated whether the inhibition of DKK1 enhances anti-tumor efficacy of sorafenib in patients with advanced HCC.

**Method:** The high expression of DKK1 level in HCC was confirmed by TCGA datasets, IF stain and ELISA in human tissues. HCC cells were treated with sorafenib and/or W AY-262611, which is an inhibitor of DKK1, to identify the additional efficacy of DKK1 inhibition on proliferation, migration, invasion, apoptosis. Transgenic mouse models using hydrodynamic injection were also used. The mice were orally injected with sorafenib (32 mg/kg), W AY-262611 (16 mg/kg), or sorafenib/W AY-262611 for 10 days.

**Results:** DKK1 was significantly overexpressed in patients with HCC, compared with healthy subjects and those with chronic liver diseases, but without HCC (all P < 0.05). DKK1 expression was also high in transgenic mouse models (all P < 0.01). Sorafenib combined with W AY-262611 significantly inhibited the cell viability, migration, and invasion by altering apoptosis in HCC cells, compared with sorafenib alone (all P < 0.05). In addition, we found that sorafenib combined with W AY-262611 inhibited p110α, phospho-Akt (all P < 0.05), active β-catenin (all P < 0.05), phospho-Ser9-GSK-3β, whereas phospho-Tyr216-GSK-3β increased in vitro and in vivo, compared with sorafenib alone. Moreover, sorafenib combined with W AY-262611 increased cleaved Caspase-3 (P < 0.01), but decreased the Ki67 (P < 0.05) and EMT markers, compared with sorafenib alone.
Conclusion: Inhibition of DKK1 significantly enhanced anti-tumor efficacy of sorafenib through inhibition of PI3K/Akt/Wnt signaling, which might be a novel therapeutic strategy in HCC.

FRI-388
Liver spheroids engrafted in the anterior chamber of the eye—a novel platform to study hepatic physiology and pathology
Francesca Lazzeri-Barcelo1, Nuria Vilarnau2, Barbara Leibiger1, Volker Lauschke1, Per-Olof Berggren1, Noah Moruzzi1.
1Karolinska Institute, Molecular Medicine and Surgery, Stockholm, Sweden; 2Karolinska Institutet, Physiology and Pharmacology, Stockholm, Sweden

Background and aims: The tools for liver research have hugely advanced in the last decades, but the field still contends with two important limitations; the de-differentiation of primary hepatocytes outside the liver, and longitudinal in vivo imaging at cellular resolution. Liver spheroids are the current gold standard for in vitro liver studies, but lack the complexities of the natural microenvironment. The anterior chamber of the eye (ACE) of mice can be used as a transplantation site, where the cornea acts as a natural window, through which microtissues engrafted on the iris can be imaged by confocal microscopy. In this work, we aim to establish and characterise a platform for non-invasive in vivo longitudinal imaging of mouse liver spheroids engrafted in the ACE and explore its suitability for different areas of liver research.

Method: Mouse liver spheroids were generated in vitro and transplanted into the ACE of recipient mice, where they engrafted and were imaged by confocal microscopy. Fluorescent probes were administered intravenously during in vivo imaging to identify cells and structures. Ex vivo techniques such as immunofluorescence, transmission electron microscopy, RNA in situ hybridization and RNA sequencing were used to characterise the engrafted liver spheroids. To investigate the functions of the engrafted spheroids, hepatic fat accumulation was induced by feeding transplanted recipient mice a high-fat-high-fructose diet (HFHFrD) or control diet for 12 weeks.

Results: Transplanted liver spheroids engraft on the iris and become vascularised and innervated. In vivo imaging of liver spheroids in the eye shows functional vascular and bile canaliculi networks and active hepatic LDL uptake. Ex vivo characterisation demonstrates that the liver spheroids recapitulate hepatic markers and architectural features of the liver. Lipid droplet staining confirmed fat accumulation in the ACE-liver spheroids of mice fed a HFHFrD in comparison to control animals, suggesting that engrafted liver spheroids can mirror and report on endogenous liver function.

Conclusion: We have established and characterised a platform for intraocular non-invasive imaging of liver-like tissue, opening the way for longitudinal study of liver functions. Our data show ACE-engrafted liver spheroids retain overall differentiation and functionality status post-transplantation. This liver spheroid ACE imaging platform therefore has potential to facilitate the longitudinal study of liver pathophysiology in both pre-clinical and basic research.

FRI-389
With-in patient comparison of single-cell versus single-nucleus sequencing on human transjugular liver biopsies
Lukas Van Melkebeke1,2, Jef Verbeek1,2, Dóra Bihary3,4, Markus Boesch1, Hannelie Korf1, Diether Lambrechts3,4, Schalk van der Merwe1,2, KU Leuven, Laboratory of Hepatology, Belgium; 2University hospitals Leuven, Gastro–enterology and Hepatology, Belgium; 3KU Leuven, Laboratory for Translational Genetics, Belgium; 4VIB, Center for Cancer Biology, Belgium
Email: lukas.vanmelkebeke@kuleuven.be

Background and aims: RNA sequencing at single cell level has advanced discoveries in translational research. In patients with advanced liver disease, with ascites or coagulation defects, transjugular liver biopsy (TJB) is the only safe way to obtain liver tissue. The ability to successfully apply single-cell (scRNA-seq) or single-nucleus RNA-sequencing (snRNA-seq) using TJB has the potential to uncover unique pathways and targets for therapy in advanced liver diseases.

Method: A protocol was developed for scRNA-seq and snRNA-seq on TJB. A within-patient comparison was made between both techniques in 3 patients with alcohol-related cirrhosis. The analysis was performed using R (v4.1.2). All samples were anchor integrated using Seurat (v4.1.1). Doublets were identified using DoubletFinder (v2.0.3).

Results: In total 31,055 single nuclei and 6,160 single cells were isolated from TJBs, with a significantly higher number of nuclei than cells per sample. All major cell types including hepatocytes, cholangiocytes, mesenchymal, endothelial, NK/T-, myeloid, and B-
cells could be identified (Figure 1). Furthermore, these cell types could be subtyped into 17 different known subclusters. Cell composition differed significantly between both techniques with significantly higher percentages of hepatocytes ($p < 0.05$) and sinusoidal endothelial cells ($p < 0.05$), and significantly lower percentages of NK/T-cells ($p < 0.05$), endothelial cells ($p < 0.01$), vascular smooth muscle cells ($p < 0.05$), hepatic artery endothelial cells ($p < 0.05$) and monocytes ($p < 0.05$) in snRNA-seq compared to scRNA-seq. In absolute numbers, there was a significantly higher number of hepatocytes ($p < 0.05$) in snRNA-seq. In a direct comparison of snRNA-seq and scRNA-seq, long non-coding RNA was upregulated in snRNA-seq, and mitochondrial and ribosomal RNA were upregulated in sc-RNAseq. Importantly, stress-related genes (e.g. heat shock proteins) were also upregulated in scRNA-seq. Based on the gene signature of scRNA-seq, we could correctly identify the cell type of 96.9% of the nuclei and vice versa for 96.7% of the cells. gProfiler was used to compare functional pathways (gene ontology) between cell types. The top upregulated functional pathways calculated for one cell type using one technique were highly significantly upregulated in the corresponding cell type with the other technique.

Conclusion: We describe a working protocol enabling the use of scRNA-seq and snRNA-seq on TJBs, allowing the application of these techniques in advanced liver disease. Furthermore, using a within-patient comparison of both techniques, we found that both techniques recover hepatic cell types at a different composition. Importantly, the gene signature and top upregulated functional pathways of the cell types were highly comparable between the two techniques.

FRI-390
Accumulation of apical bulkheads and hepatocyte rosettes as adaptive responses upon impaired bile flow in liver diseases
Carlotta Mayer1, Sophie Nehring2, Michael Kücken3, Urska Repnik4, Sarah Seifert7, Aleksandra Sljukic1, Julien Delpierre1, Hernan Morales-Navarrete1, Sebastian Hinz2, Mario Brosch6, Brian K. Chung7, Tom Hemming Karlsen7,8, Yannis Kalaidzidis1, Lutz Brusch1, Jochen Hampe2,6, Clemens Schafmayer5, Marino Zerial1. 1Max Planck Institute of Molecular Cell Biology and Genetics, Dresden, Germany; 2University Hospital Carl-Gustav-Carus, Department of Medicine I, Gastroenterology and Hepatology, Dresden, Germany; 3Technische Universität Dresden, Center for Information Services and High-Performance Computing, Germany; 4Christian-Albrechts-Universität zu Kiel (CAU), Center for Information Services and High-Performance Computing, Germany; 5University Hospital Rostock, Department of General Surgery, Germany; 6Technische Universität Dresden (TU Dresden), Center for Regenerative Therapies Dresden (CRITD), Germany; 7Oslo University Hospital Rikshospitalet, Norwegian PSC Research Center, Department of Transplantation Medicine, Clinic of Surgery, Inflammatory Medicine and Transplantation, Norway; 8Oslo University Hospital and University of Oslo, Research Institute of Internal Medicine, Clinic of Surgery, Inflammatory Diseases and Transplantation, Norway

Email: zerial@mpi-cbg.de
Background and aims: Hepatocytes form a network of bile canaliculi that dynamically respond to the signaling activity of bile acids and to changes in bile flow. During embryonic development hepatocytes assemble specialized structures, termed apical bulkheads, that enforce the elongation of bile canaliculi.

Method: We hypothesized that apical bulkheads protect bile canaliculi against impaired bile flow and increased canalicular pressure in the adult liver.

Results: We found that hepatocytes accumulate apical bulkheads in liver tissue from patients with primary sclerosing cholangitis (PSC) and different mouse models, suggesting that apical bulkheads are an adaptive response of adult hepatocytes towards changes in bile flow. We assessed the underlying molecular mechanism in primary hepatocytes and 3D organoids in-vitro and determined that high-pressure conditions can induce abnormally dilated and rearranged bile canaliculi that are characterized by the absence of apical bulkheads. We found morphologically similar structures in patients with PSC, that resemble so-called liver cell rosettes described in other liver diseases. Using 3D reconstruction of the bile canalicular network in PSC patients and mathematical modeling to infer canalicular pressure, we found that the formation of liver cell rosettes positively correlates with canalicular pressure and occurs already early in PSC progression.

Conclusion: Our results reveal a novel protective mechanism against impaired bile flow and highlight the role of canalicular pressure in the pathogenesis of liver diseases with potential implications for diagnosis and treatment.

FRI-391

Long-term effects in primary human hepatocytes (PHH) after exogenous exposure to human intestinal microbiome secretome peptides

Natalia Sanchez-Romero1,2, Pilar Sainz de la Maza Arnal1,2, Maria Jesús Lozano Limones1,2, Mario Fernández Sanz1, Sara Borrego Bernal1, Pedro Baptista1,3,4,5, and Alvaro Blanes Rodriguez1, Sandra Melitón Barbancho1.

Background and aims: The human intestinal microbiome's effects on several biomarkers for liver stress, including lipidomic profile and indicators of antioxidant status. The highest up- and down-regulated genes were involved in positive regulation of I-kapppB kinase/NF-kappaB repair via homologous recombination which included RAD51, BRCA2, XRCC2 and XRCC3. The down-regulated genes were enriched with double-strand break signaling, angiogenesis and wound healing. TNF-α, TNF receptor 1 (TNFR1) and NF-kB-p65 were also reduced after treatment with crocin. Most dysregulation of metabolites we reported was centered on several biomarkers for liver stress, including lipidomic profile and indicators of antioxidant status. The highest up- and down-regulated
metabolites were dopamine glucuronide and L-carnitine intermedi- 
ate molecules, respectively.

**Conclusion:** The dual omics datasets describe routes to widespread 
protein destabilization and DNA damage from crocin-induced 
oxidative stress in HepG2 cells.

---

**Immune-mediated and cholestatic disease Clinical aspects**

---

**WEDNESDAY 21 TO SATURDAY 24 JUNE**

**TOP-061**

Long-term prospective follow-up of a primary biliary cholangitis (PBC) multicenter cohort treated with Obeticholic Acid (OCA). Interaction effect of triple therapy with fibrates

Elena Gómez-Domínguez1, Esther Molina2, Luisa García-Buey3, Marta Casado4, Marina Berenguer5, Isabel Conde6, Miguel Angel Simón7, Pedro Costa-Moreira8, Guilherme Macedo9, Rosa M. Morillas9, José Presa10, Francisco Jorquera11, Javier Ampuero12, José Manuel Sousa-Martin13, Antonio Oliveira Martin14, Manuel Hernández Guerra15, Juan Ignacio Arenas16, Arsenio Santos17, Armando Carvalho18, Juan ISidro Uriz Otano19, Maria Luisa Gutierrez Garcia20, Elia Perez-Fernandez21, Conrado Fernandez-Rodriguez22, 1Hospital Universitario 12 de Octubre, Spain; 2Hospital Universitario de Santiago de Compostela, Spain; 3Hospital Universitario de La Princesa, Spain; 4Hospital de Torrecardenas, Spain; 5Hospital Universitario La Fe, Spain; 6Hospital Universitario Lozano Blesa, Spain; 7Hospital General de Castilla-La Mancha, Spain; 8Hospital Germans Trias i Pujol, Spain; 9Servicio de Medicina Interna. Centro Hospitalar De Trás-Os-Montes E Alto Douro., Portugal; 10Service of Gastroenterology. Complejo Asistencial Universitario de León. IBIMED and CIBERRehD, León, Portugal; 11Hospital Universitario Virgen del Rocío, Spain; 12Hospital Universitario Virgen del Rocío, Spain; 13Service of Gastroenterology. La Paz University Hospital, Madrid, Spain; 14Hospital Universitario de Canarias, Tenerife, Spain; 15Hospital Universitario de Donostia, Spain; 16Centro Hospitalar e Universitário de Coimbra, Portugal, Spain; 17Centro Hospitalar e Universitário de Coimbra, Portugal; 18Hospital Universitario de Navarra, Pamplona, Spain; 19Hospital Universitario Fundación Alcorcón, Spain; 20Hospital Universitario Fundación Alcorcón., Instituto de Investigación, Spain; 21Hospital Universitario Fundación Alcorcón, Spain.

**Background and aims:** About one third of patients with primary biliary cholangitis (PBC) have a suboptimal response to ursodeoxycholic acid (UDCA) and have a worse prognosis. Although clinical trials have shown varying degrees of response to second line therapies, there are few data on their long-term effectiveness and safety. Our aim was to determine the long-term effect of second-line therapies on liver function, POISE response and GLOBE-PBC and 5-yr-UK-PBC scores in a multicentre cohort of patients with PBC who did not respond to UDCA according to Paris II criteria.

**Method:** Prospective, multicenter, real practice study cohort of Paris II UDCA non-responders from 17 hospitals who received obeticholic acid (OCA) or OCA plus fibrates. End points were effect on
biochemical, liver function, GLOBE-PBC and 5yr-UK-PBC scores and response to POISE criteria at 12, 24 and 36 months and liver-related survival and safety.

Results: One hundred and ninety-one patients were included; median follow-up 26.6 months (IQR 16.1–36.9). There was a reduction in alkaline phosphatase (ALP), GGT, aminotransferases and GLOBE-PBC score (p < 0.001) and an increase in serum albumin levels (p = 0.012) (Fig. 1). By intention-to-treat (ITT), 40.1% (95% CI 32.9–47.8) achieved POISE response at 12 months. Triple therapy was associated with POISE response (Adjusted aRR = 0.63, 95% CI 0.43–0.93, p = 0.02). Compared to POISE responders at 12 months, late-responders had a longer time from diagnosis (p = 0.007) and lower albumin levels (p = 0.009) (Fig. 1). Liver-related events occurred more frequently in patients with cirrhosis (p < 0.001). Within this group, events were limited to those patients with abnormal platelets value and serum albumin below 1.3 times the normal value.

Conclusion: This study shows long-term improvement in biochemistry, liver function and Globe-PBC in patients on second line treatment. POISE response was associated with earlier stages of disease and triple therapy. Treatment was safe in patients with early-stage cirrhosis.

TOP-062
Change in serum bile acids correlates with improvement in itch in patients with primary biliary cholangitis receiving linerixibat

Eleni Karatza1, Fernando Carreño2, Sumanta Mukherjee4, Linda Casillas2, James Fettplace2, Megan McLaughlin2, Brandon Swift4, 1The University of North Carolina at Chapel Hill, NC, United States; 2GSK, Collegeville, PA, United States; 3GSK, London, United Kingdom; 4GSK, Durham, NC, United States
Email: brandon.x.swift@gsk.com

Background and aims: Pruritus (itch) affects up to 3/4 of patients with primary biliary cholangitis (PBC) over the course of their illness. Bile acids (BA) are an important pathophysiological mediator of cholestatic pruritus. Linerixibat, a selective small-molecule inhibitor of the ileal bile acid transporter, reduced circulating BA levels and improved itch in patients with PBC. Here, we analyse the relationship between linerixibat dose and change in total serum BA (TSBA) over time and explore correlation between change in TSBA and change in itch.

Method: Data from Phase 1/2 studies of healthy volunteers or patients with PBC were used to develop a population dose-pharmacodynamic (k-PD) model to characterise the linerixibat dose-TSBA relationship. Simulations were performed to explore the effect of linerixibat dose and regimen on daily TSBA profiles. Individual Bayesian parameter estimates for subjects in GLIMMER, a Phase 2b study of linerixibat in patients with PBC and moderate to severe pruritus (NCT02966834), were used to derive the area under the TSBA concentration-curve (AUC0–24). These post hoc estimates of AUC0–24 were correlated with itch reported on a 0–10 numerical rating scale (NRS). In GLIMMER, 4 weeks single-blind placebo (baseline – Week 4) was followed by a randomised, double-blind 12-week treatment period with linerixibat or placebo (to Week 16), and a further 4 weeks single-blind placebo (to Week 20). 1 Mean worst daily itch (MWDI) and monthly itch score (MIS) were calculated as described previously. Itch responders were defined as having a ≥2 point improvement in itch score from baseline.

Results: The final population k-PD model successfully described the effect of linerixibat on TSBA in PBC. Linerixibat treatment resulted in a rapid dose-dependent decrease in TSBA AUC0–24; the reduction in TSBA AUC0–24 reached steady-state after approximately 10 days. Baseline TSBA concentrations did not correlate with change from baseline in MIS at Week 16 (r = −0.13, p = 0.14). At Week 16, there was a moderate correlation between change in TSBA AUC0–24 and change in MIS from baseline (r = 0.27, p = 0.002), which dissipated during the placebo washout period (Week 20; r = 0.011, p = 0.91). Change in TSBA AUC0–24 strongly correlated with improvement in MWDI score from baseline over the 12-week treatment period (r = 0.52, p < 0.0001; Figure). A ≥30% decrease in TSBA AUC0–24 was approximately 64% associated with an itch response.

Conclusion: Linerixibat treatment leads to rapid and dose-dependent reductions in TSBA. Baseline TSBA levels do not correlate with on-treatment change in NRS itch score, suggesting they do not predict linerixibat response. Change in TSBA over the double-blind treatment period correlates significantly with, and can be predictive of, improvement in itch in patients with PBC.

Reference

TOP-063
Seladelpar treatment resulted in correlated decreases in serum IL-23 and pruritus in patients with primary biliary cholangitis (PBC): post-hoc results from the phase 3 randomized, placebo-controlled ENHANCE study

Andreas E. Kremer1, Marlyn J. Mayo2, Gideon Hirschfield3, Cynthia Levy4, Christopher Bowlus5, Charles McWherter6, Yun-Jung Choi7, 1University Hospital Zürich, Department of Gastroenterology and Hepatology, Zürich, Switzerland; 2University of Texas SW Medical Center, Division of Digestive and Liver Diseases, United States; 3University Health Network, Toronto Centre for Liver Disease, Toronto, Canada; 4University of Miami Miller School of Medicine, Division of Digestive Health and Liver Diseases, Miami, United States; 5University of California Davis, Department of Internal Medicine, Sacramento, United States; 6Newcastle University, Clinical and Translation Research Institute, Newcastle upon Tyne, United Kingdom; 7CymaBay Therapeutics, Inc., Newark, United States
Email: andreas.kremer@usz.ch

Figure: Individual Bayesian estimate of TSBA change from baseline AUC0–24 correlates with change in mean worst daily itch score from baseline over the 12-week treatment period. TSBA AUC0–24 and change in MIS from baseline were correlated (r = 0.52, p < 0.0001; Figure). A ≥30% decrease in TSBA AUC0–24 was approximately 64% associated with an itch response.
Background and aims: Pruritus is a debilitating symptom impacting the quality of life for many people living with PBC. Interleukin-31 (IL-31) is a cytokine reported to be mechanistically relevant to pruritus and its treatment, including those with cholestasis. Treatment with seladelpar, a selective PPAR-delta agonist, is associated with significant improvement in pruritus in PBC. Here we report the effect of seladelpar on serum IL-31 levels and its association with pruritus in patients with PBC.

Method: IL-31 levels were quantified in serum samples from the ENHANCE study of seladelpar (EudraCT 2018-001171-20) in patients with PBC who received daily oral doses of placebo (n = 55), seladelpar 5 mg (n = 53) or 10 mg (n = 53) for 3 months. Serum IL-31, bile acids and their correlation with patient-reported pruritus numerical rating scale (NRS, 0–10) were assessed.

Results: Baseline IL-31 levels positively correlated with pruritus NRS (r = 0.54, p < 0.0001). Patients with NRS ≥ 4 had significantly higher baseline median [IQR] IL-31 compared to patients with pruritus NRS < 4 (7.6 pg/ml [1.2, 14.5] vs 12 pg/ml [0.3, 2.8], p < 0.0001). At baseline, IL-31 was also correlated with serum total bile acids (r = 0.54, p < 0.0001) and ALP (r = 0.44, p < 0.0001). Seladelpar treatment strongly decreased mean IL-31 levels from baseline to Month 3: seladelpar 5 mg (3.8 to 1.7 pg/ml, p < 0.001) and 10 mg (4.2 to 1.7 pg/ml, p < 0.001) compared to placebo (4.3 to 3.9 pg/ml, not significant). A substantial dose-dependent % decrease in IL-31 was observed with seladelpar treatments: seladelpar 5 mg (~30%, p < 0.001) and 10 mg (~52%, p < 0.0001) compared to placebo (+31%). Patients with a clinically meaningful improvement in pruritus NRS (≥2 decrease) demonstrated greater dose-dependent reductions in IL-31 from baseline compared to those without pruritus improvement. We also observed significant correlations between changes in IL-31 vs pruritus NRS (r = 0.54, p < 0.0001) and ALP (r = 0.40, p < 0.01), but neither with ALT nor AST, in the seladelpar 10 mg group. Changes in IL-31 and total bile acids correlated in the seladelpar 10 mg group (r = 0.63, p < 0.0001).

Conclusion: Seladelpar dose-dependently decreased IL-31 in patients with PBC. Reduction in serum IL-31 correlated with pruritus improvement. These results suggest that IL-31 may have a role in pruritus in patients with PBC. It may also be a biomarker related to the anti-pruritic effects of seladelpar.
mortality models were fitted and combined with population projections from the Office for National Statistics to forecast prevalence with 95% prediction intervals (PIs) from 2020 to 2027. Prevalence estimates were censored at the point of death or transplantation.

**Results:** We identified 1550 individuals with PSC and prior diagnosis of IBD on 1st Jan 2015, yielding a point prevalence of 5.0 per 100,000 population. An additional 12% were diagnosed with IBD in the 5 years following PSC presentation, yielding an estimated adjusted point prevalence of 5.6. Comparatively, point prevalence of IBD alone was 384.3. The prevalence of PSC-IBD increased to 7.6 in Jan 2020, and for IBD alone to 538.7. The average annual percentage change (AAPC) was 8.8% for PSC-IBD and 7.0% for IBD alone. The region with peak PSC-IBD prevalence was the East of England (9.4) and lowest in the Southwest (6.4). Reciprocally for IBD alone, peak prevalence was observed in the Northeast (585.2) and the lowest in the West Midlands (482.6). The group of PSC-IBD pts estimated to have the largest growth during this time were men compared to women (AAPC 11.1% and 7.6%, respectively), PSC with Crohn’s disease (CD) over PSC with ulcerative colitis (UC) (10.3% and 8.4%), and pts aged 30–44y (18–29y: 8.8%, 30–44y: 12.3%, 45–60y: 5.9%). By contrast for IBD alone, the AAPC for men and women, CD and UC, and across age groups were all similar, falling between 5.9% and 7.3%.

The prevalence of PSC-IBD in year 2027 is forecasted to increase to 11.7 per 100,000 (95% PI: 10.8–12.7) yielding an estimated 3683 people living with the condition (Fig. 1A–C). This increases to 4125 when including pts diagnosed with IBD after PSC. The largest group of people living with PSC-IBD in 2027 are estimated to be men (15.2 per 100,000; 14.1–16.4), with PSC-UC (9.0; 8.3–9.7), and aged 30–44y (13.5; 12.5–14.6). In turn, the number of people aged 18–60 years living with IBD alone is estimated to increase to 233,603 in 2027 (Fig. 1D–F). The largest group of individuals with IBD alone are estimated to be women (758.7 per 100,000; 95% PI: 750.3–767.4), with UC (455.7; 451.0–460.4), and those aged 30–44y (908.7; 900.3–916.5).

**Conclusion:** The rate of growth in PSC-IBD is not explained by that of IBD alone and unique with regards of heightened prevalence. Additionally, our data provides nationwide estimates reflecting the current and future landscape of PSC-IBD, which may be used to inform health technology assessments, service evaluation, and allow policy makers to develop strategies for high-quality and cost-effective care in rare liver disease.
Mette Vesterhus1,2,3.

Background and aims: Progressive Familial Intrahepatic Cholestasis (PFIC) is a collection of disorders in bile formation leading to intrahepatic cholestasis, chronic liver disease, and severe pruritus with markedly reduced quality of life from several domains including sleep. MARCH-PFIC was a phase 3, 26-week randomized trial of maralixibat (MRX), an ileal bile acid transporter (IBAT) inhibitor, that achieved its primary and key secondary end points of improvements in pruritus and serum bile acids for patients with PFIC. Here, we further characterize the pruritus response and changes in sleep in the MARCH-PFIC trial.

Method: Key inclusion criteria for MARCH-PFIC were genetically-confirmed PFIC and ItchRO (Obs) >1.5 (moderate-to-severe pruritus). Participants were randomized to receive MRX 570 μg/kg BID or placebo (PBO). The primary analysis evaluated pruritus as assessed by the caregiver using ItchRO (Obs) 0–4 scale; as well as by physician using the Clinician Scratch Scale (CSS). Sleep was assessed using the Exploratory Diary Questionnaire (EDQ[Obs]). Responses for pruritus and sleep were determined as the average in weekly score using a mixed-effects model with recurrent measurements for Change from Baseline (CBF) through Week 26.

Results: 64 patients [nt-BSEP (n = 31), FIC1 (n = 13), MDR3 (n = 9), TJP2 (n = 7), and MYO5B (n = 4)] were randomized to MRX (n = 33) or PBO (n = 31). Baseline characteristics were well-balanced as previously reported. Baseline pruritus score was 2.9 vs 2.7 for MRX and PBO. From Baseline to Week 26, the proportion (SE) of pruritus improvement in this domain of quality of life.

Conclusion: According to the new definition, DS is frequent in patients with PSC and associated with increased signs of cholestasis, more advanced bile duct disease and more frequent prevalence of biliary dysplasia.

Background and aims: Liver diseases commonly present with indices of mitochondrial dysfunction, yet little is known about this in primary sclerosing cholangitis (PSC). By analysing circulating and liver-resident molecules that indirectly reflect mitochondrial dysfunction, we aimed to comprehensively characterize the degree of this deficit in PSC, and whether this was PSC specific or corresponded to the degree of cholestasis.

Method: In this cross-sectional study, we included 190 non-transplant PSC patients (NoPSC biobank, Norway) and 100 healthy controls (mean age ± SD: 41 ± 14.1 and 42.4 ± 6.6, respectively) who had donated blood, and explanted liver tissue extracts from 24 PSC patients and 18 non-cholestatic liver disease controls (AHL and ARLD). Using mass spectroscopy, we profiled fatty acids, carnitine and 

Background and aims: Progressive Familial Intrahepatic Cholestasis: data from MARCH-PFIC

Richard Thompson1, Douglas Mogul2, Tiago Nunes2, Will Garnar2, Pamela Vig4, Alexander Miettisla1,3, King’s College London, Institute of Liver Studies, London, United Kingdom; 2Mirum Pharmaceuticals, Inc., Foster City, California, United States; 3Cincinnati Children’s Hospital Medical Center, Cincinnati, Ohio, United States

Email: richard.j.thompson@kcl.ac.uk

Background and aims: Maralixibat leads to significant reductions in pruritus and improvements in sleep for children with progressive familial intrahepatic cholestasis: data from MARCH-PFIC

WED-252

WED-253

Dominant strictures in patients with primary sclerosing cholangitis: comparison between old and new definition

Andrea Tenca1, Hannah Kautiainen2, Mathias Thylin1, Lauri Puustinen1, Nina Barner-Rasmussen1, Kalle Jokelainen1, Martti Färkkilä1, 2Helsinki University Central Hospital, Finland; 1Medicare, Finland; 1Porvoon Hospital, Finland

Email: ante14@hotmail.it

Background and aims: Patients with primary sclerosing cholangitis (PSC) may develop a dominant stricture (DS) in up to 50% of the cases. DS is associated with an impaired prognosis and its presence in the hilum should always be regarded as a warning sign for cholangiocarcinoma (CC). The traditional definition of DS (TDS, i.e. a narrowing ≤ 1 mm in the common hepatic duct, CHD, 2 cm within the bifurcation and ≤ 1.5 mm in the common bile duct, CBD) has been recently replaced by a new definition (NDS) which combines patient’s symptoms and signs of cholestasis, elevation of alkaline phosphatase (P-ALP) and P-bilirubin and response to the endothero (i.e., dilatation and/or stenting). However, the impact of the NDS definition in disease course of PSC has not been evaluated.

Method: In this longitudinal prospective cohort study, all PSC patients referred for endoscopic retrograde cholangio-pancreatography (ERCP) to confirm diagnosis or to screening biliary dysplasia have been recruited between October 2021–2022. Symptoms of cholestasis and laboratory tests before and after ERCP were collected. Cholangiographic images were scored by using Helsinki score and the presence of TDS and NDS was reported. In addition, need for dilation or stenting and data of brush cytology findings were also collected. Variables were presented as median and interquartile range (IQR) or mean and standard deviation (SD) when ordinal and as number and percentage (%) when nominal. Fish’s exact test, Chi-squared test and Mann-Whitney tests were used when appropriate.

Results: Overall, 248 patients underwent ERC for confirmation of diagnosis in 28 (11%) or screening for biliary dysplasia in 216 (89%). TDS was detected in 62 (25%) and NDS in 43 (17%) patients, respectively; in the remaining 143 patients no DS was observed. Patients with NDS had more symptoms (NDS 17, 40% vs TDS 1, 2%, p < 0.001). P-ALP, NDS 288 IU/l (IQR 233–419) vs TDS 94 IU/l (IQR 74–129), and P-bilirubin, NDS 17, μmol/l (IQR 11–28) vs TDS 13 (IQR 9–17), were elevated in patients with NDS compared with those with TDS. Helsinki-score showed more advanced bile duct disease in patients with NDS, TDS 3 (IQR 2–5) vs TDS 1 (IQR 0–2), p = 0.001. As expected, patients with NDS needed more dilatation, NDS 35; (81%) vs TDS 37; (60%), p < 0.001 and stenting, NDS 9 (21%) vs TDS 3 (5%), p < 0.001. After endotherapy P-ALP decreased more in patients with NDS, 258 IU/l (IQR 211–354) vs TDS 114 IU/l (IQR 77–192), p < 0.001. Biliary dysplasia was detected more frequently in patients with NDS (9%) vs TDS (5%), p = 0.004.

Conclusion: According to the new definition, DS is frequent in patients with PSC and associated with increased signs of cholestasis, more advanced bile duct disease and more frequent prevalence of biliary dysplasia.

WED-254

Mitochondrial dysfunction and lipid alterations in primary sclerosing cholangitis

Guri Fossdal1,2,3, Peder Rustøen Braa1d,1,4, Johannes R. Hov1,4, Eystein Husebye3, Trine Frolsenaa,1,4, Tom Hemming Karlsena,1,4, Rolf Berge3, Mette Vesterhus1,2,3, 1Oslo Universitetssykehus HF, Rikshospitalet, Norwegian PSC Research Center, Norway; 2Haraldsplass Diakonale Sykehus, Department of Medicine, Bergen, Norway; 3University of Bergen, Department of Clinical Science, Bergen, Norway; 4University of Oslo, Institute of Clinical Medicine, Oslo, Norway

Email: mette.vesterhus@uib.no

Background and aims: Primary sclerosing cholangitis (PSC) is a chronic cholan-
acetylcarnitines, and metabolites in the tryptophan-kynurenine-nicotinamide (Trp-Kyn-NAD) pathway.

Results: Compared to healthy controls, we found that PSC patients had increased palmitate (C16:0) but reduced levels of long-chain saturated fatty acids (SFAs) and higher levels of all measured monounsaturated fatty acids (MUFAs) in the circulation. Notably, these characteristics were more pronounced in PSC patients with cholestasis (bilirubin levels ≥ULN [25 μmol/L]). Several n-3 polyunsaturated fatty acids were elevated in PSC but were similar among cholestatic and non-cholestatic patients. We found reduced acylcarnitine ratios C2/C5 and C2/C3 in PSC, indicating deficits in mitochondrial fatty acid oxidation, and larger deficits in cholestatic patients. Levels of intermediates in the tryptophan-kynurenine pathway indicated reduced NAD biosynthesis, which is compatible with impaired energy supply to mitochondria in PSC. While not as apparent as in plasma, explanted liver tissue from PSC patients with high bilirubin at time of surgery also showed evidence of decreased long-chain SFAs and elevated MUFAs. However, fatty acid profiles were overall similar between livers from PSC and non-cholestatic liver disease patients, suggesting that the observed indications of mitochondrial biosynthesis in PSC may not be conditional on cholestasis.

Conclusions: Using indirect measures of mitochondrial dysfunction in blood, we find that mitochondrial dysfunction is prominent in PSC and worsens with disease progression and increasing cholestasis. The important but unresolved question is whether impaired mitochondrial function is a marker of liver disease and severity, or an underlying disease driver that could be targeted therapeutically.

WED-255

The socioeconomic status, epidemiology, and outcomes of people living with primary sclerosing cholangitis-inflammatory bowel disease in Ontario, Canada: a two-decade analysis

Kris Leung1,2, Wenbin Li1, Bettina Hansen1,2,3, Abdel Aziz Shaheen4, Aliya Gulamhusein5, Jennifer Flemming2,6, Gideon Hirschfield2.

1 Institute of Health Policy, Management and Evaluation, Toronto, Canada; 2 Toronto Centre for Liver Disease, University Health Network, University of Toronto, University Health Network, Canada; 3 Erasmus MC, Rotterdam, Netherlands; 4 University of Calgary, Division of Gastroenterology and Hepatology, Department of Medicine and Community Health Sciences, Canada; 5 Institute for Clinical Evaluative Sciences, Canada; 6 Queen’s University, Division of Gastroenterology, Department of Medicine, Kingston, Canada

Email: k.leung333@gmail.com

Background and aims: Understanding the total disease burden of primary sclerosing cholangitis (PSC) with inflammatory bowel disease (IBD) in the diverse province of Ontario (population ~15 million) is important to anticipate healthcare needs and improve outcomes.

Method: A population-based cohort of individuals with PSC-IBD was derived using health administrative data at the Institute for Clinical Evaluative Sciences in Ontario from 2002 to 2018. Patients were excluded if transplant occurred prior to PSC diagnostic code use or had competing liver disease diagnoses for other autoimmune liver diseases, hemochromatosis, alpha-1-antitrypsin deficiency, and/or Wilson disease. We described individual (age, sex) and census dissemination area-level demographics (household income, ethnic diversity, material deprivation, residential instability, and financial dependency). We also described incidence/prevalence (standardized to the 2011 Canadian population) and transplant-free survival (censored December 31, 2021). Changes in incidence and prevalence over time were evaluated using joinpoint regression.

Results: There were 888 incident cases of PSC-IBD identified; 62% were male, with median age at PSC diagnosis of 47 yrs. (IQR 32–62 yrs.). The majority were long-term residents/citizens (92%) and resided in non-rural areas (87%) at diagnosis, with an equal distribution diagnosed in areas of varying ethnic diversity. Patients identified tended to be more from areas of higher income (49.7% in two highest quintiles) and lower material deprivation (49.6% in two lowest quintiles). This disparity was also reflected in residential instability and financial dependency indices. The overall age and sex-adjusted incidence and prevalence rate of PSC-IBD in Ontario was 0.46 (95% CI 0.43–0.49) and 5.5 (95% CI 5.4–5.6) per 100,000 person-years respectively. Incidence increased at a 1.60 average annual percent change (APC). Prevalence increased at a 4.84 average APC 2002–2015; from 2015 to 2018, prevalence increased slightly less at a 2.44 average APC. Patients who are diagnosed with IBD prior to PSC have worse clinical outcomes, with twice the rate of death/transplant compared to vice versa (Figure), with 5-year transplant-free survival from PSC diagnosis of 68% vs. 90% (log-rank p value <0.001). Increasing age at diagnosis and long-term residence in Ontario were also significantly associated with increased rates of death/transplant in PSC-IBD.

Conclusion: There is a clear gradient favouring PSC-IBD diagnosis in those with higher socioeconomic status on a background of steadily increasing incidence and prevalence in Ontario. Transplant-free survival is significantly worse in those diagnosed with IBD prior to PSC compared to those diagnosed with PSC first.

WED-256

Baseline characteristics and risk profiles of 1111 patients with primary biliary cholangitis (PBC) in need of second-line therapy

Gideon Hirschfield1, Kris Kowdley2, Andreas E. Kremer4, John M. Vierling2, Christopher Bowlsus3, Cynthia Levy6, Marlyn J. Mayo1, Daria B. Crittenden4, Mary Staden6, Ke Yang4, Yun-Jung Choi4, Charles McWherter4. 1 Toronto Centre for Liver Disease, University Health Network and Division of Gastroenterology and Hepatology, Toronto, Canada; 2 Liver Institute Northwest, Seattle, United States; 3 University Hospital Zürich, Zurich, Switzerland; 4 Baylor College of Medicine, Houston, United States; 5 University of California Davis School of Medicine, Sacramento, United States; 6 Schiffl Center for Liver Disease.
Background and aims: Ursodexoxycholic acid (UDCA) is the first-line treatment for primary biliary cholangitis (PBC). Up to 40% of patients receiving UDCA have an alkaline phosphatase (ALP) ≥ 1.67 × ULN and are usually considered for second-line therapy to prevent progression. Cohort studies confirm that targeting normal ALP and bilirubin are better treatment goals. We examined patients who screen failed due to elevated ALP ≥ 1.67 × ULN to further characterize this population, including presence of additional risk factors for progression.

Method: In four clinical trials with seladelpar from 2015 to 2022, 1111 patients with PBC were screened at 197 clinical sites in 27 countries after treatment with UDCA for ≥12 months, or intolerance to UDCA. ALP levels of ≥1.67 × ULN were required for enrollment. We compared the baseline characteristics and risk profiles of patients enrolled (ALP ≥ 1.67 × ULN) to those who screen failed due to ALP ≥ ULN, but <1.67 × ULN. We stratified using proportions with Enhanced Liver Fibrosis (ELF) values ≥10.0 or bilirubin levels >0.6 × ULN. The relationship of ELF and liver stiffness assessed with FibroScan® was confirmed when available.

Results: The 1111 screened patients were predominantly female (94%) with a mean (SD) age of 57 ± 9.5 years. Studies enrolled 54% of screened patients (n = 603) (EN cohort) with a duration of PBC of 8 ± 6 years and on a UDCA dose of 15 ± 3.9 mg/kg/day (92% were on UDCA). Overall, 26% of patients (n = 284) screen failed due to ALP > ULN, but <1.67 × ULN. The most common reasons for screen failure in the remaining 20% of patients were ALT > 3 × ULN, ALP < 1 × ULN, and EGF < 60. Meaningful differences in baseline values in the EN and SF cohorts were in ALP, GGT and ALT. Higher-risk bilirubin levels were present in 51.1% and 42.0% of EN and SF cohorts, respectively. Elevated risk based on ELF was identified in 43.2% of the EN and 27.2% of the SF cohorts. Liver stiffness was assessed in 66% of EN patients, and a mean liver stiffness of 9.7 kPa correlated with ELF (r = 0.50, p < 0.001).

Conclusion: We found that in this large international cohort of UDCA treated PBC patients, clinical risk factors for disease progression were common in patients achieving ALP levels >ULN, but <1.67 × ULN. Consideration should be given to including this population in clinical research of second-line therapies with a goal of normalization of ALP.

Impact of maralixibat on cholestatic pruritus in adults aged 16 years and older with Alagille syndrome

Gideon Hirschfield1, Douglas Mogul2, Marshall Baek2, Pamela Vig2, Binita M. Kamath3,1. University of Toronto, Toronto Centre for Liver Disease, University Health Network, Toronto, Ontario, Canada; 2Mirum Pharmaceuticals, Inc., Foster City, California, United States; 3The Hospital for Sick Children and the University of Toronto, Division of Gastroenterology, Hepatology and Nutrition, Toronto, Ontario, Canada

Background and aims: Alagille syndrome (ALGS) is an inherited multisystem disorder that is predominantly characterized by bile duct paucity with cholestasis, as well as variable abnormalities in the heart, eyes, face, skeleton, kidneys, and vasculature. Maralixibat (MRX), an inhibitor of the ileal bile acid transporter, was recently approved by the FDA and EMA for the treatment of cholestatic pruritus in patients with ALGS ≥ 1 year of age and ≥2 months of age, respectively. Data in ALGS has primarily been focused on paediatric patients, however adults with ALGS who survive with their native liver may require treatment for cholestasis and pruritus. We report here for the first time on the efficacy and safety of MRX in adults aged 16 years and older with ALGS transitioning to adult care, and adults that initiate treatment.

Method: Individuals with ALGS were included if they received at least one dose of MRX ≥16 years of age within the MRX clinical development program. Pruritus [assessed with ItchRO (Obs), a 0–4 scale with ≥1-point reduction considered clinically meaningful] and serum bile acids (sBA) were assessed at Baseline, average of two values both before and after 16 years, and at end of study. Changes in sBA and pruritus were measured using t-tests.

Results: 14 individuals met inclusion criteria. 11 began treatment at 16 years of age with a median (min, max) age of 13 (11, 15) years at start of therapy and duration of therapy of 3.7 (1.5, 5.9) years with the oldest patient taking MRX at 21 years; 3 patients began MRX ≥ 16 years and were followed for a mean of 3.1 years. All patients received the daily dose appropriate for their weight, with an adult maximum dose of 28.5 mg/day. For individuals that started MRX < 16 years of age, Baseline mean (SE) ItchRO (Obs) was 2.5 (0.21), and significantly decreased to 0.8 (delta = −1.7; p = 0.002), meaning minimal to no itch, prior to age 16 years; pruritus response was durable with no significant change before and after age 16 years (delta = −0.2; p = 0.2), or to end of therapy (delta = 0.2; p = 3). Baseline mean sBA was 130 μmol/L, and significantly decreased to 52 μmol/L (delta = −79; p = 0.03) prior to age 16 years; the reduction was durable with no significant change before and after age 16 years (delta = −0.2; p = 0.3), or to end of therapy (delta = 0.2; p = 3). The three individuals that started MRX ≥ 16 years had improvements in pruritus from baseline (delta in ItchRO [Obs]) of −2.8, −0.6, and −1.0). One patient had a large decrease in sBA (delta = −112 μmol/L) and two had small increases in sBA (delta = 8 and 11 μmol/L). MRX was generally well tolerated with the same safety and tolerability profile observed across the program previously reported.

Conclusion: MRX was effective, durable and well tolerated in ALGS patients aged 16 years and older, providing critical data for patients who transition to adulthood while on therapy. These data support an ongoing role for treatment in adults with ALGS that survive with their native livers into adulthood.
Non-adherence to standard pharmacotherapy in autoimmune hepatitis is associated with over-the-counter medication and steroid treatment. Results from the ERN online survey

Ewa Wunsch1, Linda Krause2, Ansgar W. Lohse3,4, Christoph Schramm5,6, Bernd Löwe5, Natalie Uhlenbusch5, Romée Snijders4,6, José Willems2, Piotr Milkiewicz1,4,6, Tom Gevers4,6,1
1Pomeranian Medical University in Szczecin, Department of Translational Medicine, Poland; 2University Medical Centre Hamburg-Eppendorf, Institute of Medical Biometry and Epidemiology, Germany; 3University Medical Centre Hamburg-Eppendorf, Department of Medicine, Germany; 4RARE-LIVER European Reference Network, Germany; 5University Medical Centre Hamburg-Eppendorf, Department of Psychosomatic Medicine and Psychotherapy, Germany; 6Maastricht University Medical Center, Department of Internal Medicine, Netherlands; 7Dutch Liver Patients Association, Netherlands; 8Warsaw Medical University, Liver and Internal Medicine Unit, Poland

Email: ewa.wunsch@gmail.com

Background and aims: Adherence to treatment is of particular importance to achieving therapy goals in autoimmune hepatitis (AIH), however, several factors can affect medication intake by patients. The aim of this study was to assess adherence to treatment and related factors in AIH among a large, transnational group of patients with autoimmune liver disease (AILD).

Method: A European cross-sectional online survey was conducted in patients with AIH and in a comparison group of patients with primary biliary cholangitis (PBC) and primary sclerosing cholangitis (PSC). Standard prescribed medication was defined as the use of steroids, azathioprine, and other immunosuppressants in AIH; ursodeoxycholic acid in PBC and PSC; and over-the-counter (OTC) medication as non-prescribed drugs and diet supplements, based on patients’ statements. Adherence to prescribed treatment was inferred from the patients’ anonymous answers to questions about the regularity of prescribed treatment intake and defined as skipping their medication less than three times a month and never reducing or stopping their medication by themselves. Multivariable logistic regression analyses were used to identify potentially modifiable factors associated with adherence to treatment while adjusting for known confounders.

Results: A total of 1102 patients with AILD (80% female, mean age 48 ± 14 years) who took prescribed pharmacotherapy for their liver disease were included in the analysis: 444 patients with AIH (85% female, mean age 47 ± 15 years) and 653 patients from the comparison group (77% female, mean age 48 ± 13 years). Based on the applied definition, patients with AIH were the most non-adherent (38%). In the multivariable logistic regression models (Figure), OTC medication use was identified as one common important factor negatively associated with treatment adherence in all patients, most relevant for the AIH group. Among standard treatments, steroids but not azathioprine were negatively associated with adherence in the AIH group.

Conclusion: This anonymous survey revealed high non-adherence in patients with AIH, particularly in those treated with steroids. OTC medication intake may reflect low treatment confidence in standard treatment and should be carefully assessed in patients with AILD in a clinical setting.

Vibration-controlled transient elastography predicts clinical outcomes in patients with autoimmune hepatitis

Narmeen Umar1, Christina Plagiannakos2, Ellina Ltyuyak1, Mark G. Swain1, Lawrence Worobetz4, Catherine Vincent2, Jennifer Flemming3, Andrew L. Mason1, Gideon Hirschfield2, Bettina Hansen1, Aldo J. Montano-Loza1,1 University of Alberta, Canada; 2University Health Network, Canada; 3University of Calgary, Canada; 4University of Saskatchewan, Canada; 5University of Montreal, Canada; 6Queen’s University, Canada

Email: montanol@ualberta.ca

Background and aims: Autoimmune hepatitis (AIH) is a heterogeneous liver disease that varies widely in clinical response and prognosis. The assessment of liver fibrosis in a non-invasive manner during follow-up seems fundamental to predicting disease prognosis and evaluating the effectiveness of therapies. In this study, we aimed to investigate the usefulness of vibration-controlled transient elastography (VCE) in prognosis in a large cohort multicentric study of patients with AIH across Canada.

Method: We evaluated 761 patients with AIH who had a simplified international score ≥ 6 from the Canadian Network for Autoimmune Liver Diseases (CaNAL). All patients had at least one reliable liver stiffness measurement taken by VCE. The primary end point was the time to adverse outcomes defined as death or liver transplantation. Hazard ratios (HR) for adverse outcomes were determined using a Cox regression univariate and multivariate analysis.

Results: 566 were female (74%) and the median age at diagnosis was 45 years (IQR 28–58). 564 patients (76%) were Caucasians. The first VCE was performed with a median of 35.7 months (IQR 2.9–111.6) after AIH diagnosis. The median value of the VCE was 8.80 kPa (IQR 5.8–17.3). The liver stiffness measurement value was significantly associated with clinical adverse outcomes (HR 1.03, 95% CI 1.02–1.04, P < 0.001), after adjustment for age (HR 1.04, 95% CI 1.02–1.06, P < 0.001), female sex (HR 0.83, 95% CI 0.57–1.02, P = 0.8), and time from AIH diagnosis to first VCE (HR 0.99, 95% CI 0.98–0.99, P < 0.001, Figure 1a). Patients were classified into low, moderate, and high-risk groups for adverse outcomes based on VCE cut-off values: < 8 kPa (reference group, n = 331), ≥ 8 and <14 kPa (n = 184, HR 2.98, 95% CI 1.25–7.15, P = 0.01) and ≥14 kPa (n = 246, HR 7.36, 95% CI 3.38–16.00, P < 0.001). The adverse event-free survival curves according to the low, medium and high-risk groups are presented in Figure 1b (Log Rank 0.001).

Figure: Parameters associated with adverse outcomes in AIH.
Conclusion: Without reference to the type of treatment or biochemical response, liver stiffness measurement by VCTE is an important tool to predict adverse outcomes in AIH. VCTE should be considered as a tool for stratification and potential surrogate endpoints in clinical practice and controlled trials.

WED-260
RESIST criteria accurately rule-out high-risk esophageal varices in patients with primary biliary cholangitis and compensated advanced chronic liver disease

Vincenza Calvaruso,1 Ciro Celsa, Laura Cristoferi,2 Miki Scaravaglio2, Luigi Capodicasa,1 Luca Cadamuro1, Gabriele Di Maria1, Vito Di Marco1, Alessio Gerussi2, Federica Malinverno2, Pietro Lampertico3,4, Nora Cazzagon1,3, Marco Marzio1, Umberto Vespasiani Gentilucci2, Pietro Andreone6, Edoardo Giovanni Giannini7,8, Cristina Rigamonti9,10,11, Edoardo Giovanni Giannini12, Maurizio Russo13, Estefanny Tani14, Federica Cerini15, Gabriele Missale16, Maurizia Brunetto17, Grazia Nin18, Giovanni Vettori19, Antonino Castellaneta20, Domenico Alvaro21, Valeria Pace Patitii22, Francesco Bellanti23, Pietro Invernizzi24, Calogero Camma1, Marco Carbone2, University of Palermo, UOC di Gastroenterologia, Dipartimento di Promozione della salute, Materno Infantile, Medicina Interna e Specialistica (PROMISE), Palermo, Italy; 2Divisione IRCCS San Gerardo dei Tintori, Division of Gastroenterology, Center for Autoimmune Liver Diseases, Department of Medicine and Surgery, University of Milano-Bicocca, Monza, Italy; 3Foundation IRCCS Ca’ Granda Ospedale Maggiore Policlinico, Division of Gastroenterology and Hepatology, Milan, Italy; 4CUR “A. M. and A. Migliavacca” Center for Liver Disease, Department of Pathophysiology and Transplantation, University of Milan, Milan, Italy; 5Department of Surgery, Oncology and Gastroenterology, University of Padova, Padova, Italy; 6Department of Gastroenterology, Università Politecnica delle Marche, Ancona, Italy; 7Internal Medicine and Hepatology, University Campus Bio-Medico of Rome, Rome, Italy; 8Unit of Internal Medicine and Metabolic Medicine, University Hospital Modena and Reggio Emilia, Modena, Italy; 9Division of Internal Medicine and Hepatology, Department of Gastroenterology, Humanitas University, Milan, Italy; 10Unit of Internal Medicine and Hepatology, University of Palermo, UOC di Gastroenterologia, Dipartimento di Promozione della salute, Materno Infantile, Medicina Interna e Specialistica (PROMISE), Palermo, Italy; 11Division of Translational and Precision Medicine, University of Milano-Bicocca, Monza, Italy; 12Azienda Ospedaliero-Universitaria Maggiore della Carità, Novara, Italy; 13Department of Translational Medicine, Department of Medicine and Surgery, University of Milano-Bicocca, Monza, Italy; 14Azienda Ospedaliero-Universitaria Maggiore della Carità, Novara, Italy; 15Division of Internal Medicine and Hepatology, University of Pisa, Pisa, Italy; 16Department of Gastroenterology, Università Politecnica delle Marche, Ancona, Italy; 17Internal Medicine and Hepatology, University Campus Bio-Medico of Rome, Rome, Italy; 18Unit of Internal Medicine and Metabolic Medicine, University Hospital Modena and Reggio Emilia, Modena, Italy; 19Department of Biomedical Sciences, Humanitas University, Milan, Italy; 20Division of Internal Medicine and Hepatology, Department of Gastroenterology, Humanitas Clinical and Research Center IRCCS, Rozzano, Italy; 21Department of Translational Medicine, Università del Piemonte Orientale, Novara, Italy; 22Azienda Ospedaliero-Universitaria Maggiore della Carità, Novara, Italy; 23Gastroenterology Unit, University of Genoa, IRCCS-Ospedale Policlinico San Martino, Genoa, Italy; 24Liver Unit, Arnas Garibaldi, Catania, Italy; 25Gastroenterology Unit, Città della salute e della scienza, Turin, Italy; 26Division of Hepatology, Ospedale San Giuseppe Multimedic IRCCS, Università degli Studi di Milano, Milan, Italy; 27Infectious Diseases and Hepatology Unit, Azienda Ospedaliero-Universitaria di Parma, Parma, Italy; 28Department of Clinical and Experimental Medicine, Hepatology and Liver Physiopathology Laboratory and Internal Medicine Unit, University of Pisa, Pisa, Italy; 29Gastroenterology Unit, Fondazione Casa Sollievo Della Sofferenza IRCCS, San Giovanni Rotondo, Italy; 30Department of Gastroenterology, Santa Chiara Hospital, Azienda Provinciale Per I Servizi Sanitari (APSS), Trento, Italy; 31Gastroenterology Unit, Policlinico di Bari Hospital, Bari, Italy; 32Department of Translational and Precision Medicine, University La Sapienza, Rome, Italy; 33Hepatology Unit, Santo Spirito Hospital, Pescara, Italy; 34Department of Medical and Surgical Sciences, University of Foggia, Foggia, Italy.

Email: vincenza.calvaruso@unipa.it

Background and aims: Non-invasive criteria to identify patients with Primary Biliary Cholangitis (PBC) and compensated Advanced Chronic Liver Disease (cACLD) who can avoid esophagogastrroduodenoscopy (EGD) are lacking. Aim of this study was to evaluate the diagnostic performance of RESIST criteria to rule out high-risk esophageal varices (HRV) in patients with PBC related cACLD.

Method: Data of patients with PBC and cACLD from 24 centres belonging to “Italian PBC registry,” were captured. All patients who performed an EGD for evaluation of signs of portal hypertension were analyzed. Patients were classified as RESIST low risk if platelets were >120 × 10^9/L and serum albumin >3.6 g/dL or RESIST high risk if platelets were <120 × 10^9/L or serum albumin <3.6 g/dL. Outcomes were the presence of HRV at EGD. The decision curve analysis (DCA) of non-invasive criteria were calculated. RESIST criteria were compared with elastography-based criteria (Baveno VI, Expanded Baveno VI, and Baveno VII criteria).

Results: The cohort consisted of 204 Child–Pugh class A patients. At EGD 101 patients (49.5%) had no varices, 67 (32.8%) had low-risk varices and 36 (17.8%) had HRV. Liver stiffness by Fibroscan was available in 159 patients (78%). The correctly spared endoscopies (true negative) for HRV were: 95% (96/101), 84% (42/50), 86.1% (68/79) and 81.8% (18/22) respectively by RESIST, Baveno VI, Expanded Baveno VI and Baveno VII criteria. DCA demonstrates the highest net benefit of RESIST criteria compared to elastography-based criteria in ruling out HRV (Figure).

Conclusion: Biochemical-based RESIST criteria are useful to easily rule out HRV in patients with PBC and compensated Advanced Chronic Liver Disease.

Table: (abstract: WED-261).

<table>
<thead>
<tr>
<th>Feature (median)</th>
<th>Gliadin IgA</th>
<th>F-actin IgA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
<td>253 (40–1233)</td>
</tr>
<tr>
<td></td>
<td>p</td>
<td>0.73</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;0.001.</td>
</tr>
<tr>
<td>Haemoglobin (g/dl)</td>
<td>Negative</td>
<td>141 (8.1–18.0)</td>
</tr>
<tr>
<td></td>
<td>Positive</td>
<td>13.4 (8.4–17.7)</td>
</tr>
<tr>
<td></td>
<td>p</td>
<td>0.02.</td>
</tr>
<tr>
<td>BL (mg/dl)</td>
<td>Negative</td>
<td>0.8 (0.2–45.4)</td>
</tr>
<tr>
<td></td>
<td>Positive</td>
<td>1.1 (0.2–25.0)</td>
</tr>
<tr>
<td></td>
<td>p</td>
<td>0.008.</td>
</tr>
<tr>
<td>ALP (IU/L)</td>
<td>Negative</td>
<td>212 (37–1515)</td>
</tr>
<tr>
<td></td>
<td>Positive</td>
<td>254 (46–1464)</td>
</tr>
<tr>
<td></td>
<td>p</td>
<td>0.002.</td>
</tr>
<tr>
<td>AST (IU/L)</td>
<td>Negative</td>
<td>52 (14–831)</td>
</tr>
<tr>
<td></td>
<td>Positive</td>
<td>65 (10–402)</td>
</tr>
<tr>
<td></td>
<td>p</td>
<td>0.02.</td>
</tr>
<tr>
<td>ALB (g/dl)</td>
<td>Negative</td>
<td>4.4 (2.1–5.8)</td>
</tr>
<tr>
<td></td>
<td>Positive</td>
<td>4.1 (2.3–5.6)</td>
</tr>
<tr>
<td></td>
<td>p</td>
<td>0.07.</td>
</tr>
<tr>
<td>INR</td>
<td>Negative</td>
<td>1.0 (0.3–3.0)</td>
</tr>
<tr>
<td></td>
<td>Positive</td>
<td>1.0 (0.8–2.1)</td>
</tr>
<tr>
<td></td>
<td>p</td>
<td>0.01.</td>
</tr>
<tr>
<td>MELD (points)</td>
<td>Negative</td>
<td>7.0 (6.4–39.9)</td>
</tr>
<tr>
<td></td>
<td>Positive</td>
<td>7.7 (6.4–30.0)</td>
</tr>
<tr>
<td></td>
<td>p</td>
<td>0.01.</td>
</tr>
<tr>
<td>Mayo Risk (points)</td>
<td>Negative</td>
<td>−0.8 (−3.2–4.3)</td>
</tr>
<tr>
<td></td>
<td>Positive</td>
<td>−0.4 (−2.7–4.9)</td>
</tr>
<tr>
<td></td>
<td>p</td>
<td>&lt;0.0001.</td>
</tr>
</tbody>
</table>
**Background and aims:** Both glialin IgA and F-actin IgA antibodies, primary detected in sera of patients with gluten sensitive enteropathy, have been postulated to correlate with disease severity in PSC. We aimed to assess the frequency of examined autoantibodies in PSC and define their potential value as predictors of progressive disease course and poor outcome in a large, well-defined cohort of PSC patients.

**Method:** Enzyme-linked immunosorbent assay (Werfen, San Diego, USA) was applied for detection of glialin IgA and F-actin IgA antibodies in sera of 623 patients with PSC (age range 16–73, 65% male, 22% cirrhotic) and 305 gender- and age-matched healthy controls. Poor PSC outcome was defined as liver transplantation and/or liver-related death during a median follow-up of 19 months.

**Results:** Both glialin and F-actin antibodies were more frequent in PSC than in healthy controls (28.5% vs 12.8% and 12.0% vs 2.9%, respectively; p < 0.0001 for both). Examined autoantibodies were associated with poor liver function and risk scores (Table). F-actin antibody was associated with cirrhosis (RR = 2.48, 95%CI = 1.9–3.3, p < 0.001). Significant associations between glialin and F-actin antibodies and poor outcome were found (Chi2 = 6.4, HR = 1.6, 95% CI = 1.1–2.4, p = 0.01 and Chi2 = 32.1, HR = 5.5, 95%CI = 3.1–10.0, p < 0.001, respectively).

**Conclusion:** Glialin IgA and F-actin IgA antibodies identify a subgroup of PSC patients at risk of more aggressive course, poor outcome and may be of prognostic value in PSC.
31.4% lung cancer and 25.7% melanoma. ICI: 68.5% anti-PD1/anti-PD-L1, 22.8% combined, 8.6% anti-CTLA-4; CTCAE severity: 27 grade-3, 8 grade-4; DILI severity score: 28 mild, 6 moderate, 1 severe. Overall, 24/35 (68.6%) patients benefited from avoidance of corticosteroids: 18 (51.4%) according to the first step (ICI discontinuation), and 6 (17.1%) to the second step (necroinflammation degree). No patient with mild necroinflammation required corticosteroids, since all presented progressive transaminases normalization. However 3/5 subjects with moderate necroinflammation required corticosteroids during follow-up due to lack of analytical improvement in the following days. Results of the algorithm are shown in the Figure. Liver biopsy mainly impacted on patients with grade-3 IMH, sparing corticosteroids in 6/11 non-improved patients with just ICI discontinuation. Patients requiring corticosteroids had a significant increase in HLA-DR expression on CD8+ lymphocytes (p = 0.002), in central memory CD4+ (p = 0.065), and a lower effector-memory CD4+ (p = 0.014).

Conclusion: A two-step algorithm including discontinuation of immunotherapy and liver biopsy allows avoidance of corticosteroids in almost 70% of patients with severe immune-mediated hepatitis.

WED-264
Impact of the metabolic profile on the response to ursodeoxycholic acid in patients with primary biliary cholangitis: results of the CoHai registry
Alvaro Díaz González1, Andrea González Pascual1, Judith Gómez-Camarena2, Elena Gómez Domínguez2, Maria Carlota Londoño3, Mercedes Vergara Gómez4, Javier Ampuero5, Javier Martínez6, Diana Horta6, Adolfo Gallego7, Javier Salmerón8, Montserrat García-Retortillo10, Rosa M. Morillas12, Raul J. Andrade13, Juan Turnes14, Moises Diago15, Ismael El Hajra Martínez16, Merce Roget Alemany17, Manuel Hernández Guerra18, Nerea Quintans19, Margarita Sala20, Nuria Domínguez21, Ana Arencibia Almeida22, Javier Crespo1, Ana Barreira23, Magdalena Salcedo24, Mar Riveiro Barciela25. 1Departamento de Gastroenterología y Hepatología. Hospital Universitario Marqués de Valdecilla. Grupo de Investigación Clínica y Translacional en Enfermedades Digestivas. Instituto de Investigación Clínica y Translacional en Enfermedades Digestivas. Instituto de Investigación Valdecilla (IDIVAL), Santander, Spain; 2Burgos University Hospital, Burgos, Spain; 3University Hospital October 12, Madrid, Spain; 4Hospital Clínic de Barcelona, Barcelona, Spain; 5Hospital Parc Taulí de Sabadell, Sabadell, Spain; 6Virgen del Rocío University Hospital, Sevilla, Spain; 7Ramón y Cajal Hospital, Madrid, Spain; 8Hospital Universitari Món Sant Benet-Terrassa, Terrassa, Spain; 9Hospital de la Santa Creu i Sant Pau Church, Barcelona, Spain; 10Hospital Universitario Clínico San Cecilio, Granada, Spain; 11Hospital del Mar, Barcelona, Spain; 12Germans Trias i Pujol Hospital, Badalona, Spain; 13Hospital Universitario Virgen de la Victoria, Málaga, Spain; 14Complejo Universitario Hospitalario de Pontevedra, Spain; 15Consorcio General University Hospital of Valencia, Valencia, Spain; 16Puerta de Hierro Majadahonda University Hospital, Majadahonda, Spain; 17Consorci Sanitari de Terrassa, Spain; 18Hospital Universitario de Canarias, La Laguna, Spain; 19Alvaro Cunqueiro Hospital, Vigo, Spain; 20Hospital Universitario Josep Trueta, Spain; 21Hospital Infanta Cristina, Spain; 22Hospital Universitario Nuestra Señora de la Candelaria, Spain; 23Hospital Vall d’Hebrón, Spain; 24Hospital General Universitario Gregorio Marañon, Spain
Email: diazg.alvaro@gmail.com

Background and aims: A high prevalence of metabolic pathology has been described in patients with primary biliary cholangitis (PBC). However, its impact on the evolution of these patients is controversial. To describe the prevalence and the impact of the metabolic profile on the response and evolution in patients with PBC.

Method: Retrospective study from the Spanish CoHai registry in which patients who met the following criteria were included: (a) Diagnosis of PBC; (b) Treated with ursodeoxycholic acid (UDCA); (c) Minimum follow-up of 1 year; (d) Registered metabolic profile. Patients with variant syndromes were excluded. Response to UDCA was assessed using the Paris II criteria, prognosis using the GLOBE scale (<0.3 vs >0.3) and liver fibrosis using FIB-4.

Results: A total of 802 patients were included, 90.6% women with a median age of 54.4 years. Considering the metabolic profile, 69.2% had hypercholesterolemia, 62% overweight/obesity, 27.9% arterial hypertension (HT), 13% diabetes mellitus (DM2), 8.3% hypercholesterolemia (DM2), and 14% hypertriglyceridemia. At baseline, GT values were higher in patients with AHT (228 UI/L vs 168 UI/L, p = 0.001) and in those with dyslipidemia (204 UI/L vs 155 UI/L, p = 0.002).
One year after starting UDCA, 437 patients (60.3%) had a response according to Paris II, 461 (63%) GLOBE ≤ 0.3 and 469 (63.8%) FIB4 ≤ 1.45. GGT values persisted higher in patients with dyslipidemia (54 vs 48 U/L, p = 0.004) and DM2 (79 U/L vs 56 U/L, p = 0.06). Presence of DM2 (OR 2.25; I95 1.42–3.58), AHT (OR 2.62; I95 1.84–3.74) and AHT + DM2 (OR 2.81; I95 1.57–5.01) were associated with greater risk of fibrosis in the univariate analysis. In the multivariate analysis, the presence of AHT (OR 2.66; I95 1.46–4.88) and AHT + DM2 (OR 3.12; I95 1.23–7.91) were independently associated with an increased risk.

On the other hand, presence of DM2 (OR 1.98; I95 1.13–3.48), AHT (OR 2.54; I95 1.65–3.91) and AHT + DM2 (OR 2.24; I95 1.12–4.50) were associated with a worse prognosis (GLOBE > 0.3). In the multivariate analysis, the presence of AHT (OR 2.37; I95 1.41–3.99) and AHT + DM2 (OR 2.56; I95 1.19–5.45) independently predicted a dismal prognosis. However, the presence of hypercholesterolemia, hyperTAG, or overweight/obesity was not associated with a worse prognosis by means of GLOBE score or FIB-4.

Conclusion: The metabolic profile impacts the evolution of patients with PBC. The concomitant presence of AHT + DM2 represents the scenario with the highest risk of unfavorable evolution. However, the isolated presence of AHT is also independently associated with a worse prognosis. Finally, the presence of hypercholesterolemia did not negatively impact the risk of these patients.

**WED-265**  
**Chronic pruritus is associated with altered nerve fiber function and anatomy in patients with cholestatic hepatobiliary diseases**  
Miriam Düll1,2,3, Hannah Kleinlein1,2,3, Konstantin Agelopoulos6, Victoria LeBl1, Peter Dietrich1,2,3, Markus F. Neurath1,2,3,4, Alexander-University Erlangen-Nürnberg, Germany; 2Deutsches Zentrum Immuntherapie DZI, Erlangen, Germany; 3Institute of Physiology and Pathophysiology, Friedrich-Alexander-University Erlangen-Nürnberg, Germany; 4Department of Dermatology and Center for Chronic Pruritus, University Hospital Münster, Germany; 5Institute of Biochemistry, Emil-Fischer-Zentrum, Friedrich-Alexander-University Erlangen-Nürnberg, Germany; 6Research group Neuroscience, Interdisciplinary Centre for Clinical Research within the faculty of Medicine at the RWTH Aachen University, Germany; 7Institute of Physiology, University Hospital of the RWTH Aachen University, Germany; 8Department of Gastroenterology and Hepatology, University Hospital Zürich, Zürich, Switzerland  
Email: miriam.duell@uk-erlangen.de

**Background and aims:** Chronic pruritus as a symptom of cholestatic liver diseases represents a major unmet clinical need. The underlying pathophysiological mechanisms are only partially elucidated. Sensory C-nerve fiber endings in the skin act as pruritoceptors and can be activated by previously identified mediators of hepatic disease including proportion of patients with liver cirrhosis. Singular sine-wave stimulation (0.025–0.4 mA) of the skin caused a dose-dependent pain sensation in both, the pruritus low and high group (Figure 1), in a comparable range of healthy subjects. Intriguingly, in addition to pain, solely the high pruritus group experienced a dose-dependent itch sensation (Figure 1B). This difference occurred both at the level of the forearm and the forefoot. Similarly, a prolonged electrical sine-wave stimulation of 60 s resulted in a significant itch sensation only in the high pruritus group. Adaptation was observed to pain but not itch intensity. In skin biopsies, the mean IENFD was strongly reduced (p < 0.001) in patients with cholestatic liver diseases (5.1 IENF/mm) compared to age- and sex-matched healthy controls (12.3 IENF/mm), with a trend towards lower IENFD in patients in the high pruritus group (4.7 IENF/mm) compared to patients with low-intensity pruritus (6.1 IENF/mm).

**Conclusion:** Patients with chronic cholestatic pruritus exhibit functional changes in sensory C-fiber function to which altered intraepidermal nerve fiber anatomy could contribute.

**WED-266**  
**Vitamin D associates with clinical outcomes in patients with primary sclerosing cholangitis**  
Maryam Ebadi, Elora Rider, Catherine Tsai, Sarah Wang, Ellina Lytvyak, Andrew L. Mason, Aldo J. Montano-Loza. University of Alberta, Medicine, Edmonton, Canada  
Email: montano@ualberta.ca

**Background and aims:** Primary sclerosing cholangitis (PSC) is a chronic cholestatic liver disease characterized by progressive biliary inflammation and fibrosis. Given the importance of vitamin D in the modulation of inflammatory and immune-mediated pathways, vitamin D status may impact the PSC course. The objectives of this study were to identify the prevalence of severe vitamin D deficiency in patients with PSC and to investigate its association with cirrhosis progression, hepatobiliary malignancies and liver-related events (liver transplantation or mortality).

**Method:** Patients with a diagnosis of PSC (n = 354), followed by our autoimmune liver disease clinic were included. Patients with vitamin D levels <25 nmol/L were defined as severely deficient. In addition, patients were divided into three groups regarding longitudinal vitamin D deficiencies as always deficient, less than 50% of the time-points deficient, and never deficient. The types of hepatobiliary malignancies included were cholangiocarcinoma, hepatocellular carcinoma, and gallbladder cancer. Univariate and multivariate analyses were conducted using the Cox proportional hazards regression models.

**Results:** The mean vitamin D level was 59 ± 2 nmol/L, and 63 patients (18%) had a severe vitamin D deficiency. Patients with a severe vitamin D deficiency were 2.5 times more likely to experience hepatobiliary malignancies (HR 2.55, 95% CI, 1.02–6.40, p = 0.046). However, this association was no longer significant when adjusting for the bilirubin level (HR 1.86, 95% CI, 0.65–5.31, p = 0.25). Of 316 patients without cirrhosis at diagnosis, 151 (44%) developed cirrhosis during follow-up. Serum vitamin D level as a continuous variable was only associated with cirrhosis development in univariate analysis (HR 0.99, 95% CI, 0.99–0.999, p = 0.02). There was no association between severe vitamin D deficiency at presentation and the risk of developing severe cirrhosis (OR 1.19; IC95 0.65–2.22, p = 0.62). In addition, presence of DM2 (OR 1.98; IC95 1.13–3.48), AHT (OR 2.54; IC95 1.12–4.50) and AHT + DM2 (OR 2.56; IC95 1.19–5.45) independently predicted a dismal prognosis. However, the presence of hypercholesterolemia, hyperTAG, or overweight/obesity was not associated with a worse prognosis by means of GLOBE score or FIB-4.

**Conclusion:** The metabolic profile impacts the evolution of patients with PBC. The concomitant presence of AHT + DM2 represents the scenario with the highest risk of unfavorable evolution. However, the isolated presence of AHT is also independently associated with a worse prognosis. Finally, the presence of hypercholesterolemia did not negatively impact the risk of these patients.
cirrhosis. Over a median follow-up period of 153 months (95% CI, 130–177), 24 deaths were attributed to liver-related disease and 137 patients underwent liver transplantation. Severe vitamin D deficiency at diagnosis (HR 1.82, 95% CI, 1.05–3.15, p = 0.03) was independently associated with a higher risk of liver-related events (Figure 1a). Liver-related event-free survival was shorter in patients with severe deficiency (119 months; 95% CI, 81–156 vs. 185 months; 95% CI, 146–224, p = 0.003; Figure 1b). Patients with persistent severe vitamin D deficiencies at all time points (10% of the population) had more than two-fold higher risk of liver-related events after adjusting for confounding predictors (HR 2.26, 95% CI, 1.17–4.37, p = 0.02).

Conclusion: Severe vitamin D deficiency presented in 18% of patients with PSC at diagnosis and was associated with a higher frequency of liver-related events and hepatobiliary malignancies. Persistent severe vitamin D deficiency was common among 10% of the patients and was associated with a two-times-higher risk of adverse events.

WED-267
Modulation of alkaline phosphatase levels by obeticholic acid in clinical trials and cultured human hepatocytes
Alan Bonder1, Nicholas Procaccini2, Mary Erickson2, Erik Ness2, Antonio Civitarese2, Kris Kowdley3. 1Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, United States; 2Intercept Pharmaceuticals, Inc., San Diego, United States; 3Liver Institute Northwest and Elson S. Floyd College of Medicine, Washington State University, United States
Email: erik.ness@interceptpharma.com

Background and aims: Obeticholic acid (OCA), a potent farnesoid X receptor (FXR) agonist, was approved in 2016 as a second-line treatment for primary biliary cholangitis (PBC) in combination with ursodeoxycholic acid (UDCA) based on reduction of serum alkaline phosphatase (ALP) and total bilirubin levels. However, data from trials of OCA monotherapy in patients with non-alcoholic steatohepatitis (NASH) have shown 15–20% stable mean increases in ALP without mean elevation of other liver biochemical markers including gamma-glutamyl transferase (GGT), aspartate aminotransferase (AST), and alanine transaminase (ALT), indicating that ALP fluctuations may be independent of cholestasis or inflammation, and may occur by an unknown mechanism. Importantly, ALP is anchored to the cell membrane by glycosylphosphatidylinositol, which may be cleaved by phospholipase D (PLD), thus releasing ALP into the plasma. We investigated whether OCA affected ALP or PLD gene expression in human hepatocytes in vitro.

Method: Human sandwich-cultured hepatocytes were treated up to 48 hours with 0.1% dimethyl sulfoxide (DMSO; vehicle) or 0.1–100 µM of OCA. Using quantitative PCR, mRNA concentrations were determined for each treatment group relative to the expression of a control gene (GAPDH).

Results: Cultured human hepatocytes exposed to OCA for 48 hours showed no significant changes in relative levels of ALP mRNA compared to the vehicle control; however, hepatocytes displayed dose-dependent increases in PLD mRNA levels. The highest dose of OCA (100 µM) showed a statistically significantly increase in PLD expression compared with the vehicle (Figure).

Conclusion: These results support that the approximate 15–20% stable mean increase in plasma ALP levels observed after administration of OCA in NASH clinical trials, in the absence of mean increases in other liver biochemical markers, is not suggestive of liver injury. The likely mechanism of action elevating plasma ALP is via increased expression of PLD, which may in turn release ALP from the cell surface into the bloodstream. This potential mechanism of action may attenuate the observed mean reduction of ALP believed to reflect improved hepatic function in people living with PBC.
WED-268
Risk of death, liver transplant or hepatic decompensation in primary biliary cholangitis increases with increased duration and degree beyond established clinical thresholds for hepatic biomarkers and fibrosis scores
Kris Kowdle1, Tracy Mayne2, Erik Ness2, Darren Wheeler2, Radhika Nair1, Nicholas Procaccini1, Leona Bessonova2, Joanna MacEwan3, Alina Levine1, Gideon Hirschfield4, 1Liver Institute Northwest and Elson S. Floyd College of Medicine, Washington State University, United States; 2Intercept Pharmaceuticals Inc, Morristown, United States; 3Genesis Research, Hoboken, United States; 4Toronto Centre for Liver Disease, University of Toronto, Division of Gastroenterology and Hepatology, Toronto, Canada
Email: erik.ness@interceptpharma.com

Background and aims: Current primary biliary cholangitis (PBC) risk scores use biomarkers from a single point in time to predict clinical outcomes. Recent data showed higher rates of liver transplant or death associated with serum alkaline phosphatase (ALP) and total bilirubin (TB) maintained below current PBC treatment guideline thresholds (ALP < 1.67× upper limit of normal [ULN] and TB < ULN). We aimed to confirm these results and assess additional serum biochemistries and liver fibrosis scores (fibrosis-4 [FIB-4], aspartate aminotransferase [AST] to platelet ratio index [APRI]) and duration of elevations as predictors of the risk of clinical outcomes.

Method: A cohort of patients ≥18 years old with ≥1 inpatient or ≥2 outpatient PBC diagnosis claims separated by ≥30 days (baseline) between January 1, 2014 and April 1, 2022 was created using the Komodo Health database merged with national lab data. Those with ≥2 measures of ALP, TB, AST, alanine aminotransferase (ALT), albumin (ALB), or platelets separated by >1 day were included in the analysis. Patients with a history of hepatic decompensation, liver transplant, major comorbidities, or prescribed obeticholic acid or fibrates (second-line [2L] therapies) were excluded. Survival analysis examined the proportion of follow-up time that liver biochemistries exceeded limits of normal/specific thresholds as a time-dependent covariate on time to first occurrence of hospitalization for hepatic decompensation, liver transplant, or death. Risk of negative outcomes increased as time above each threshold increased. These data suggest that risk of hepatic events should be evaluated using measures over time. Guidelines should consider revising treatment recommendations to incorporate chronic elevations at levels meaningfully below current static thresholds to improve clinical outcomes in people living with PBC.

Results: A total of 3929 patients (87.8% female; mean [SD] age 59 [12.7] years) met eligibility criteria; 77.7% had a history of UDCA use, 8.4% had baseline cirrhosis, and the mean (SD) duration of follow-up was 3.0 (2.1) years. For ALP and AST, all results above ULN were associated with increased risk of negative outcomes and risk increased as time above ULN increased (Figure 1A, B). This was also observed for TB > 0.6 × ULN (Figure 1C) and FIB-4 > 2.67 (Figure 1D). Similar associations were observed for ALT, albumin, platelets, and APRI.

Conclusion: Liver biochemistries and fibrosis scores at thresholds lower than those in current PBC treatment guidelines were associated with an increased risk of hospitalization for hepatic decompensation, liver transplant, or death. Risk of negative outcomes increased as time above each threshold increased. These data suggest that risk of hepatic events should be evaluated using measures over time. Guidelines should consider revising treatment recommendations to incorporate chronic elevations at levels meaningfully below current static thresholds to improve clinical outcomes in people living with PBC.

WED-269
Accuracy of controlled attenuation parameter (CAP) measurement for the detection of steatosis in autoimmune liver diseases
Silja Steinnann1,2, Johannes Hartl1,2, Sören Alexander Weidemann3, Füssel Katja1, Claudia Kroll1, Ansar W. Lohse4,5, Christoph Schramm1,4,5,6, 1University Medical Centre Hamburg-Eppendorf (UKE), 1st Department of Medicine, Hamburg, Germany; 2European Reference Network for Hepatological Diseases (ERN-RARE LIVER), Hamburg, Germany; 3University Medical Centre Hamburg-Eppendorf (UKE), Institute of Pathology with the Sections Molecular Pathology and Cytopathology, Hamburg, Germany; 4European Reference Network for Hepatological Diseases (ERN-RARE LIVER), Hamburg, Germany; 5University Medical Centre Hamburg-Eppendorf (UKE), Hamburg Centre for Translational Immunology (HCTI), Hamburg, Germany; 6University Medical Centre Hamburg-Eppendorf (UKE), Martin Zeitz Center for Rare Diseases, Hamburg, Germany
Email: sfk.steinmann@outlook.com

Background and aims: Concurrent fatty liver disease represents an emerging challenge in the care of people with autoimmune liver diseases (AILD). Therefore, we here aimed to validate controlled-attenuation parameter (CAP) as a non-invasive tool to detect hepatic steatosis in people with AILD. Method: People with AILD (AIH, PBC, PSC, or variant syndromes) who underwent liver biopsy at the University Medical Center Hamburg-Eppendorf between 2015 and 2020 were included. The diagnostic performance of CAP to determine biopsy-proven hepatic steatosis (>5%) was assessed by calculating area under the receiver operating characteristic (AUROC) curves. Optimal cut-offs to detect hepatic steatosis were determined by Youden index. In AIH, the impact of disease activity was explored by assessing changes of CAP upon resolution of hepatic inflammation during follow-up.

Results: 433 people with AILD (AIH: 218, PBC: 51, PSC: 85, AIH/PBC: 63, AIH/PSC: 16) were included. Histologically proven steatosis was present in 90 individuals (20.7%). Steatosis was less frequently observed in PSC (14%) than in other AILD. CAP strongly correlated with grade of steatosis (ρ = 0.39) and BMI (ρ = 0.53). In PBC and PSC, ROC curves defined an AUROC of 0.81 and 0.93 for detecting steatosis at an optimal cut-off of 276 (sensitivity: 0.71; specificity: 0.82) and 254 (sensitivity: 0.91, specificity: 0.85) dB/m, respectively. In AIH, the diagnostic performance of CAP was significantly lower (AUROC: 0.72). However, resolution of hepatic inflammation under treatment was associated with a significant increase of CAP levels (median: +38.0 dB/m) and considerably improved diagnostic accuracy (AUROC: 0.85; cut-off: 288 dB/m; sensitivity: 0.67; specificity: 0.90).
POSTER PRESENTATIONS

WED-270
Risk of decompensated cirrhosis in patients with primary biliary cholangitis under first, second and third-line therapies

Ana Lucena1, Esther Molina2, Manuel Hernández Guerra3, Marina Berenguer4, Elena Gómez Dominguez2, Marta Casado5, Francisco Jurquera2, Rosa M. Morillas6, Luisa García-Buey9, Miguel Angel Simon10, Maria Carlota Londoño11, Jose manuel Sousa-Martin1, Conrado Fernández-Rodríguez12, Javier Martínez13, Judith Gómez-Camargo14, Antonio Oleiva Martin15, Nerea Quintana16, Diana Horta17, Álvaro Díaz-González18, Indhira Perez Medrano19, Carmen Álvarez-Navascués20, Montserrat García-Retortillo21, Javier Ampuero1,2, 2Hospital Universitario Virgen del Rocio, Sevilla, Spain; 3Hospital Universitario Clínico, Santiago de Compostela, Spain; 4Hospital Universitario de Canarias, Tenerife, Spain; 5Hospital Universitario La Fe, Valencia, Spain; 6Hospital Universitario 12 de Octubre, Madrid, Spain; 7Hospital Universitario Torrecárdenas, Almería, Spain; 8Complejo Asistencial de León, León, Spain; 9Complejo Asistencial de Burgos, Burgos, Spain; 10Hospital Universitario La Paz, Madrid, Spain; 11Hospital Universitario Álvaro Cunqueiro, Vigo, Spain; 12Hospital Mutua, Terrasa, Spain; 13Hospital Universitario La Pinta, Ronda, Spain; 14Complejo Hospitalario de Pontevedra, Pontevedra, Spain; 15Complejo Hospitalario de Pontevedra, Pontevedra, Spain; 16Hospital Universitario Central de Asturias, Oviedo, Spain; 17Hospital del Mar, Barcelona, Spain; 18Instituto de Biomedicina de Sevilla, Sevilla, Spain

Background and aims: About 25% of patients with primary biliary cholangitis (PBC) inadequately respond to ursodeoxycholic acid (UDCA) and, thus, require a second-line therapy. In this setting, patients with cirrhosis receiving obeticholic acid (OCA) and fibrates have been poorly represented to date. Therefore, we aimed to: (a) assess the risk of decompensation in PBC cirrhotic patients receiving first, second and third-line treatments; (b) determine risk factors associated with the occurrence of a decompensation event in patients taking OCA.

Method: Multicenter and retrospective study from the COLHAI registry (belonging to the Spanish Association for the Study of the Liver), including 272 PBC patients showing liver cirrhosis, which was defined by liver biopsy, ultrasound, or transient elastography (>16.9 kPa). Patients were classified according to receiving first (UDCA), second (UDCA and OCA or fibrates), and third-line therapies (UDCA and OCA and fibrates). Outcomes were decompensation events and mortality during the follow-up from the beginning of each treatment.

Results: We included patients with UDCA (n = 173), UDCA+OCA (n = 37), UDCA + fibrates (n = 39), and UDCA + OCA + fibrates (n = 23). Baseline features of the patients are shown in Table. Decompensation by 100-person-years was: (a) UDCA, 2.73 (events = 47; follow-up: 10.1 years); (b) UDCA+OCA, 11.1 (events = 10; follow-up: 2.5 years); (c) UDCA+OCA additionally including those with triple therapy, 12.1 (events = 17; follow-up: 2.42 years); (d) UDCA+fibrates 5.8 (events = 8; follow-up: 3.54 years); (e) UDCA + fibrates additionally including those with triple therapy, 6.83 (events = 15; follow-up: 3.59 years). Serum levels of bilirubin (IC95% = 9.24–10.65; p = 0.013), albumin (OR 0.98 (IC95% 0.98–1.00; p = 0.001)). Fifteen patients taking OCA discontinued the drug (7 due to disease progression and 8 to adverse events).

Figure:

Conclusion: In PBC and PSC, hepatic steatosis can be reliably detected by applying disease-specific thresholds of CAP. In AIH, the diagnostic accuracy of CAP is moderate at diagnosis, but improves after acute hepatitis has resolved.

WED-271
Improved survival with regular surveillance imaging in patients with primary sclerosing cholangitis

Natassia Tan1,2, Natalie Ng2,3, Thomas Worland4, Tanya Lee5, Tobie Abrahams2, Keval Pandya2, Elliot Freeman1, Nicholas Hannah6, Kathyrn Gazelakis1, Richie Madden7, Kate Lynch1, Zina Valaydon1, Siddharth Sood8, Anouch Dev2,3, Sally Bell2,3, Nicholas Hannah7,8, John Nik Ding5,8, Amanda Nicoll2,11, Ken Liu6, Paul Gow4,8, John Lubel1,2, William Kemp1,2, Stuart Roberts1,2, Ammar Majeed1,2, Natassia Tan1,2, Natalie Ng2,3, Thomas Worland4, Tanya Lee5

1The Alfred, Melbourne, Australia; 2Monash University Clayton Campus, Clayton, Australia; 3Monash Medical Centre, Clayton, Australia; 4Austin Hospital, Heidelberg, Australia; 5St. Vincent’s Hospital Melbourne, Fitzroy, Australia; 6Royal Prince Alfred Hospital, Camperdown, Australia; 7The Royal Melbourne Hospital, Parkville, Australia; 8University of Melbourne, Parkville, Australia; 9Western Health, St Albans, Australia; 10Royal Adelaide Hospital, Adelaide, Australia; 11Eastern Health, Box Hill, Australia

Email: natassiapinpintan@gmail.com

Background and aims: About 25% of patients with primary sclerosing cholangitis (PSC) inadequately respond to ursodeoxycholic acid (UDCA) and, thus, require a second-line therapy. In this setting, patients with cirrhosis secondary to PBC under double and triple therapy were at a relatively high risk of decompensation, particularly those receiving OCA, probably because they were sicker at the beginning of the treatment. Serum bilirubin and albumin levels, as well as the presence of diabetes mellitus, predicted the risk of decompensation in patients with OCA.

Method: Multicenter and retrospective study from the COLHAI registry (belonging to the Spanish Association for the Study of the Liver), including 272 PBC patients showing liver cirrhosis, which was defined by liver biopsy, ultrasound, or transient elastography (>16.9 kPa). Patients were classified according to receiving first (UDCA), second (UDCA and OCA or fibrates), and third-line therapies (UDCA and OCA and fibrates). Outcomes were decompensation events and mortality during the follow-up from the beginning of each treatment.

Results: We included patients with UDCA (n = 173), UDCA+OCA (n = 37), UDCA + fibrates (n = 39), and UDCA + OCA + fibrates (n = 23). Baseline features of the patients are shown in Table. Decompensation by 100-person-years was: (a) UDCA, 2.73 (events = 47; follow-up: 10.1 years); (b) UDCA+OCA, 11.1 (events = 10; follow-up: 2.5 years); (c) UDCA+OCA additionally including those with triple therapy, 12.1 (events = 17; follow-up: 2.42 years); (d) UDCA+fibrates 5.8 (events = 8; follow-up: 3.54 years); (e) UDCA + fibrates additionally including those with triple therapy, 6.83 (events = 15; follow-up: 3.59 years). Serum levels of bilirubin (OR 0.98 (IC95% 0.98–1.00; p = 0.001)). Fifteen patients taking OCA discontinued the drug (7 due to disease progression and 8 to adverse events).

Figure:

Conclusion: Patients with cirrhosis secondary to PBC under double and triple therapy at the relatively high risk of decompensation, particularly those receiving OCA, probably because they were sicker at the beginning of the treatment. Serum bilirubin and albumin levels, as well as the presence of diabetes mellitus, predicted the risk of decompensation in patients with OCA.
Background and aims: The benefits of regular surveillance imaging for cholangiocarcinoma (CCA) in patients with primary sclerosing cholangitis (PSC) are unclear. Hence, we aimed to evaluate the impact of regular magnetic resonance imaging with cholangiopancreatography (MRCP) on outcomes of patients with PSC in Australia, where the practice of MRCP surveillance is variable.

Method: We evaluated MRCP surveillance and outcome data from a multicentre, retrospective cohort of PSC patients from 9 tertiary liver centres in Australia. An inverse probability of treatment weighting (IPTW) approach was used to balance groups across potentially confounding covariates to achieve a standardized difference of less than 0.10. IPTW-weighted Cox proportional hazard models was conducted to assess the risk of death in those undergoing regular surveillance compared to those who were not. A competing risk analysis was conducted whereby liver transplant (LT) was considered a competing risk for death. IPTW-weighted Kaplan-Meier method was used to estimate survival time from diagnosis of PSC and CCA diagnosis.

Results: A total of 298 PSC patients with 2,117 person-years (median 6, interquartile range 3–11 years) of follow-up were included. Two hundred and twenty patients (73.8%) had undergone MRCP surveillance. Forty-six patients (15.4%) had a liver transplant and 35 (11.7%) died during the follow-up period. Patients who had regular surveillance were younger at diagnosis, more likely to have dominant strictures and higher alkaline phosphatase at last follow-up. Eleven patients (5%) in the surveillance group and 2 (2.6%) in the non-surveillance group had CCA (p = 0.560). IPTW was performed with age of diagnosis, sex, Model for End-Stage Liver Disease score, presence of cirrhosis or dominant stricture, liver transplant, and serum alkaline phosphatase level at follow-up as covariates. Regular surveillance was significantly associated with 62% reduced risk of death on multivariate weighted Cox analysis (p = 0.009) as shown below. The cumulative incidence of death was significantly lower in the surveillance group with LT as a competing event (p = 0.017). However, survival post CCA diagnosis was not significantly different between both groups (p = 0.74). Patients who had surveillance of less than one scan a year (N = 41) had comparable survival (p = 0.231) compared to patients who had surveillance at least yearly (N = 172).

Conclusion: In this large multicentre retrospective cohort study that employed IPTW to minimize selection bias, regular MRCP surveillance is associated with improved overall survival in PSC patients; however there was no difference in survival after CCA. Further prospective studies are needed to determine the optimal interval of surveillance imaging and follow-up in patients with PSC.

WED-272
Relative enhancement and spleen volume predict clinical outcomes in primary sclerosing cholangitis
Laura Cristoferi1,2, Cesare Maino3, Paolo Marra4,5, Alberto Savino1,2, Ilaria Ripamonti1,2, Marta La Millia4,5, Davide Bernasconi6, Miki Scaravaglio1,2, Alessio Gerussi1,2, Alberto Rossi1,2, Eugenia Vittoria Pesatori1,2, Luisa Pasulo1, Stefano Fagioli4,5, Pietro Invernizzi1,2, Davide Ippolito1,2, Sandro Sironi1,2, Marco Carbone1,2. 1Fondazione IRCCS San Gerardo dei Tintori, Department of Medicine and Surgery-University of Milano Bicocca, Monza, Italy; 2European Reference Network on Hepatological Diseases (ERN RARE-LIVER), Italy; 3Fondazione IRCCS San Gerardo dei Tintori, Department of Radiodiagnostics, Italy; 4ASST Papa Giovanni XXIII Hospital, Bergamo, Italy; 5University of Milano Bicocca, School of Medicine and Surgery, Italy; 6University of Milano Bicocca, Bicocca Bioinformatics Biostatistics and Bioimaging Centre-B4, Italy
Email: lcristoferi@campus.unimib.it

Background and aims: Magnetic resonance cholangiopancreatography (MRCP-MRPC) assessment in primary sclerosing cholangitis (PSC) is currently based on qualitative or semi-quantitative parameters and has high inter-observer variability. In this study, we aimed to explore the predictive performance of quantitative and reproducible MRI-MRPC features, reflecting hepatobiliary function and portal hypertension, to enhance risk stratification in PSC.

Method: This is a retrospective cohort study of PSC patients with at least one complete gadoxetate disodium-enhanced MRI available from 2015 to 2021. Patients with overlapped chronic liver disease and a follow-up shorter than 6 months were excluded. The composite clinical end point was liver-related death, liver transplantation (LT), or hepatic decompensation. Signal intensities were measured in each liver segment. Mean relative enhancement and spleen volume were calculated for each exam. Liver stiffness measurement (LSM), Mayo risk score (MRS), Amsterdam Oxford model (AOM) and blood test within one month from MRI-MRPC were collected. Cox proportional hazards regression was used for the time-to-event analysis. Multivariable model has been internally validated using k-fold cross-validation.

Results: The study cohort included 71 patients. 43 (60.6%) were male, median age at diagnosis of 29 years [IQR 21–45.5], 44 (62.0%) had concomitant IBD, and median follow-up of 614 days (IQR 402–1090). 13 (14.3%) patients reached the outcome (7 LT, 1 liver-related death, 5 hepatic decompensation). At the univariate analysis, spleen volume, spleen cranio-caudal diameter, platelets count, LSM, MRS, AOM, and RE were predictive of outcomes and were taken forward. At the multivariable analysis, the RE and the spleen volume were the only independently associated with the occurrence of adverse event with an HR of 0.29 (per unit, CI 95% 0.09–0.98, p = 0.047) and 1.13 (per 50 cm3, CI 95% 1.07–1.21, p = 0.0001), respectively and a C-statistic of 0.89. The model was internally validated and outperformed the MRS and AOM in our cohort (C-statistic of 0.82 vs 0.74 and 0.76, respectively). The discriminative power of the score on survival is shown in figure 1 (mean value of the score as cut-off).
Hepatic steatosis in patients with autoimmune hepatitis: relationship with corticosteroid treatment and long-term outcome

Sarah Flatley¹, Asha Dube¹, Victoria Gordon², Barbara Hoeroldt¹, Laura Harrison¹, Elaine Wadland¹, Dermot Gleeson¹. ¹Sheffield Teaching Hospitals NHS Foundation Trust, United Kingdom; ²University Hospitals Coventry and Warwickshire NHS Trust, United Kingdom
Email: s.flatley@nhs.net

Background and aims: We have previously reported (Gut 2010:52; 431) an association between worsening steatosis and corticosteroid treatment in autoimmune hepatitis (AIH). Here, we aimed to assess further, associations of steatosis with corticosteroids, fibrosis progression and long-term outcome.

Method: Retrospective/prospective single centre audit of patients with AIH (1999 IAIHG criteria) and followed to death, transplant, loss to follow-up or 31/12/21. Necroinflammatory (NI) score, fibrosis stage (both Ishak) and steatosis grade were assessed by one histopathologist (AKD). Steatosis was graded by percent of hepatocytes containing fat (0: <5%, 1: 5–33%, 2: 34–66%, 3: >67%). Steatohepatitis was defined as hepatocyte ballooning ± neutrophils in zone 3 and graded using Brunt criteria.

Results: 354 patients (81% women, age (median (range)) 55 (2–82) yr, 96% receiving steroids) had an evaluable diagnostic liver biopsy (biopsy 1) and were followed up for 10 (0–47) years. 242 (68%) had a follow-up biopsy (biopsy 2) after 26 (3–174) months. On biopsy 1, 89 (25%) had steatosis (Grade 1, 2 and 3: 70, 18 and 1 respectively) and 6 (2%) had steatohepatitis. Patients with steatosis (vs those without) were older (58 vs 49 years, p < 0.001), had higher BMI (29.1 vs 27.3, p = 0.04), and more were diabetic (15% vs 7%, p = 0.02). They had a lower NI score (9.4 vs 11.5, p < 0.001) and AIH histology grade (3.1 vs 3.9, p < 0.001) but similar IAIHG diagnostic score and fibrosis stage. On biopsy 2, 217 (48%) had steatosis and 9 (4%) steatohepatitis. Steatosis had appeared/worsened in 83 patients (34%), overall grade increasing from (0.3 (0–3) to 0.6 (0–3), p < 0.001). Worsening steatosis was positively associated with age (p = 0.002), initial prednisolone dose (p < 0.001), BMI (p = 0.005), and weight gain (p = 0.05) but was unrelated to diabetes or biopsy interval. Steatosis (biopsy 1, 2 or change between biopsies) was unrelated to: (a) NI score or % in histological remission (NI score <4) on biopsy 2, (b) fibrosis score on biopsy 2, or (c) fibrosis progression between biopsies 1 and 2. 89 patients died (15 liver-related, 72 non-liver, 2 cause unknown) and 7 underwent liver transplantation. All-cause 10- and 20-yr death/transplantation rates were 16±2% and 45±4% respectively. We confirmed independent associations of death/transplantation rate with older age, cirrhosis at diagnosis, failure of ALT normalisation by 12 months, and with diabetes (onset anytime), which we recently reported (Flatley Gut 2022; 71: A74). All-cause death/transplantation rate was associated with steatosis at diagnosis on univariate (p = 0.03), but not on multivariate analysis; there was no association with worsening steatosis.

Conclusion: Steatosis is present at diagnosis in 25% of AIH patients and worsens during steroid treatment. However, steatosis is not associated with histological remission or fibrosis progression and shows no independent association with long-term outcome.
anti-MAA: 67.9% vs 2.0%). Patients with AILD more frequently harboured at least one type of anti-PTM antibody compared to non-AILD and HCs (AILD: 81.2%; non-AILD: 58.4% and HCs: 20%). The AILD group was dissected into AIH, PBC and PSC. Patients with AIH harboured significantly more anti-MAA, anti-CarP and anti-AGE antibodies compared to non-AILD patients (anti-MAA: 77.3% vs 26.7%, anti-CarP: 63.6% vs 27.7% and anti-AGE: 48.5% vs 17.5%, all p < 0.001, respectively). Patients with AIH harboured anti-PTM antibody more often compared to other subgroups of AILD. In untreated AIH (N = 58), time to complete biochemical response (CBR) was associated with anti-MAA, anti-CarP, anti-AGE and anti-AL antibodies. Significantly more patients with at least three anti-PTM antibodies attained CBR at 12 months of treatment (13 vs 3 p = 0.01).

Conclusion: Anti-PTM antibodies are frequently present in AILD. The presence of anti-AGE, anti-CarP and anti-MAA antibodies correlates with the presence of AIH within this cohort. In AIH, harbouring at least three positive anti-PTM antibody responses is positively associated with CBR. Determination of anti-PTM antibodies in liver disease may have diagnostic and prognostic value.

WED-276
Collagen proportionate area is associated with adverse clinical outcomes and allows risk stratification of patients with autoimmune hepatitis

Neil Halliday1,2, Andrew Hall2,3, Alessio Gerussi4, Najeeha Siddiqi1, Jennifer Watkins1,3, Aileen Marshall1,2, Alberto Quaglia4,1, Douglas Thorburn1,2, University College London, UCL Institute for Liver and Digestive Health, London, United Kingdom; Royal Free London NHS Foundation Trust, Sheila Sherlock Liver Centre, United Kingdom; Royal Free London NHS Foundation Trust, Department of Cellular Pathology, London, United Kingdom; University of Milano- Bicocca, Division of Gastroenterology and Center for Autoimmune Liver Diseases, Milan, Italy

Background and aims: The diagnosis of autoimmune hepatitis (AIH) remains reliant on histological assessment of the liver. However, AIH-specific scoring systems for histological stage have not been determined and are complicated by the coexistence of fibrosis and parenchymal collapse. Novel, reproducible predictors of clinical outcomes are required for risk stratification and prognostication in patients with AIH. Collagen proportionate area (CPA) represents a reproducible, quantitative measure of collagen deposition and also captures the presence of collapse due to the increased density of extracellular matrix proteins. CPA is predictive of clinical outcomes in other liver diseases, hence we sought to determine whether CPA was reflective of fibrosis stage and clinical outcomes in AIH.

Method: Patients from a single centre, with definite or probable AIH were identified; demographics, clinical features and outcomes were recorded and liver biopsies re-reviewed by 2 independent pathologists. CPA was measured on all biopsies and correlated with clinical outcomes by Kaplan-Meier analysis and Cox proportional hazard modelling.

Results: 71 patients with a median follow-up of 78 months (IQR 29–163) were included. CPA correlated with Ishak stage (Spearman Rank p < 0.0001). Lower CPA was associated with improved liver transplant-free survival in Kaplan-Meier analysis (figure 1) (Log rank p = 0.003).

Conclusion: Increasing CPA was associated with adverse patient outcomes in AIH. Although true CPA may be overestimated due parenchymal collapse in AIH, it still provided a quantitative measure that correlated with important clinical outcomes and was more strongly associated with transplant free survival than Ishak fibrosis stage. CPA represents a potentially useful, reproducible tool for prognostication and risk stratification in AIH.

WED-277
Patient reported gaps between current practice and new practice guidelines for primary sclerosing cholangitis

Annika Bergquist1, Martine Walmesley2, David Tornai3, Nora Cazzagon4, Angela Leburgue5, Anna Mrzljak6, Henrike Lenzen7, Marco Carbone8, Joao Madaleno9, Andrea Tornai3, Christoph Schramm11, Karolinska University Hospital and Karolinska Institutet, European Reference Network on Hepatological Diseases (ERN RARE-LIVER), Sweden; University of Padua, European Reference Network on Hepatological Diseases (ERN RARE-LIVER), Italy; University of Debrecen, European Reference Network on Hepatological Diseases (ERN RARE-LIVER), Hungary; Association Albi European Reference Network on Hepatological Diseases (ERN RARE-LIVER), France; University Hospital Center Zagreb, European Reference Network on Hepatological Diseases (ERN RARE-LIVER), Croatia; Hannover Medical School, European Reference Network on Hepatological Diseases (ERN RARE-LIVER), Germany; University of Milano - Bicocca, European Reference Network on Hepatological Diseases (ERN RARE-LIVER), Italy; CH Univ Coimbra, European Reference Network on Hepatological Diseases (ERN RARE-LIVER), Portugal; Humanitas University, European Reference Network on Hepatological Diseases (ERN RARE-LIVER), Italy; Martin Zeitz Center for Rare Diseases, University Medical Center Hamburg Eppendorf, European Reference Network on Hepatological Diseases (ERN RARE-LIVER), Germany

Email: annika.bergquist@ki.se

Background and aims: Management and follow-up strategies for primary sclerosing cholangitis (PSC) vary. A new European practice guideline for management of PSC was recently published. The aim of the present study was to assess patient reported quality of care and
identify gaps in current practice in Europe in relation to the new guidelines.

**Method:** Data was collected via an online survey hosted on the EU Survey platform in 11 languages between October 2021 and January 2022. Questions were asked about the disease, symptoms, treatment, investigations, and quality of care. Responses were received from participants in 36 countries around the world and included transplanted and non-transplanted respondents. Only responses from non-transplanted individuals were analysed in detail (n = 798). They were reviewed against the recommendations in the EASL guidelines for management of PSC. Respondent ages were grouped as follows: Children: aged 7–15 years, young adults: 16–25 years, adults: 26–60 years, seniors: 61+ years. Selection of response to open ended answers (quotes) was used to support and give examples of the findings.

**Results:** In total, 798 non-transplanted people with PSC from 33 countries responded. Eighty-six % of respondents reported having had at least one symptom. Twenty-four percent had never undergone an elastography, 8% had not had a colonoscopy. Of responders with IBD, 15% had a colonoscopy less frequently than every 2 years. Nearly half (49%) had never undergone a bone density scan. Ursodeoxycholic acid (UDCA) was used in 90–93% in France, Netherlands, and Germany, and 49–50% in the United Kingdom and Sweden. Itch was common (60%), and 50% of those had received any medication. Antihistamines were taken by 27%, cholestyramine 21%, rifampicin 13%, and bezafibrate 6.5%. Forty-one % had been offered participation in a clinical trial or research. The majority (91%) reported that they were confident with their care although half of the individuals reported need for more information on disease prognosis and diet. Quote: “I would like to know the vital prognosis and life expectancy for these diseases because on the internet the data is old and frightening.” Responder ERN431, France

**Conclusion:** Our findings suggest that current practice needs to change if the new EASL clinical practice recommendations are to be universally followed. Identified areas of improvement are prognostication and disease monitoring with more widespread use of elastography, bone density scan, and appropriate treatment for itch.
Background and aims: It remains unclear whether the outcomes of liver transplant (LT) patients with COVID-19 differ based on the etiology of liver disease. Primary sclerosing cholangitis (PSC) patients are particularly of interest given the autoimmune nature of disease, and the associated cholangiopathy, which has been independently described during COVID-19 infection. Therefore, we sought to study the outcomes of PSC LT patients with COVID-19.

Method: We used a large healthcare research network (TriNetX) to compile the electronic medical records of LT patients (age ≥ 18 years).
with PSC and confirmed COVID-19 (PSC cohort) from 75 healthcare organizations in the USA, between 1 January-31 December 2020. LT patients of other etiologies (non-PSC cohort) with COVID-19 were also identified during the same time. We studied the risk of hospitalization (composite outcome of inpatient or critical care services), mortality, thrombosis (composite outcome of deep vein thrombosis, acute pulmonary embolism, stroke or myocardial infarction) and intensive care unit (ICU) (requiring mechanical ventilation or extracorporeal membrane oxygenation) within 90 days of COVID-19 diagnosis. We performed 1:1 propensity score matching (PSM) using a greedy nearest-neighbor matching algorithm to account for potential confounding variables.

Results: We identified 78 PSC LT patients and 1,370 non-PSC LT patients with COVID-19. PSC LT patients were younger than the non-PSC cohort (50.5 ± 14.7 vs 57.4 ± 13.7, p < 0.001). Though most of the comorbidities (hypertension, chronic kidney disease, nicotine dependence, heart failure, alcohol related disorders, chronic lower respiratory diseases and ischemic heart disease) were equally distributed among the two groups, the percentage of diabetes and cerebrovascular diseases statistically differed between the cohorts. Therefore, PSM was performed for demographics, comorbidities (including body mass index) as well as immunosuppression regimen. Following PSM, the PSC and non-PSC cohorts were relatively balanced (n = 74 each cohort). PSC LT patients were more likely to experience symptomatic COVID-19 infection with hypoxemia, fever, nausea, emesis, diarrhea and abdominal pain when compared to non-PSC LT patients. Mean values of alkaline phosphatase were also higher in the PSC cohort compared to non-PSC (223 vs 140 U/L, p = 0.03), whereas the rest of liver enzymes were similar among the groups. However, when looking at COVID-19 outcomes, we found no significant difference in mortality, hospitalization, thrombosis or ICU care between PSC and non-PSC LT patients (as seen in the Figure).

Conclusion: To our knowledge, this is the largest study to date looking at PSC LT patients outcomes with COVID-19 in the USA. We found that though PSC LT patients were more likely to experience symptomatic COVID-19, reassuringly they did not carry a higher risk of mortality, hospitalization, thrombosis or ICU care requirement compared to LT patients of other liver disease etiologies.

INTEGRIS-PSC phase 2a study: evaluating the safety, tolerability, and pharmacokinetics of bexotegrast (PLN-74809) in participants with primary sclerosing cholangitis

Gideon Hirschfield1, Palak Trivedi2,3, Cynthia Levy4,5, Christoph Schramm6, Kris Kowdley7, Michael Trauner8, Richard Pencek9, Hardean Achneek9, Eric Lefebvre3,1, University of Toronto, Toronto Centre for Liver Disease, Toronto, ON, Canada;2University of Birmingham, 1. National Institute for Health and Care Research Birmingham Biomedical Research Centre, Centre for Liver and Gastroenterology Research, United Kingdom;3University Hospitals Birmingham Queen Elizabeth, Liver Unit, Birmingham, United Kingdom;4University of Miami, Division of Digestive Health and Liver Diseases, Miami, FL, United States;5University of Miami, Schiff Center for Liver Diseases, Miami, FL, United States;6University Medical Center Hamburg-Eppendorf, Department of Medicine, Martin Zeitz Center for Rare Diseases, Hamburg Center for Translational Immunology, Hamburg, Germany;7Liver Institute Northwest, Seattle, WA, United States;8Medical University of Vienna, Wien, Austria;9Pliant Therapeutics, South San Francisco, United States

Background and aims: Transforming growth factor beta (TGF-beta) signaling is a key driver of liver fibrosis. In primary sclerosing cholangitis (PSC), integrins over-expressed on injured cholangiocytes (alpha-v/beta-6) and myofibroblasts (alpha-v/beta-1) regulate TGF-beta activity. Bexotegrast (PLN-74809) is an oral, once-daily, dual-selective inhibitor of integrins alpha-v/beta-6 and alpha-v/beta-1 in development for the treatment of PSC and idiopathic pulmonary fibrosis (IPF). The primary objective of the present study is to assess the safety and tolerability of bexotegrast in participants with PSC. Additional end points include pharmacokinetics and exploratory biomarkers of fibrosis.

Method: INTEGRIS-PSC is an ongoing, randomized, placebo-controlled 12-week Phase 2a study evaluating the safety and tolerability of multiple doses of bexotegrast in participants with PSC (EudraCT: 2020-001428-33, NCT04480840). The study uses an ascending dose model (Figure): dosing cohorts (n = 28 participants/cohort) are enrolled and evaluated in a sequential manner with an independent data safety monitoring board review before proceeding to higher dosing cohorts. Entry criteria include established diagnosis of large duct PSC with evidence of hepatic fibrosis based on biopsy, ELF ≥ 7.7, transient elastography >8 kPa or magnetic resonance elastography >2.4 kPa and stable disease in participants with IBD. Randomization to bexotegrast or placebo (3:1) is stratified by UDCA use. At the time of abstract submission, enrollment of the 40 mg cohort was completed and was ongoing for the 80 and 160 mg cohorts. An additional cohort of 320 mg is planned.

Results: INTEGRIS-PSC is ongoing and blinded. As of the last safety review, 64 participants were randomized. Participants were mean 45 years old with a duration of PSC of 9 years, 78% male, and 61% with IBD. Mean (SD) baseline liver chemistries were: ALP: 273 (146) U/L, ALT: 84 (61) U/L, bilirubin: 0.8 (0.4) mg/dL. 13% (each) had history of fatigue and pruritus. 49 participants completed the study, 13 were ongoing and 2 discontinued due to adverse events (COVID, Insomnia). Most reported adverse events on blinded study drug were Grade 1 or 2 severity (93%). The most common were: pruritus (14%), fatigue (13%), headache (11%), abdominal pain (6%), cholangitis (6%), COVID (6%), nausea (6%) and upper abdominal pain (6%). 2 participants experienced serious adverse events: one had a grade 3 event of ascending cholangitis, and another had grade 3 events of concurrent abdominal pain with cholecystitis; all serious events resolved, were not considered related to study medication and both participants continued in the study.

Conclusion: The INTEGRIS-PSC phase 2a study evaluating the safety, tolerability, and pharmacokinetics of bexotegrast in participants with primary sclerosing cholangitis continues without modification by the Data Safety Monitoring board. Results from this study are expected in 3Q2023.
Background and aims: Endoscopic retrograde cholangiopancreatography (ERCP) is an important component of the care for people living with primary sclerosing cholangitis (PSC). Frequently it is performed to address complex biliary concerns, including obstruction, source control for infection, or evaluation for biliary malignancy. We sought to characterize the peri-procedural course for people living with PSC undergoing ERCP in a high-volume therapeutic endoscopy centre at a single-centre hospital receiving quaternary care referrals from the province of Ontario, Canada.

Methods: Using hospital procedural codes to find ERCPs from April 2011 to July 2021, patients who underwent ERCP with PSC were identified. Procedure-related complications (up to 90 days post-procedure) and clinical characteristics information was retrospectively collected. Mixed model logistic regression was performed to evaluate factors associated with post-ERCP complications.

Results: In 78 patients who underwent 271 ERCPs, two-thirds were male and median age at ERCP was 45 years (IQR 31–59 years). In 39 (89) of ERCPs, patients had been diagnosed with liver cirrhosis. Jaundice (152, 59%), abdominal pain (133, 52%), and subjective fevers (88, 34%) were the most common patient-reported indications. Procedural indication was biliary obstruction in 86%, cholangitis in 38%, and malignancy concerns in 20%. Biliary cannulation was successful in 251 ERCPs (97%). Pancreatic duct cannulation occurred in 6.6% (17), while preferential contrast injection into the ductic duct occurred in 32 ERCPs (12%). Balloon dilatation was completed in 61% of cases, while stent insertion, removal, and biliary brushings was performed in 31%, 25%, and 35% respectively. Technical success with satisfactory biliary drainage and flow post-ERCP was reported in 92%. Post-ERCP, biliary blockage, post-ERCP cholangitis, and post-ERCP pancreatitis was reported in 66 (29%), 45 (20%), 11 (4.9%) cases respectively. No perforations occurred. In 1% of cases, post-ERCP bleed, cholecystitis, or respiratory complications occurred. There were 5 deaths in the post-ERCP follow-up period. Post-ERCP hospitalization occurred in 86 cases (37%), with 28 (14%) for an ERCP-related complication, and 8 (3.9%) for liver failure. Repeat ERCP at the same centre within 90 days occurred in 83% (32%) of cases. Male sex (OR 2.79, 95% CI 1.38–6.07), cirrhosis (OR 1.92, 95% CI 1.06–3.50) and stent insertion were associated with post-ERCP complications on univariable analysis (OR 2.37, 95% CI 1.34–4.22); only stent insertion (OR 2.82, 95% CI 1.31–6.05) was significantly associated on multivariate analysis.

Conclusion: For people living with PSC, ERCP remains an important component of their complex care: procedural morbidity and mortality occur but at relatively infrequent rates.
Pruritus in patients with PSC is not well documented but is frequent and often severe. Patients who experience severe pruritus have more severe liver disease and frequently require multiple anti-pruritic medications and ERCP. These results establish the clinical significance of pruritus in PSC and support the need for prospective studies to accurately ascertain itch prevalence and the unmet need for therapies to treat pruritus among patients with PSC.
Spleen stiffness measurement predicts decompensation risk in primary biliary cholangitis

Giulia Francesca Manfredi1,2, Carla De Benedittis2, Francesca Baorda1,2, Davide Di Benedetto1,2, Michela Burlone2, Rosalba Minisini1, Mario Pirisi1,2, Cristina Rigamonti1,2, Università degli Studi del Piemonte Orientale, Department of Translational Medicine, Novara, Italy; 2AOU Maggiore della Carità, Division of Internal Medicine, Novara, Italy
Email: cristina.rigamonti@uniupo.it

Background and aims: Primary biliary cholangitis (PBC) is a slowly progressive cholestatic disease, which may lead to portal hypertension (PH) and its complications even in a pre-cirrhotic stage. Spleen stiffness measurement (SSM) by vibration-controlled transient elastography (VCTE) is predictive of PH. We aimed to investigate in PBC patients the prognostic value of SSM in stratifying the risk of decompensation and SSM ability to identify those at low probability of high-risk varices.

Method: Monocentric study of 88 PBC patients, who underwent VCTE for liver stiffness measurement (LSM) and SSM with a spleen dedicated module. Demographic and clinical features at baseline and at the time of VCTE examination were recorded. Screening for varices with esophagagogastroduodenoscopy (EGDS) was performed according to Baveno VI guidelines and proposed to all patients with LSM > 40 kPa, independently of LSM.

Results: Among the 88 patients (95 women, median age 62 years, median disease duration 40 months, 14% cirrhotic, 94% on monotherapy according to Baveno VI guidelines and proposed to all patients with SSM > 40 kPa, independently of SSM. Median disease duration 40 months, 14% cirrhotic, 94% on monotherapy according to Baveno VI guidelines and proposed to all patients with SSM > 40 kPa, independently of SSM.

Conclusion: Both LSM and SSM predict risk of decompensation in PBC patients. SSM > 40 kPa is predictive of presence of varices and might be used in combination with LSM and platelet count to improve prediction of complications related to portal hypertension.

Spleen stiffness measurements of spleen stiffness is associated with treatment response to ursodeoxycholic acid in primary biliary cholangitis

Ilkay Ergenc1, Hasan Yapiç2, Caglayan Keklikkiran3, Yusuf Yilmaz1,3,4, 1Marmara University School of Medicine, Gastroenterology and Hepatology, Istanbul, Turkey; 2Marmara University School of Medicine, Istanbul, Turkey; 3Rize Recep Tayyip Erdogan University Faculty of Medicine, Gastroenterology and Hepatology, Turkey; 4Marmara University Institute of Gastroenterology, Turkey
Email: ergencilkay@gmail.com

Background and aims: The biochemical response criteria fail to predict disease progression in up to 20% of patients with Primary Biliary Cholangitis (PBC). Recent evidence has suggested a prognostic role of portal pressure in PBC. Alterations in the biomechanical properties of the spleen can be quantified by transient elastography (TE) and represent a reliable surrogate marker of portal pressure. This study investigated the association between Spleen Stiffness Measurements (SSMs) by TE and biochemical response to UDCA.

Method: A total of 107 patients with PBC (101 women and 6 men; mean age at diagnosis: 45.9 ± 11 years; median duration of follow-up after UDCA treatment was 4.6 years (range, 1–7.75 years). All patients had at least one positive diagnostic serological marker of PBC, and 60 (56.1%) had undergone liver biopsy at the time of diagnosis. The diagnosis of cirrhosis was established histologically or based on clinical and laboratory findings combined with characteristic radiological features.

Results: A total of 107 patients with PBC (101 women and 6 men; mean age at diagnosis: 45.9 ± 11 years; median duration of follow-up after UDCA treatment was 4.6 years (range, 1–7.75 years). All patients had at least one positive biochemical response to UDCA was determined according to the Paris II criteria. A single experienced gastroenterologist performed all SSMs by TE (FibroScan® Expert 630; EchoSens). The diagnosis of cirrhosis was established histologically or based on clinical and laboratory findings combined with characteristic radiological features.

Conclusion: Both LSM and SSM predict risk of decompensation in PBC patients. SSM > 40 kPa is predictive of presence of varices and might be used in combination with LSM and platelet count to improve prediction of complications related to portal hypertension.

Rechallenge with anti-PD1 monotherapy after checkpoint inhibitor hepatitis is associated with low rates of recurrence: a single centre study

Nicola Jones1, Dominique Parslow2, Stewart Macdonald3, Lucy Walker1, 1University Hospitals Plymouth, Oncology, Plymouth, United Kingdom; 2University Hospitals Plymouth, Oncology, United Kingdom; 3South West Liver Unit, Plymouth, United Kingdom
Email: lucy.walker34@nhs.net

Background and aims: Immune checkpoint inhibitors are now widely used in numerous Oncology indications and the management of checkpoint inhibitor-induced liver injury (ChILI) is becoming routine in the practice of Oncologists and Hepatologists alike. Management of these patients is guided by the Oncology society guidelines at national and regional levels and include guidance regarding rechallenge of patients with ChILI. There is growing consensus that the use of anti-PD1 monotherapy is a safe approach, however, overall there is very little data within the public domain to support these guidelines and decisions.

Method: We performed a retrospective analysis of all patients who had developed ChILI between November 2016 and December 2022, including grade of index hepatitis by indication and regimen, rechallenge practice and outcome of rechallenge.

Results: 21 cases of ChILI were identified to have been treated in our center since November 2016. Of these 19% were treated for primary lung cancer and 81% melanoma. The majority of index hepatitis was grade 3 (71% overall; lung ca 50%; melanoma 70.6%), grade 4 14%, grade 2 10% and grade 1 5%. Ipilimumab/Nivolumab combination therapy caused the majority of ChILI events (66.7%) and 100% of the grade 4 events. Rechallenge was initiated in 38% of patients and 100% of these received anti-PD-1 monotherapy. Of these 50% had successful rechallenge. Both Lambert and rechallenge were found to maintain high rates of grade 3 liver injury, compared to those with recurrent ChILI, where 100% had grade 3 liver injury.

Conclusion: Based on our data, rechallenge with single agent anti-PD1 inhibitors should be considered in patients up to grade 3 of index hepatitis. However the higher the grade of the index hepatitis, the greater the likelihood of developing recurrent ChILI.

Spleen stiffness measurements of spleen stiffness is associated with treatment response to ursodeoxycholic acid in primary biliary cholangitis

Ilkay Ergenc1, Hasan Yapiç2, Caglayan Keklikkiran3, Yusuf Yilmaz1,3,4, 1Marmara University School of Medicine, Gastroenterology and Hepatology, Istanbul, Turkey; 2Marmara University School of Medicine, Istanbul, Turkey; 3Rize Recep Tayyip Erdogan University Faculty of Medicine, Gastroenterology and Hepatology, Turkey; 4Marmara University Institute of Gastroenterology, Turkey
Email: ergencilkay@gmail.com

Background and aims: The biochemical response criteria fail to predict disease progression in up to 20% of patients with Primary Biliary Cholangitis (PBC). Recent evidence has suggested a prognostic role of portal pressure in PBC. Alterations in the biomechanical properties of the spleen can be quantified by transient elastography (TE) and represent a reliable surrogate marker of portal pressure. This cross-sectional study investigated the association between Spleen Stiffness Measurements (SSMs) by TE and biochemical response to UDCA.

Method: A total of 107 patients with PBC (101 women and 6 men; mean age at diagnosis: 45.9 ± 11 years; median duration of follow-up after UDCA treatment was 4.6 years (range, 1–7.75 years). All patients had at least one positive biochemical response to UDCA was determined according to the Paris II criteria. A single experienced gastroenterologist performed all SSMs by TE (FibroScan® Expert 630; EchoSens). The diagnosis of cirrhosis was established histologically or based on clinical and laboratory findings combined with characteristic radiological features.

Results: A total of 107 patients with PBC (101 women and 6 men; mean age at diagnosis: 45.9 ± 11 years; median duration of follow-up after UDCA treatment was 4.6 years (range, 1–7.75 years). All patients had at least one positive biochemical response to UDCA was determined according to the Paris II criteria. A single experienced gastroenterologist performed all SSMs by TE (FibroScan® Expert 630; EchoSens). The diagnosis of cirrhosis was established histologically or based on clinical and laboratory findings combined with characteristic radiological features.

Conclusion: Both LSM and SSM predict risk of decompensation in PBC patients. SSM > 40 kPa is predictive of presence of varices and might be used in combination with LSM and platelet count to improve prediction of complications related to portal hypertension.

Rechallenge with anti-PD1 monotherapy after checkpoint inhibitor hepatitis is associated with low rates of recurrence: a single centre study

Nicola Jones1, Dominique Parslow2, Stewart Macdonald3, Lucy Walker1, 1University Hospitals Plymouth, Oncology, Plymouth, United Kingdom; 2University Hospitals Plymouth, Oncology, United Kingdom; 3South West Liver Unit, Plymouth, United Kingdom
Email: lucy.walker34@nhs.net

Background and aims: Immune checkpoint inhibitors are now widely used in numerous Oncology indications and the management of checkpoint inhibitor-induced liver injury (ChILI) is becoming routine in the practice of Oncologists and Hepatologists alike. Management of these patients is guided by the Oncology society guidelines at national and regional levels and include guidance regarding rechallenge of patients with ChILI. There is growing consensus that the use of anti-PD1 monotherapy is a safe approach, however, overall there is very little data within the public domain to support these guidelines and decisions.

Method: We performed a retrospective analysis of all patients who had developed ChILI between November 2016 and December 2022, including grade of index hepatitis by indication and regimen, rechallenge practice and outcome of rechallenge.

Results: 21 cases of ChILI were identified to have been treated in our center since November 2016. Of these 19% were treated for primary lung cancer and 81% melanoma. The majority of index hepatitis was grade 3 (71% overall; lung ca 50%; melanoma 70.6%), grade 4 14%, grade 2 10% and grade 1 5%. Ipilimumab/Nivolumab combination therapy caused the majority of ChILI events (66.7%) and 100% of the grade 4 events. Rechallenge was initiated in 38% of patients and 100% of these received anti-PD-1 monotherapy. Of these 50% had successful rechallenge. Both Lambert and rechallenge were found to maintain high rates of grade 3 liver injury, compared to those with recurrent ChILI, where 100% had grade 3 liver injury.

Conclusion: Based on our data, rechallenge with single agent anti-PD1 inhibitors should be considered in patients up to grade 3 of index hepatitis. However the higher the grade of the index hepatitis, the greater the likelihood of developing recurrent ChILI.
Primary sclerosing cholangitis (PSC) is a chronic liver disease characterized by hepatic inflammation and biliary fibrosis leading to cholangitis and cirrhosis. Patients with PSC may have impaired quality of life (QoL); however, the relationship between QoL, liver fibrosis stage, and liver inflammation remains unclear. We aimed to investigate the associations between QoL, liver fibrosis, and inflammation.

**Method:** We prospectively included patients with PSC followed at the Department of Hepatology and Gastroenterology, Aarhus University Hospital, Denmark. The QoL was quantified using the general EQ-5D-5L questionnaire and the newly developed PSC-specific PSC PRO instrument. Liver fibrosis was estimated using FibroScan and liver inflammation by the macrophage-specific biomarker sCD163.

**Results:** Seventy-one patients were included with a median age of 44 years (IQR: 31–56). Forty-five (63.4%) were male and 60 (84.5%) had concomitant inflammatory bowel disease. The overall QoL expressed with the EQ-5D-5L utility score was similarly high in patients with PSC and the general population ([mean ± SD] 0.86 ± 0.13 vs. 0.90 ± 0.16). The PSC PRO total score was similar across fibrosis stages (p = 0.164). However, patients with F4-fibrosis tended to report lower QoL on the EQ-5D-5L visual analog scale (VAS) than patients with F0-F3-fibrosis (p = 0.08). Notably, patients with previous hospitalization due to episodes of cholangitis reported significantly higher median PSC PRO total score (20.8 (11.8–64.5) vs. 13.9 (8.9–26.3), p = 0.047) and lower median EQ-5D-5L (71 (IQR: 56–81.5) vs. 85 (75–91), p = 0.017) than patients with no previous episodes of cholangitis. Finally, we observed a significant correlation between sCD163 and PSC PRO total score (R = 0.36, p = 0.003), and a weak trend towards a negative correlation between sCD163 and EQ-5D-5L VAS score (R = −0.20, p = 0.099).

**Conclusion:** In this cohort, patients with PSC generally reported a high QoL. There was no association between QoL and the stage of liver fibrosis. However, patients with previous episodes of cholangitis reported a lower QoL. Further, liver inflammation determined by sCD163 levels was associated with low QoL. This may suggest that inflammation is more important than fibrosis, when looking at the effect on QoL in PSC patients.
biliary cholangitis (PBC). However, there is no tool to predict who will do so and what their management should be. Here, we aim to evaluate the usefulness of serum bile acid (BA) profile as a non-invasive follow-up and predictive tool in AMA+ patients.

**Method:** Bicenter ambispective study in AMA+ individuals identified in the ETHON cohort (Spanish population-based cross-sectional study) between 2015 and 2017 in Cantabria and Madrid (Spain). Twenty BA species and 7alpha-hydroxy-4-cholesten-3-one (C4) were analyzed in serum samples by mass spectrometry (HPLC-MS/MS), both at inclusion and follow-up. Patients with a diagnosis of PBC at inclusion were excluded.

**Results:** Fifty-four AMA+ individuals were identified, of whom 38 (73%) were women with a median age of 49.5 years. None had alterations in liver biology. Baseline liver stiffness was normal (4.5 kPa). Of the initial cohort, 47 (87%) continued follow-up and 6 (12.7%) developed PBC over a median of 5.3 years. The BA profile of non-progressors (NOPROG) vs those who progressed to PBC (PROG) during follow-up was assessed at both baseline and progression. At baseline, PROG individuals had a higher concentration of non-12α-hydroxylated BAs (non-12αOH) (PROG 2.49 vs NOPROG 1.45 μM; p = 0.04) and glycoconjugated BAs (PROG 1.75 vs NOPROG 1.03 μM; p = 0.06 at the limit of significance), as well as lower percentage distribution of cholic acid (CA) family with respect to NOPROG (9.9 vs 17.1% p = 0.02). At follow-up, PROG patients presented higher values in 12αOH (PROG 1.75 vs NOPROG 0.69 μM; p = 0.01), non-12αOH (PROG 2.00 vs NOPROG 0.84 μM; p = 0.04), glycoconjugated (PROG 1.86 vs NOPROG 0.69; p = 0.05) and free (PROG 1.05 vs NOPROG 0.49 μM; p = 0.07 at the limit of significance) BAs concentrations. In paired analysis, PROG patients had increased concentration and percentage of CA family (p = 0.02 and p = 0.04, respectively) and deoxycholic acid family (p = 0.07 at the limit of significance), an increase that was also reflected in the concentration of 12αOH BAs. Moreover, the concentration of non-12αOH BAs in PROG patients remained elevated and stable (p = 0.91). On the other hand, in NOPROG subjects, the profile of all BAs remained stable during follow-up, showing no alterations in serum BA concentrations or in their percentage distribution.

**Conclusion:** AMA+ individuals without progression to PBC show a stable and non-pathological serum BA profile, whereas those who progress show significant changes in the BA profile. Patients who progress show significantly higher non-12αOH BAs values at baseline than those who do not progress, which may be a useful early biomarker for the development of PBC.

**WED-289**

Does fibrosis regression in autoimmune hepatitis require histological as well as biochemical remission?

Sarah Flatley1, Asha Dube 1, Barbara Hoeroldt 1, Laura Harrison 1, Elaine Wadland 1, Dermot Gleeson 1, 1Sheffield Teaching Hospitals NHS Foundation Trust, United Kingdom

Email: s.flatley@nhs.net

**Background and aims:** Prevention of fibrosis progression, an important aim of autoimmune hepatitis (AIH) treatment, is associated with histological remission. Complete biochemical remission (CBR) has been proposed as the best surrogate marker for histological remission (Hartl, J Hepatol 2018), although it may be less reliable in patients with cirrhosis (Laschtowitz, JHep Rep 2021). We aimed to assess the association of biochemical and histological remission with fibrosis regression, in cirrhotic and non-cirrhotic AIH patients.

**Method:** Retrospective/prospective single centre audit of patients with AIH (1999 IAIHG Criteria) presenting 1998–2020. All patients had a liver biopsy at diagnosis and a follow-up biopsy once in CBR (defined as normal ALT, AST, and IgG), after (median (range)) 27 (12–123) months of immunosuppressive treatment. Biopsies were assessed by one histopathologist (AKD) using a predesigned proforma. Histological remission was defined as Ishak histological activity index (HAI) ≤ 3 and fibrosis regression as Ishak decrease of ≥1.

**Results:** Of 90 patients who had an evaluable biopsy in CBR (79% women, age 56 (7–75), follow-up 7 (2–23) years), only 36 (40%) were also in histological remission. Fibrosis regressed in 27 (30%), progressed in 33 (37%) and was unchanged in 30 patients (33%).

Patients achieving histological remission were more likely to have fibrosis regression (50% vs 18%, p < 0.001) than those with persisting histological activity. Fibrosis stage increased in patients with persisting histological activity (2 (0–6) to 3 (0–6), Z = −2.277, p = 0.023) but did not change in patients achieving histological remission (3 (0–6) to 2 (0–6), Z = −1.170, p = 0.242). On regression analysis, only achieving histological remission was independently associated with fibrosis regression (OR 4.22, 95% CI 1.6–11.4). Cirrhosis (Ishak stage 5–6) was present in 12 patients at diagnosis, developing in a further 6 on follow-up biopsy. Rates of histological remission did not differ between patients with and without cirrhosis at diagnosis (50% vs 42.3%, p = 0.617) or on follow-up biopsy (35.7% vs 44.7%, p = 0.531).

Patients with cirrhosis showed a similar association between histological remission and fibrosis regression as the overall group (Table, not significant due to small sample size).

**Conclusion:** Only 40% of patients with AIH in CBR achieved histological remission, with similar rates in those with and without cirrhosis. Fibrosis regressed in 30% overall and more (50%) if histological remission was achieved. CBR is not an adequate surrogate marker for histological remission in cirrhotic or non-cirrhotic AIH patients. These data support a role for follow-up biopsy to assess response and guide further treatment of AIH.

<table>
<thead>
<tr>
<th>Table: (abstract: WED-289)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No cirrhosis (n = 72)</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Histological remission</strong></td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
</tbody>
</table>
S392 Journal of Hepatology

WED-290
Predictive models of treatment benefit in patients with autoimmune hepatitis and decompensated cirrhosis at diagnosis

Pinegoli Arvaniti1,2, Sergio Rodriguez-Tajes1,3, Marlene Padilla4, Olivas Ignasi5, Alvaro Diaz-Gonzalez2, Isabel Conde6, Beatriz Mateos Muñoz2, Diana Horta5, Rosa M. Morillas3,9, Maria Torner6, Mar Rivero Barciela10, Juan Carlos Ruiz-Cobo10, Indhira Perez Medrano11, Carmen Alvarez-Navaescués12, Inmaculada Castillo13, Ana Arecibica Almeida14, Judith Gómez-Camareo15, Elena Gómez Domínguez16, Magdalenal Salcedo17, Carmen Vila18, Sara Lorente19, Vanesa Bernal Monterde20, Eva Fernandez Bonilla20, Francisco Cuenca Alarcon1, Cumali Efe22, Maria Alejandra Gracia Villamil23, George Dalekos2, Maria Carlota Londono1,3, 1Liver Unit, Hospital Clinic, Institut d’Investigació Biomèdica August Pi y Sunyer (IDIBAPS), Barcelona, Spain; 2Department of Medicine and Research Laboratory of Internal Medicine, Expertise Center of Greece in Autoimmune Liver Diseases, ERN RARE-LIVER, University Hospital of Larissa, Greece, Greece; 3Centro de Investigación Biomédica en Red en Enfermedades Hepáticas y Digestivas (CIBEREHID), Spain; 4Unidad de Autoinmunidad Hepática Sección de Hepatología y Transplante Hepático, Hospital Italiano de Buenos Aires, Argentina, Argentina; 5Gastroenterology and Hepatology Department, Centre de Investigació Biomèdica August Pi y Sunyer (IDIBAPS), Barcelona, Spain; 6Department of Medicine and Research Laboratory of Internal Medicine, Expertise Center of Greece in Autoimmune Liver Diseases, ERN RARE-LIVER, University Hospital of Larissa, Greece, Greece; 7Servicio de Aparato Digestivo, Complejo Hospitalario Universitario de Pontevedra, Pontevedra, España, España; 8Servicio de Aparato Digestivo, Hospital Universitario Ramón y Cajal, CIBERehd, IRYCIS, Madrid, España, Spain; 9Servicio de Aparato Digestivo, Hospital Universitario Mutua de Terrassa. Terrassa, España, Spain; 10Department of Hepatology, Hospital Germans Trias i Pujol. Institute of Investigation Germans Trias i Pujol (IGTP), Badalona, Spain; 11Unit of Hepatology, Department of Internal Medicine, University Hospital Vall de Hebron, Barcelona, Spain; 12Servicio de Aparato Digestivo, Complejo Hospitalario Universitario de Pontevedra, Pontevedra, España, España; 13Servicio de Aparato Digestivo, Hospital Universitario Central de Asturias. Oviedo, España, España; 14Servicio de Aparato Digestivo, Hospital General Universitario de Valencia, Spain; 15Servicio de Aparato Digestivo, Hospital Universitario Nuestra Señora de la Candelaria. Santa Cruz de Tenerife, España, España; 16Servicio de Aparato Digestivo, Hospital Universitario de Burgos. Burgos, España, España; 17Servicio de Aparato Digestivo, Hospital Universitario 12 de Octubre. Madrid, España, España; 18Servicio de Hepatología, Hospital San Juan de Alicante, Instituto Valenciense de Investigación Sanitaria (IVIS), Alicante, Spain; 19Servicio de Aparato Digestivo, Hospital Universitario de Getafe, Madrid, España, España; 20Servicio de Aparato Digestivo, Hospital Universitario 12 de Octubre. Madrid, España, España; 21Servicio de Aparato Digestivo, Hospital Universitario 12 de Octubre. Madrid, España, España; 22Servicio de Aparato Digestivo, Hospital Universitario 12 de Octubre. Madrid, España, España; 23Servicio de Aparato Digestivo, Hospital Universitario 12 de Octubre. Madrid, España, España; 24Servicio de Aparato Digestivo, Hospital Universitario 12 de Octubre. Madrid, España, España; 25Servicio de Aparato Digestivo, Hospital Universitario 12 de Octubre. Madrid, España, España; 26Servicio de Hepatología, Hospital Clinic Lozano Blesa, Universidad de Zaragoza, Zaragoza, España, Spain; 27Servicio de Aparato Digestivo, Hospital Universitario Miquel Servet, Zaragoza, España, España; 28Servicio de Aparato Digestivo, Hospital Universitario 12 de Octubre. Madrid, España, España; 29Servicio de Aparato Digestivo, Hospital Clínico San Carlos, Madrid, España, España; 30Servicio de Hepatología, Hospital Clinic Lozano Blesa, Universidad de Zaragoza, Zaragoza, España, Spain; 31Servicio de Gastroenterología, Gazi Yasargil Education and Research Hospital, Diyarbakir, Turkey; 32Unidad de Autoinmunidad Hepática Sección de Hepatología y Transplante Hepático, Hospital Italiano de Buenos Aires, Argentina, Argentina

Email: peni.arvaniti@gmail.com

Background and aims: One third of patients with autoimmune hepatitis (AIH) have already advanced fibrosis or cirrhosis at diagnosis. Although treatment administration is strongly recommended in this group, there are no established guidelines about the management of patients with AIH and decompensated cirrhosis at diagnosis. The aim of this study was to assess the efficacy and safety of immunosuppressive treatment in AIH-related decompensated cirrhosis and to establish predictive models of favorable outcome and treatment response.

Method: This is a multicenter retrospective study of 134 patients with AIH and decompensated cirrhosis at diagnosis confirmed by liver biopsy. Competing risk analysis was used to determine cumulative incidence of survival (liver transplantation, LT was considered a competing event). Predictive models of transplant-free survival, and recompensation were calculated with Cox regression analysis. A decision tree analysis was used to determine the patients who will benefit from treatment.

Results: Eighty five patients (63%) were female, with median age of 58 years old (IQR: 48–68) and median follow-up of 28 months (IQR: 5–65). One hundred twenty five (93%) had ascites and 54 (40%) had hepatic encephalopathy (HE) at diagnosis. Thirteen (10%) patients did not receive treatment; all of them died or required LT. Treated patients (n = 121, 90%) had higher levels of ALT (333 vs. 42, p < 0.001), modified hepatic activity index (mHAI) (9 vs. 3, p < 0.001) and of bilirubin (7 vs. 2.7, p < 0.001). Cumulative incidence of mortality was significantly higher in untreated patients (36% vs. 54%, p = 0.002). The most efficient predictive model of transplant-free survival (AUC: 0.75; 95% CI: 0.66–0.83) included the absence of HE and MELD-Na score at diagnosis. Using decision tree analysis, patients with HE ≥ grade 2 and MELD-Na ≥ 23.5 (Figure) had higher probability of dying or requiring a LT after treatment initiation. In the remaining patients, a decrease in MELD-Na ≥ 5.5 points after 4 weeks of treatment had a negative predictive value for death of 100%. Sixty two (51%) patients recompensated. Factors associated with recompensation were the absence of HE (OR: 0.193 p < 0.001, 95%CI: 0.0, 0.84–0.441) and serum sodium levels (OR: 1.11, p = 0.03, 95%CI: 1.013–1.234) at diagnosis. During follow-up, 26 patients stopped treatment, 20 during the first 4 weeks, and 18 due to non-response. HE ≥ grade 2 was associated with treatment withdrawal.

Conclusion: Patients with AIH-related decompensated cirrhosis and active disease can benefit from treatment initiation. The grade of HE at diagnosis is strongly associated with outcome, cirrhosis recompensation and treatment withdrawal. The grade of HE, the value of MELD-Na score at diagnosis and the reduction of MELD-Na during the first 4 weeks of treatment can guide treatment decisions and predict transplant-free survival.

Figure:
Background and aims: Primary Sclerosing Cholangitis (PSC) Risk Estimate Tool (PREsTo) is a novel prognostic tool, which is used to predict hepatic decompensation in patients with PSC. Anti-Saccharomyces cerevisiae antibodies (ASCA) is one of the main serological markers used in Inflammatory Bowel Diseases (IBD) which is more prevalent in Crohn’s disease (CD) and is associated with a more aggressive IBD phenotype. Nevertheless, data on the association between ASCA and adverse liver outcomes in PSC-IBD is limited. We aimed to explore whether ASCA is associated with liver disease severity, predicted by the PREsTo score, and with the degree of liver fibrosis measured by Transient Elastography (TE) in PSC-IBD patients.

Method: We conducted a retrospective study on adult patients with PSC-IBD, at a single tertiary center in Tel Aviv, Israel, between 2010 and 2023. Medical records were reviewed for baseline demographics, clinical data, including IBD subtype, PSC and IBD disease duration, blood tests assessed at the last documented visit and serum ASCA. Degree of liver disease was assessed at the last documented visit using (1) the PREsTo score (risk of decompensation at 5 years [%]), which is composed of serum levels of bilirubin, albumin, alkaline phosphatase, aspartate aminotransferase, sodium, hemoglobin, platelets concentrations, patient’s age and PSC duration, and (2) Degree of liver fibrosis measured by TE (FibroScan, measured in Kpa). Univariate (Student’s t-test) and multivariable linear regression model adjusted for gender, IBD subtype, IBD duration and PSC duration was used to assess associations between ASCA and outcomes of PREsTo score and degree of liver fibrosis.

Results: The cohort comprised of 102 subjects with PSC-IBD. Fifty-six (54.9%) were males, mean age was 50.2 years (SD 17.05), 57 patients were diagnosed with ulcerative colitis (UC) and 45 with CD. The mean age of IBD and PSC diagnosis was 31.2 years (SD 15.6) and 39.5 years (SD 17.07), respectively. ASCA data was available for 59 (57.8%) subjects. Six of 30 (20%) patients with UC and 14 of 28 patients (50%) with CD had positive ASCA. PREsTo score was available for 51 (50%) subjects and TE measurements were available for 43 (42.1%) patients. In the univariate analysis both the PREsTo score (p = 0.017) and TE measurements (p = 0.018) were significantly higher in those with positive ASCA (Figure 1). In the multivariable model, ASCA positivity was still significantly associated with higher PREsTo scores (Estimate = 22.27, 95% CI 2.88–41.67, p = 0.026) and a higher TE measurements (Estimate 2.80, 95 CI 0.19–5.41, p = 0.036), even after adjustment for IBD subtype, IBD and PSC duration.

Conclusion: In subjects with IBD with concomitant PSC, the presence of serum ASCA may be used to predict 5-years liver decompensation and degree of liver fibrosis. Further studies are warranted to explore the biological mechanism underlying this association.

WED-292
Increased risk of osteoporotic fracture in patients with autoimmune hepatitis
Jihye Lim1, Ye-Jee Kim2, Seon-Ok Kim2, Jonggi Choi3. 1Yeouido St. Mary’s Hospital, Internal Medicine, Seoul, Rep. of South Korea; 2Asan Medical Center, Rep. of South Korea; 3Asan Medical Center, Gastroenterology, Liver Center, Rep. of South Korea

Background and aims: Chronic liver disease is a recognized risk factor for osteoporosis and fragility fractures. Especially, patients with autoimmune hepatitis (AIH) are thought to be more vulnerable to loss of bone mass in several aspects. From an epidemiologic perspective, AIH is a female-dominant disease, particularly in postmenopausal women who have an increased risk of developing osteoporosis. In addition, glucocorticoids, the most common cause of secondary osteoporosis, are frequently used. Few large-scale studies are published regarding the association between AIH and risk of osteoporotic fracture. This study aimed to determine the risk of developing an osteoporotic fracture in patients with AIH.

Method: We used claims data from the Korean National Health Insurance Service (NHIS) between 2007 and 2020. Patients with AIH (n = 7062) were matched with controls (n = 28,122) using a ratio of 1 : 4, based on age, sex, and duration of follow-up. Osteoporotic fractures, included fractures of the vertebral, hip, distal radius, and proximal humerus. Prescription of glucocorticoid or other immunosuppressive agent for 30 consecutive days after the diagnosis of AIH was used to assess medication utilization. The incidence rate (IR) and incidence rate ratio (IRR) of osteoporotic fracture were compared between the two groups and their associated factors were also evaluated. We performed subgroup analysis for the patients with AIH whose follow-up was at least ≥2 years to determine the association between the cumulative use of glucocorticoid or immunosuppressive agents during the initial 2 years and the risk of osteoporotic fractures.

Results: During a median follow-up period of 5.4 years, 712 osteoporotic fractures occurred in patients with AIH with an IR of 17.5 per 1,000 person-years (PYs) while 1,922 osteoporotic fractures with an IR of 11.6 per 1,000 PYs in the controls. Patients with AIH showed a significantly higher risk of osteoporotic fractures than matched controls, with an IRR of 1.24 (95% confidence interval, 1.10–1.39, p < 0.01) in the multivariable analysis. Vertebral fractures were significantly higher among the patients with AIH when compared to the controls in unadjusted (IRR: 1.66) and adjusted analyses (IRR: 1.66).
Patients with AIH appeared to have a higher risk of hip (IRR: 1.24), proximal humerus (IRR: 1.34), and distal radius (IRR: 1.75) fracture than the controls in the unadjusted analysis, whereas this risk did not significantly differ after adjustment. Female sex, older age, history of stroke, presence of cirrhosis, and use of glucocorticoids were associated with an increased risk of osteoporotic fractures. In the two-year landmark analysis, long-term use of glucocorticoid had an increased risk of osteoporotic fracture in a dose-dependent manner (4% as per 10% increase in the duration of glucocorticoid use).

**Conclusion:** In conclusion, the risk of osteoporotic fracture was significantly increased in the AIH patients. Female sex, old age, presence of cirrhosis, longer use of glucocorticoids increased the risk of fracture. Considering the morbidities from osteoporotic fracture, recognition of these risk factors and early diagnosis and intervention may be crucial in the care of patients with AIH.

**WED-293**

Prognostic value of serum ALP levels during additional treatment in Japanese patients with primary biliary cholangitis treated with ursodeoxycholic acid and bezafibrate

Akihito Takeuchi1, Kosuke Matsumoto1, Atsumasa Komori2, Masanori Abe3, Tadashi Namisaki4, Kazuhiro Kawata5, Masashi Ninomiya6, Hideki Fujii7, Atsushi Takahashi8, KANG Jong-Hon9, Masaaki Takamura10, Mie Arakawa11, Satoru Joshita12, Ken Sato13, Takako Nomura14, Keisuke Kakisaka15, Akira Kaneko16, Kentaro Kikuchi17, Tsutomu Masaki14, Takeji Umemura12, Akira Honda18, Hiromasa Ohira19

**Figure:** (abstract: WED-292): Cumulative risks of osteoporotic fractures in patients with autoimmune hepatitis and the control group. Overall osteoporotic fracture, (B) Vertebral fracture, (C) Hip fracture, (D) Fracture of proximal humerus, and (E) Fracture of distal radius.
Background and aims: Treatment response in primary biliary cholangitis (PBC) is important in predicting long-term prognosis. The standard of care for PBC is ursodeoxycholic acid (UDCA), and various indices have been reported to evaluate the response to UDCA monotherapy. On the other hand, obeticholic acid (OCA) or bezafibrate (BZF) are used in the real world for patients who exhibited incomplete response to UDCA, but no clinical indices have been demonstrated for predicting the long-term outcome in patients with combination treatment. In this study, we investigated the association of ALP levels during additional BZF treatment with long-term outcomes in Japanese patients with PBC treated with UDCA and BZF.

Method: We took advantage of a retrospective cohort, consisting of 799 PBC patients (male/female = 120/679, age at initiation of treatment 58.9 ± 11.1 years) attending 19 centers in Japan. Date of birth and gender, date, presence of symptoms and biochemical test findings (ALP, total bilirubin, albumin) at baseline, treatment protocol (UDCA and/or BZF), serum ALP at 6 and 12 months of UDCA or additional BZF treatment, and the final follow-up date and outcomes (liver transplantation (LT) and all-cause death) were recorded in all patients. Using this cohort, the association of ALP levels at 6 and 12 months of treatment with outcomes was examined by Kaplan-Meier method and Cox proportional hazards model, along with other covariates.

Results: Among 799 patients, 619 and 180 patients were treated with UDCA monotherapy and UDCA/BZF combination therapy, respectively. All patients with combination therapy received UDCA first, followed by BZF. In the analysis of all 799 patients (observation period 7.4 ± 5.1 years, death/LT = 24/3), ALP levels at 12 months of treatment (UDCA or additional BZF; 1.5×, 1.67×, and 2× ULN) and at 6 months (2× ULN) were significantly associated with outcome, along with gender, presence of symptoms and albumin at baseline. In the analysis of 180 patients with a combination treatment of UDCA and BZF (observation period 6.8 ± 4.6 years, death/LT = 7/0), ALP levels at 12 months (2× ULN) and at 6 months (1.5×, 1.67×, and 2× ULN) of additional BZF treatment along with age and albumin at baseline were significantly associated with outcome. C-statistics were 0.968 (2× ULN at 12 months), 0.968 (1.5× ULN at 6 months), 0.968 (1.67× ULN at 6 months) and 0.975 (2× ULN at 6 months). In the figure, we demonstrate LT-free survival adjusted by clinical covariates according to serum ALP level 2× ULN at 6 and 12 months of additional BZF in patients treated with combination treatment.

Conclusion: In patients treated with a combination of UDCA and BZF, serum ALP values at 6 or 12 months of additional BZF treatment are significantly correlated with long-term outcome, and are of value as prognostic tools.
outperformed APRI and FIB4 in terms of net benefit, demonstrating clinical utility. 

**Conclusion:** This novel non-invasive web-based online APOSF-nomogram provided a convenient tool for identifying advanced fibrosis in patients with AIH-PBC overlap syndrome.

**WED-295**

**Presence of metabolic associated liver disease in autoimmune hepatitis is associated with advanced liver fibrosis**

Alvaro Urzúa1, Daniela Simian1, Giselle Arevalo1, Consuelo Palomo1, Jaime Poniachik1. 1University of Chile Clinical Hospital, Gastroenterology Section, Santiago, Chile

**Background and aims:** Metabolic associated liver disease (MAFLD) is one of the most frequent causes of chronic liver disease worldwide. Steatohepatitis is a major risk factor for the development of fibrosis and its progression. MAFLD is very common and is present in other causes of chronic liver damage, such as autoimmune hepatitis (AIH). There is scarce information of the role of MAFLD in fibrosis in patients with AIH. We describe the frequency of steatosis, steatohepatitis, and fibrosis in AIH liver biopsies and the impact of steatosis and steatohepatitis on fibrosis severity.

**Method:** Observational and retrospective study of liver biopsies performed, prior to initiation of immunosuppressive therapy, between 2015 and 2018. Presence of steatosis, steatohepatitis and fibrosis was recorded. Alcohol and other etiologies of liver disease were excluded. Clinical data was obtained from electronic charts. Descriptive analysis was performed using media and median, comparative analysis was performed with chi 2 and exact Fisher test, p < 0.05 was considered statistically significant.

**Results:** 131 biopsies were analyzed for the presence of steatosis, steatohepatitis, and fibrosis with its staging. 76% were female, mean age 56 (15–83) years. Steatosis was present in 27%, steatohepatitis in
Conclusion: In this cohort of AIH liver biopsies, steatosis and steatohepatitis were risk factors for advanced fibrosis. All patients with steatohepatitis had advanced liver fibrosis and mortality was higher in patients with steatosis (47% vs 14% p 0.011). All patients with steatohepatitis had advanced fibrosis (>F3).

WED-296 Improving the diagnosis of primary biliary cholangitis through immunology protocols
Mario de Bonis Encinoso1, Javier Rodríguez Jiménez1, Carmen Iglesias Sobrino1, Hildo Rodriguez Santos1, Hilda Suárez Montesdeoca1, Paula Moreno Martín1, Elisa Suárez Zambrano1, Esther Rodríguez Candelaria1, Itahisa Marcelino-Rodriguez2, Delia Almeida González3, Francisco Andrés Pérez Hernández4, Ana Arencibia Almeida1.

1University of Málaga, Gastroenterology and Hepatology Service, Santa Cruz de Tenerife, Spain; 2University of La Laguna, Preventive Medicine and Public Health Area, San Cristóbal de La Laguna, Spain; 3University of Málaga, Gastroenterology and Hepatology Service, Santa Cruz de Tenerife, Spain; 4University of Málaga, Gastroenterology and Hepatology Service, Santa Cruz de Tenerife, Spain

Email: mario.dbencinoso@gmail.com

Background and aims: The diagnosis of primary biliary cholangitis (PBC) relies largely on the detection of antinuclear antibodies (ANA) and antimitochondrial antibodies (AMA) by indirect immunofluorescence (IIF). The primary aim of this study was to analyse the role of autoimmunity in the diagnosis of PBC. The secondary aim was to analyse differences in diagnosis rates between AMA-positive and AMA-negative patients, and to propose an immunological diagnostic algorithm designed to recruit the largest number of patients who meet PBC laboratory criteria.

Method: A descriptive observational study was conducted between 2015 and 2020. Patients with alkaline phosphatase (ALP) levels exceeding the upper limit of normal (ULN) and any PBC-specific antibody were followed up.

Results: 635 positive antibody determinations were recorded in 274 patients. From these, 89% were AMA-positive and 96% ANA-positive. Furthermore, 234 (85%) patients were AMA-ANA positive, whilst 30 (12%) were AMA-negative, but ANA-positive. The staining pattern obtained (by IIF on Hep-2 cells) was reticular mottled cytoplasmic pattern (AC21) in 219 patients, multiple nuclear dots (AC6) in 40 patients and punctate nuclear envelope (AC12) in 21 patients. Immunoblot was performed on 182 patients resulting in 179 subjects testing positive: 145 for AMA-M2, 117 for BPO, 55 for Gp210, 47 for Sp100, and 17 for PML; additionally, of these 145 AMA-M2 patients, 18 were AMA-negative, and all ANA-positive. 55.8% of the sample had a clinical diagnosis of PBC; 96% AMA-positive (147 and 4% AMA-negative (6); p < 0.001. 99.3% ANA-positive (152) and 1% ANA-negative (1); p < 0.001. 121 patients had no diagnosis; 80% AMA-positive (97) and 20% AMA-negative (24); p < 0.001; 92% ANA-positive (112) and 7% ANA-negative. The sensitivity of AMA was 96% and that of ANA was 99%. 147 AMA-positive patients (60.2%) were diagnosed with PBC whilst 97 (39.8%) were undiagnosed; (p < 0.001). The Gastroenterology Department diagnoses a higher number of patients with PBC in relation to AMA request (p < 0.001) followed by Primary Care and Rheumatology. Statistically significant differences were observed between undiagnosed and diagnosed patients for AMA (p < 0.001), ANA (p = 0.007), immunoblot (p = 0.004), Gp210 (p = 0.001), AMA-M2 (p = 0.027), Sp100 (p = 0.005) and chronicity of ALP, altered GGT and AST (p < 0.001).

Conclusion: Although AMA are present in 90–95% of patients with PBC, IIF based on Hep-2 is more sensitive to detect autoantibodies associated with the disease than IIF in rodent tissue (99.3% vs. 96%). In cases where PBC is suspected, the most efficient action is to combine IIF on Hep-2 with specific autoantibody detection using immunoblotting. The immunology laboratory can approach the diagnosis of PBC through the standardization of algorithms, especially in patients whose autoimmunity was requested by other medical departments besides Gastroenterology.

WED-297 The devastating impact of severe pruritus in primary biliary cholangitis
Helen Smith1, Megan McLaughlin2, Sugato Das3, Andrea Ribeiro4, Philip Troke5, Andreas E. Kremer5, David Jones6, 1GSK, United Kingdom; 2GSK, United States; 3GSK, India; 4GSK, Spain; 5University of Zürich, Switzerland; 6Newcastle University, United Kingdom

Email: helen.t.smith@gsk.com

Background and aims: Pruritus associated with primary biliary cholangitis (PBC) affects sleep and, social and emotional wellbeing. The impact of itch severity on quality of life (QoL) using the EuroQol-5-Dimension 5-Level (EQ-5D-5L) health utility score was explored and quantified in a post hoc analysis of the Phase 2b GLIMMER study of linixibat for the treatment of pruritus in PBC (NCT02966834). Pruritus (particularly severe pruritus) was previously found to have a significant negative impact on QoL and health utility: mean (standard deviation [SD]) baseline (BL) utility was 0.69 (0.23); patients with mild or moderate pruritus at BL had similar utilities (0.75 [0.17] and 0.76 [0.17], respectively) whereas patients with severe pruritus at BL had notably worse utility (0.49 [0.28]). Here we look in detail at factors impacting QoL in patients with PBC and pruritus.

Method: Patients in GLIMMER completed the EQ-5D-5L and Beck Depression Inventory (BDI-II) at BL, which followed a 4-week single-blind placebo run-in period. EQ-5D-5L is a generic, standardised and simple health-related QoL instrument. Scores range from 1 “perfect health” to 0 “death.” BDI is a 21-item, self-rated scale that evaluates key symptoms of depression. Patients were classified as having mild (<4, BL all mild were ≥ 3 to <4), moderate (≥4 to <7) or severe pruritus (≥ 7 to 10) using the mean worst daily itch score. Sleep disturbance severity was based on the same numerical rating scale thresholds as those used for pruritus.

Results: There were striking associations between itch severity, sleep disturbance and health utility, and between itch severity, depression and health utility. Overall mean (SD) health utility was highest in
those with mild sleep impairment 0.83 (0.126). Those with severe sleep impairment had a much lower score and those with severe itch and severe sleep disturbance even lower (0.52 [0.30] and 0.47 [0.31], respectively). Interestingly, no patients with mild itch had severe sleep impairment and no patients with severe itch had mild sleep impairment. As might be expected, health utility was lower with worse depression; from 0.81 (0.18) with minimal depression to 0.39 (0.31) for those with severe depression; amongst those with moderate or severe depression the incremental impact of severe pruritus on health utility was striking, with utilities of 0.32 and 0.26, respectively. In mild and moderate itch, the distribution of depression severity was similar, with over 80% having minimal or mild depression. However, in the group with severe itch, 49% had moderate or severe depression.

Conclusion: Pruritus in PBC significantly impacts QoL. Severe sleep disturbance and moderate and severe depression were far more common in patients with severe pruritus. In patients suffering with both severe pruritus and moderate to severe depression, health utility was severely impaired.

WED-298 Variation in maintenance therapy practices in a large U.S. cohort of patients with autoimmune hepatitis
Therese Bittermann1, Ranganath Kathawate2, James Lewis1, Cynthia Levy3, David Goldberg2, 1University of Pennsylvania, United States; 2Wayne State University, United States; 3University of Miami, United States

Email: therese.bittermann@pennmedicine.upenn.edu

Background and aims: The overarching goals of treating autoimmune hepatitis (AIH) are to induce remission and prevent disease progression while minimizing corticosteroids (CS) due to side effects. Data on maintenance therapy for AIH are largely derived from clinical trials or studies from tertiary care centers. “Real-world” data in a representative population are limited. We sought to determine patient factors associated with the use of CS-sparing and CS monotherapy regimens among patients receiving maintenance therapy for AIH.

Method: Retrospective cohort study of adults (≥18 years) with incident or prevalent AIH identified using a validated algorithm in the Optum® Clininformatics® Deidentified Data Mart, a U.S. health insurance database. All patients were followed 2 years: the first year served as a washout period to exclude instances of the induction phase of treatment and the second year served as the observation period during which the dominant maintenance AIH regimen was assessed. Dominant regimens were defined as those survived >6 months during observation year. All patients in the cohort were required to have filled ≥1 prescription of any drug (AIH-related or not) during the observation period. Separate multivariable logistic regression models investigated patient factors independently associated with a dominant maintenance regimen of (i) azathioprine (AZA) or mycophenolate mofetil (MMF) monotherapy (vs AZA/MMF with prednisone [Pred]) and (ii) Pred monotherapy (vs AZA/MMF ± Pred).

Results: Among 3,591 AIH patients, 2,330 (64.9%) had ≥1 prescription for an AIH drug during the observation year. Patients who did not receive AIH treatment were largely similar to those receiving treatment. Dominant regimens during the observation period included: 41.5% AZA monotherapy, 13.4% AZA with Pred, 10.9% Pred monotherapy, 3.7% MMF monotherapy, 1.8% MMF with Pred, 1.6% Bud monotherapy, 0.3% tacrolimus (Tac) mono, 0.2% Tac with Pred, and 8.5% other regimens. Factors independently associated with decreased AZA/MMF monotherapy (vs AZA/MMF with Pred) as a dominant regimen included: male sex (OR 0.7; p = 0.007), age 18–39 years (OR 0.6 vs age 40–59 years; p = 0.025), Hispanic ethnicity (OR 0.6 vs White; p = 0.021), osteoporosis (OR 0.5; p < 0.001), and other autoimmune disease (OR 0.7; p < 0.001). Factors associated with increased use of Pred monotherapy as a dominant regimen included: age ≥ 70 (OR 2.7 vs age 40–59 years; p < 0.001) and history of other autoimmune disease (OR 2.0; p < 0.001).

Conclusion: Less than half of patients receiving AIH therapy in a large, diverse insurance-based cohort were treated with AZA or MMF monotherapy as their dominant regimen. Older patients ≥70 years were more likely to receive Pred monotherapy, which may be suboptimal in this group.

WED-299 Burden, impact and variability of pruritus in primary sclerosing cholangitis (PSC) over time: a prospective observational study
Nasir Hussain1,2, Benjamin Hirschfield2, James Ferguson1,2, Nadir Abbas1,2, Usha Gungabasoom1, Khushpreet Bhandal2, Emma Burke2, Diana Hull2, Penelope Rogers2, Sunamata Mukherjee3, Andrea Ribeiro1, Martine Walsmsley2, Paula Hanford2, Megan McLaughlin3, Linda Casillas2, Palak Trivedi1,2, 1University of Birmingham, National Institute for Health Research (NIHR) Birmingham Biomedical Research Centre (BRC), Birmingham, United Kingdom; 2University Hospitals Birmingham, Liver Unit, Birmingham, United Kingdom; 3Clayson Smith Kline, United States; 4PSC Support, United Kingdom

Email: nxh100@student.bham.ac.uk

Background and aims: Pruritus is a recognised symptom of PSC, although the prevalence, persistence and impact on quality of life (QoL) are unknown. The aims of this study are to (A) quantify the proportion of patients (pts) with PSC who experience pruritus, (B) identify factors associated with symptom intensity, and (C) determine the association between pruritus and overall health related QoL.

Method: Pts with a diagnosis of PSC (age >16 years; non-transplant) were invited to complete specific QoL tools: 5D itch, itch numerical rating scale (NRS), chronic liver disease questionnaire (CLDQ) and the EQ-5D-5L. Measures were obtained at 0, 3, 6, 9 and 12 months, alongside clinical and laboratory data. This multicentre, prospective observational study began recruitment in Aug ’21. Follow-up is ongoing, and interim results are presented herein.

Results: Between Aug ’21 and Nov ’22, we accrued data from 184 pts. The majority had large duct disease (n = 166), were men (n = 105), with a median age of 41yrs (IQR 29–57), a history of inflammatory bowel disease (IBD, n = 156; 134 with quiescent activity) and a median MELD score of 7 (IQR 6–8). (A) Observing the cohort in its entirety, median baseline 5D itch score was 8 (IQR 5–12), with 92 pts. reporting any degree of itch according to the NRS. The latter included 23 pts. who reported itch despite taking anti-pruritic therapy. (B) 5D itch scores negatively correlated with age, positively correlated with...
Pruritus is commonly reported yet under-treated in PSC, has a propensity to persist over time, and with negative connotations on QoL. Those with a history of recurrent cholangitis, advanced fibrosis and cirrhosis have the greatest need for anti-pruritic therapy and must be prioritised for symptom-directed interventional trials.

BACKGROUND AND AIMs: The incidence and prevalence of PBC has increased within the last years. This is most likely a result of earlier diagnosis and greater disease awareness. It is currently uncertain if this results in modifications to the pattern of presentation and treatment response. Therefore, the aim of the study was to assess the impact of the diagnostic period (P) in the characteristics of PBC at diagnosis and treatment response.

METHOD: Retrospective analysis of 795 patients with PBC included in COLHA registry. The inclusion criteria were: (1) diagnosis of PBC made after 1997 (when ursodeoxycholic acid, UDCA, was approved), (2) UDCA treatment for at least 1 year. Patients with variants forms (overlap syndromes) of PBC and other concomitant liver diseases were excluded. The cohort was divided in 3 periods according to the date of PBC diagnosis: P1 before April 2008, P2 between May 2008 and November 2013, and P3 after December 2013.

RESULTS: Most of the patients were female (n = 713, 91%), with a median age of 55 years, 223 (28%) with autoimmune comorbidities. At diagnosis, patients from P3 had lower levels of alkaline phosphatase (ALP), transaminases, bilirubin, and total cholesterol than patients from P1 and P2 (Table). The proportion of patients with liver biopsy and ALT ≥ 2 × ULN was lower in patients from P3 (44% vs. 31% vs. 24%, p < 0.001 y 49% vs. 43% vs 36%, p = 0.012, respectively). The mean time from diagnosis to UDCA initiation was lower in patients from P3 (9.8 vs. 4.3 vs. 2.9 months; p = 0.006). After 1 year of UDCA treatment, patients from P3 had lower transaminases, GGT, and bilirubin (Table). There was a trend towards a higher response rate (according to Paris-II criteria) in patients from P3, but the difference was not statistically significant (58% vs. 60% vs. 62%, p = 0, 754).
**WED-302**

Autoimmune hepatitis (AIH) in Greece: first results from the Hellenic autoimmune liver diseases study group of the Hellenic association for the study of the liver (HASL)

Nikolaos Gatselis1,2, Christos Triantos3, George Papatheodoridis4, Pinelopi Arvanit1,2, Katerina Antoniou1,2, Efthymios Tsounis5, Margarita Papatheodoridi6, Demetrious N. Samakonis7, Themistokis Vasilieadi8, Ioannis Ketikoglou9, Emmanuel Manesis8, Dimitris Christodoulou5, Alexandra Alexopoulos7, Ioannis-Georgios Koskinas10, Spyridon Michopoulos10, Mairi Koulentakis11, Evangelos Cholongitas12, Elena Vezali12, Emmanueli Sinaoks11, Melanie Deutch13, Nikolaos Papadopoulos14, Adonis Protopapas15, Athina Chounta16, Konstantinos Thomopoulos3, Vasileios Lekakis8, Maria Tsafaridou9, Anna Samakidou1,2, Stella Gabela1,2, George Koukoulis17, Eirini Rigopoulos1,2, Kalliopi Zachou1,2, Dina Tiniakos8, George Dalekos1,2, 1General University Hospital of Larissa, Department of Medicine and Research Laboratory of Internal Medicine, National Expertise Center of Greece in Autoimmune Liver Diseases, Larissa, Greece; 2General University Hospital of Larissa, European Reference Network on Hepatological Diseases (ERN RARE-LIVER), Larissa, Greece; 3University Hospital of Patras, Division of Gastroenterology, Department of Internal Medicine, Patras, Greece; 4General Hospital of Athens “Laiko”; Academic Department of Gastroenterology, Medical School, National and Kapodistrian University of Athens, Athens, Greece; 5University Hospital of Heraklion, Department of Gastroenterology and Hepatology, Heraklion, Crete; 6Papatgeorgiou Hospital, Aristotle University of Thessaloniki, 3rd Department of Internal Medicine, Thessaloniki, Greece; 7Liver Unit Euroclinic, Athens, Greece; 8University Hospital of Ioannina, Division of Gastroenterology, Department of Internal Medicine, Ioannina, Greece; 9Hippokratia General Hospital of Athens, 2nd Department of Internal Medicine, Medical School of National and Kapodistrian University of Athens, Athens, Greece; 10Alexandra General Hospital, Department of Gastroenterology, Athens, Greece; 11General Hospital of Athens “Laiko”, 1st Department of Internal Medicine, Medical School, National and Kapodistrian University of Athens, Athens, Greece; 12Hygeia Hospital of Athens, Department of Hepatology, Athens, Greece; 13Hippokratia Hospital, 4th Department of Internal Medicine, Aristotle University of Thessaloniki, Thessaloniki, Greece; 14Army Share Fund Hospital of Athens, 1st Department of Internal Medicine, Athens, Greece; 15Hepatogastroenterology Unit, First Propaedeutic Department of Internal Medicine, Aristotle University of Thessaloniki, Thessaloniki, Greece; 16University Hospital “ATTIKON”, Hepatology Unit, 4th Dep. of Internal Medicine, National and Kapodistrian University of Athens, Athens, Greece; 17University of Thessaly, Department of Pathology, Faculty of Medicine, School of Health Sciences, Larissa, Greece; 18Aretaieion Hospital, Department of Pathology, Medical School, National and Kapodistrian University of Athens, Athens, Greece

Email: gatselis@me.com

Background and aims: AIH is an acute or chronic inflammatory disease of the liver, affecting people from all ethnic groups irrespective of age and sex. The Hellenic Autoimmune Liver Diseases Study Group of HASL was established in 2016, aiming to evaluate patients’ characteristics, treatment practices and outcome, determine the unmet needs of patients, and develop and implement improved treatment approaches.

Method: We included data from 691 patients (518 females, 75%; mean age: 47.5 years) who were recorded in our database till 11/2022.

---

**Table 1**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Period 1</th>
<th>Period 2</th>
<th>Period 3</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>50 (31-87)</td>
<td>50 (20-86)</td>
<td>50 (30-86)</td>
<td>0.392</td>
</tr>
<tr>
<td>At diagnosis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALP (x ULN)</td>
<td>1.97 (1.20-7)</td>
<td>2.27 (1.18-3)</td>
<td>2.38 (1.15-7)</td>
<td>0.036</td>
</tr>
<tr>
<td>AST (U/L)</td>
<td>68 (17-97)</td>
<td>85 (12-36)</td>
<td>85 (12-36)</td>
<td>0.011</td>
</tr>
<tr>
<td>ALT (U/L)</td>
<td>68 (9-63)</td>
<td>85 (13-36)</td>
<td>85 (13-36)</td>
<td>0.011</td>
</tr>
<tr>
<td>GGT (U/L)</td>
<td>68 (11-160)</td>
<td>65 (13-140)</td>
<td>65 (13-140)</td>
<td>0.011</td>
</tr>
<tr>
<td>Bilirubin (mg/dL)</td>
<td>0.6 (0.4-16.6)</td>
<td>0.6 (0.4-16.6)</td>
<td>0.6 (0.4-16.6)</td>
<td>0.011</td>
</tr>
<tr>
<td>Cholesterol (mg/dL)</td>
<td>224 (192-1847)</td>
<td>213 (192-1847)</td>
<td>213 (192-1847)</td>
<td>0.011</td>
</tr>
<tr>
<td>Creatinine (mg/dL)</td>
<td>0.96 (0.4-2.5)</td>
<td>0.70 (0.4-2.1)</td>
<td>0.70 (0.4-2.1)</td>
<td>0.011</td>
</tr>
</tbody>
</table>

**Figure:**

Conclusion: PBC is currently diagnosed with lower levels of ALP, transaminases, and bilirubin. The time from diagnosis until treatment initiation is shorter. However, these differences do not appear to influence treatment response.

---

**POSTER PRESENTATIONS**

**Table 1**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Period 1</th>
<th>Period 2</th>
<th>Period 3</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
<td>54 (23-87)</td>
<td>55 (20-86)</td>
<td>56 (30-86)</td>
<td>0.392</td>
</tr>
<tr>
<td>Period 1</td>
<td>54 (23-87)</td>
<td>55 (20-86)</td>
<td>56 (30-86)</td>
<td>0.392</td>
</tr>
<tr>
<td>Period 2</td>
<td>55 (20-86)</td>
<td>56 (30-86)</td>
<td>56 (30-86)</td>
<td>0.392</td>
</tr>
<tr>
<td>Period 3</td>
<td>56 (30-86)</td>
<td>56 (30-86)</td>
<td>56 (30-86)</td>
<td>0.392</td>
</tr>
</tbody>
</table>

**Table 2**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Period 1</th>
<th>Period 2</th>
<th>Period 3</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
<td>54 (23-87)</td>
<td>55 (20-86)</td>
<td>56 (30-86)</td>
<td>0.392</td>
</tr>
<tr>
<td>Period 1</td>
<td>54 (23-87)</td>
<td>55 (20-86)</td>
<td>56 (30-86)</td>
<td>0.392</td>
</tr>
<tr>
<td>Period 2</td>
<td>55 (20-86)</td>
<td>56 (30-86)</td>
<td>56 (30-86)</td>
<td>0.392</td>
</tr>
<tr>
<td>Period 3</td>
<td>56 (30-86)</td>
<td>56 (30-86)</td>
<td>56 (30-86)</td>
<td>0.392</td>
</tr>
</tbody>
</table>

**Table 3**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Period 1</th>
<th>Period 2</th>
<th>Period 3</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
<td>54 (23-87)</td>
<td>55 (20-86)</td>
<td>56 (30-86)</td>
<td>0.392</td>
</tr>
<tr>
<td>Period 1</td>
<td>54 (23-87)</td>
<td>55 (20-86)</td>
<td>56 (30-86)</td>
<td>0.392</td>
</tr>
<tr>
<td>Period 2</td>
<td>55 (20-86)</td>
<td>56 (30-86)</td>
<td>56 (30-86)</td>
<td>0.392</td>
</tr>
<tr>
<td>Period 3</td>
<td>56 (30-86)</td>
<td>56 (30-86)</td>
<td>56 (30-86)</td>
<td>0.392</td>
</tr>
</tbody>
</table>
Results: There was a mean delay till diagnosis of 26.8 ± 60 months. One fifth of patients (20.4%) were initially evaluated by physicians other than Internists/General practitioners, Gastroenterologists or Pediatricians. At first evaluation, 441/691 (63.3%) patients were asymptomatic, 149/691 (21.6%) had general symptoms, while only 102/691 (14.8%) had icteric hepatitis. Extrahepatic autoimmune diseases were diagnosed in 34%. Cirrhosis was present in 153/691 (22.1%), with decompensation in 41/153 (26.8%). During follow-up, 541/691 (78.3%) received corticosteroids, 278/691 (40.2%) azathioprine and 282/691 (40.8%) mycophenolate mofetil (MMF). In 72/691 (10.4%) patients, immunomodulatory treatment changed between azathioprine and MMF. At last evaluation (n = 587 patients), 81.6% had complete biochemical response (CBR) on treatment, 13.5% insufficient response, 2.4% relapse and 2.4% no-response.

Conclusion: AIH is frequently misdiagnosed because of its heterogeneity, resulting in diagnosis delay and increased cirrhosis incidence. Approximately 1/5 of patients did not achieve CBR on treatment suggesting the need for strict follow-up and potential new therapies. Large databases will aid better understanding and management of AIH in Greece. [on behalf of the Hellenic Autoimmune Liver Diseases Study Group of HASL]

WED-303 May symptom combinations at initial diagnosis of primary biliary cholangitis implicate distinct natural history?

Atsumasa Komori1, Yuki Kugiyama2, Junko Hihiroa, Toshiaki Nakano3, Atsushi Tanaka 4.

Background and aims: It is generally appreciated that pruritus and jaundice, a hallmark cholestatic symptoms of primary biliary cholangitis (PBC), precede clinically significant portal hypertension (CSPH) in disease progression. Meanwhile, CSPH, esophagogastric varix in particular, may emerge as a sole initial symptom of PBC, in the absence of either pruritus or jaundice. The pattern of combination of liver-related symptoms, in conjunction with age, at initial diagnosis of PBC is a clue for a greater understanding of natural history and trajectories of disease progression in PBC. We analysed the association between symptom combinations of PBC and age at initial diagnosis in large nationwide Japanese PBC cohort.

Method: We performed a cross-sectional study using the nationwide registry in Japan, a cohort study of patients with PBC that has been conducted almost every 3 years by the Intractable Hepato-Biliary Diseases Study Group for Research on Measures for Intractable Disease, which is supported by Health Labour Science Research Grants in Japan. Patients who met at least 2 of the following criteria were diagnosed as having PBC: biochemical evidence of chronic cholestasis; positive AMA in sera; histologic features compatible with PBC. Prevalence and age distribution of patients with liver-related symptoms at diagnosis, comprising of pruritus (P), jaundice (≥2 mg/dl of total serum bilirubin: TSB) (J), esophagogastric varix (V), and ascites (A), were analysed.

Results: A total of 2985 patients (mean age 60.4 years) from 14th, 15th and 16th registry (n = 632, 2005–9; n = 1096, 2008–12; n = 1244, 2011–16) were enrolled for study. The mean age of patients with P at diagnosis (58.8; n = 521, 17.5%) was significantly younger than those with V (64.7; n = 201, 6.7%) (p < 0.0001) or A (67.1; n = 95, 3.2%) (p < 0.0001), but not than those with J (61.0; n = 160, 5.4%) (p = 0.6247). In 16th registry, patients presenting P and/or J with CSPH (either P/V, P/J/V, P/J/V/A, J/V or J/V/A: stringently cholestatic PBC with CSPH, n = 44) were significantly younger than those with V or VA, but without P/J (CSPH-only PBC, n = 49) (59.9 vs 68.5, p = 0.00134). The median TSB and platelet count (PLT, ×10^4/microL) of CSPH-only PBC were 1.0 and 12.0, respectively; 13 (26.5%) were larger than 15.0 in PLT, suggesting possible inclusion of non-advanced chronic liver disease.

Conclusion: The age distribution of CSPH among PBC patients might be bimodal, reflecting two distinct trajectories toward CSPH in the natural history of PBC, that is, with or without overt cholestasis.

WED-304 Prevalence of celiac disease in adult patients with cryptogenic liver disease

Aditya Vikram Pachisia1, Ankit Agarwal1, Shubham Mehta1, Alika Kumari1, Anam Ahmed1, Shubham Prasad1, Vignesh Dwarkanathan2, Sonu Sharma1, Sambuddha Kumar1, Prasenjit Das3, Rimlee Dutta3, Shalimar Shalimar3, Vineet Ahuja3, Govind Makharia1, 1All India Institute Of Medical Sciences, Gastroenterology, New Delhi, India; 2All India Institute Of Medical Sciences, Community Medicine, New Delhi, India; 3All India Institute of Medical Sciences, Pathology, India

Email: avpafmc@gmail.com

Background and aims: In addition to the small intestine, liver also gets affected in them. The spectrum of liver disease in CeD may vary from hypertransaminasaemia, cirrhosis and autoimmune liver diseases. A recent systematic review, including studies with a small number of patients, has shown that 4.6% of patients with cryptogenic cirrhosis have CeD.

Method: Consecutive patients with cryptogenic liver disease with a spectrum ranging from cryptogenic hypertransaminasaemia to cryptogenic cirrhosis were recruited prospectively. All of them were screened for CeD using IgA anti-tissue transglutaminase antibody (anti-tTG ab) and if anti-tTG Ab was found positive, they were subjected to anti-endomyosal antibody (AEA) testing and duodenal mucosal biopsy examination. Liver biopsies and corresponding duodenal biopsies of patients with cryptogenic cirrhosis and CeD were subjected to IgA/anti-tTG colocalization studies. For assessment of the prevalence of CeD in cryptogenic cirrhosis, 235 patients were required.

Results: Of 264 patients recruited, 232 had cryptogenic cirrhosis and 32 had cryptogenic hypertransaminasaemia. Of 232 with cryptogenic cirrhosis, 16 had high anti-tTG Ab mean (SD) fold rise of 16.9 (10.5) folds and 11 of them had biopsy-proven CeD, suggesting a prevalence of 4.7%. Of 11 patients with cryptogenic cirrhosis with CeD, AEA was positive in 9. IgA/anti-tTG Ab colocalization was demonstrated in 7/8 liver biopsies from cryptogenic cirrhosis with CeD. All patients with cryptogenic cirrhosis with CeD were started on a gluten-free diet (GFD). Till the writing of this abstract, 6 patients completed a follow-up of 6 months, and all of them had a trend towards improvement in liver functions (CTP score and Meld Na). Two out of 32 patients with cryptogenic hypertransaminasaemia had high anti-tTG Ab and 1 had biopsy-proven CeD.
Figure: Individual patient characteristics with Cryptogenic Liver cirrhosis with CeD (N=16223)

<table>
<thead>
<tr>
<th>No.</th>
<th>Age</th>
<th>Sex</th>
<th>BMI</th>
<th>Diabetes</th>
<th>Liver biochemistry</th>
<th>Pred</th>
<th>Bude</th>
<th>No</th>
<th>Time</th>
<th>CeD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>35</td>
<td>M</td>
<td>22</td>
<td>No</td>
<td>26</td>
<td>3.5</td>
<td>2.1</td>
<td>No</td>
<td>12</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>36</td>
<td>F</td>
<td>24</td>
<td>Yes</td>
<td>36</td>
<td>3.2</td>
<td>2.8</td>
<td>No</td>
<td>18</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>38</td>
<td>M</td>
<td>28</td>
<td>No</td>
<td>35</td>
<td>3.5</td>
<td>3.1</td>
<td>No</td>
<td>24</td>
<td>Yes</td>
</tr>
<tr>
<td>4</td>
<td>40</td>
<td>F</td>
<td>30</td>
<td>Yes</td>
<td>40</td>
<td>3.7</td>
<td>3.3</td>
<td>No</td>
<td>30</td>
<td>Yes</td>
</tr>
<tr>
<td>5</td>
<td>42</td>
<td>M</td>
<td>32</td>
<td>Yes</td>
<td>32</td>
<td>3.9</td>
<td>3.5</td>
<td>No</td>
<td>36</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>Age</th>
<th>Sex</th>
<th>BMI</th>
<th>Diabetes</th>
<th>Liver biochemistry</th>
<th>Pred</th>
<th>Bude</th>
<th>No</th>
<th>Time</th>
<th>CeD</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>44</td>
<td>F</td>
<td>34</td>
<td>Yes</td>
<td>34</td>
<td>3.5</td>
<td>3.1</td>
<td>No</td>
<td>42</td>
<td>Yes</td>
</tr>
<tr>
<td>7</td>
<td>46</td>
<td>M</td>
<td>36</td>
<td>Yes</td>
<td>36</td>
<td>3.7</td>
<td>3.3</td>
<td>No</td>
<td>48</td>
<td>Yes</td>
</tr>
<tr>
<td>8</td>
<td>48</td>
<td>F</td>
<td>38</td>
<td>Yes</td>
<td>38</td>
<td>3.9</td>
<td>3.5</td>
<td>No</td>
<td>52</td>
<td>Yes</td>
</tr>
<tr>
<td>9</td>
<td>50</td>
<td>M</td>
<td>40</td>
<td>Yes</td>
<td>40</td>
<td>4.1</td>
<td>3.7</td>
<td>No</td>
<td>56</td>
<td>Yes</td>
</tr>
<tr>
<td>10</td>
<td>52</td>
<td>F</td>
<td>42</td>
<td>Yes</td>
<td>42</td>
<td>4.5</td>
<td>3.9</td>
<td>No</td>
<td>60</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Results: 291 patients were identified of whom 56 were excluded (35 cirrhosis, 13 paediatric and 8 receiving both regimens). Of 110 patients reviewed to date, 39/110 (35.45%) receiving Bude and 71/110 (64.54%) Pred. Mean age at diagnosis (57.5 and 52.8 p = 0.11), BMI at diagnosis (27.1 vs 28.7 p = 0.22), and diabetes at diagnosis (1/39 (2.6%) and 5/71 (7.04%), p = 0.42) were similar between both groups. Mean ALT at diagnosis was significantly higher in those receiving Pred (318 vs 744 p < 0.01). Median follow-up time was 49 months. Pred was associated with significantly increases in BMI at the end of steroid treatment (mean 1.49 (±2.63) vs (0.35 ± 2.66), p = 0.03), and a trend towards increased BMI at end of follow-up (1.20 (±4.02), budesonide – 0.24 (±3.60), p = 0.06). 2/71 Pred treated patients developed diabetes and 2/5 with existing diabetes required escalation of treatment whilst on steroids. Neither complication was seen in Bude treated patients.

**Background and aims:** The survival benefit of corticosteroid therapy in the management of autoimmune hepatitis is well recognised. Budesonide (Bude), an option in patients without cirrhosis, undergoes 90% first pass hepatic clearance with potentially fewer systemic effects than Prednisolone (Pred). A registration trial demonstrated fewer side effects, including lower rates of weight gain, with Bude vs Pred. However, data on the amount of weight gained was not reported and the comparative effects on weight in routine clinical practice over longer durations are unknown.

**Method:** A retrospective chart review of patients attending 5 Scottish hospitals with a diagnosis of autoimmune hepatitis was performed using a list prospectively kept to facilitate audit. Data was obtained from electronic health records supplemented by historic case notes. Patients diagnosed in paediatric care, with cirrhosis at diagnosis, not treated with steroids or treated with both regimens were excluded. Data on BMI, Diabetes, Diabetic medication and routine biochemistry were collected at diagnosis, end of steroid therapy and last known encounter. Comparison of changes in BMI from baseline to end of steroid therapy and end of follow-up were compared using a two-sample t-test.

**Conclusion:** Approximately 4.7% of patients with cryptogenic cirrhosis have biopsy-proven CeD which is substantially higher than the prevalence of CeD in the general population. Hence all patients with cryptogenic cirrhosis should be screened for CeD.

**WED-305**

Budesonide is associated with less weight gain than Prednisolone amongst patients with autoimmune hepatitis: results from long term follow-up in routine clinical care

Josh Orpen-Palmer1, Thea Rodig1, Alexander Grayston1, Shannon Devlin1, Michael Johnston2, Jude Morris3, Shouren Datta4, Helen Cairms5, Evan Fforres7, Stephen Barclay1.1Glasgow Royal Infirmary, Glasgow, United Kingdom; 2Royal Alexandra Hospital, United Kingdom; 3Queen Elizabeth University Hospital, United Kingdom; 4The New Victoria Hospital, United Kingdom; 5Gartnavel General Hospital, United Kingdom

Email: josh.orpen-palmer@ggc.scot.nhs.uk

**Background and aims:** The widespread use of auto-antibody test panels in non-hepatological settings allows incidental findings of AMA patients. Furthermore, in a region of 521117 inhabitants, 261 tested positive for AMA for the first time, 83% of them were female with a median age 62 years (range 25–92). The overall yearly incidence was 11.13 cases per 100 000 persons. Out of these, 76 matched criteria for AMA positive PBC, 69 of which were female (91%), with an overall yearly incidence
of 3.24 cases per 100,000 persons, 0.6 cases per 100,000 males and 5.7 cases per 100,000 females. Only 73% of patients were referred to a Liver Unit and started UDCA treatment, out of these 70% underwent stadiation with transient elastography or liver biopsy. Stage III–IV liver fibrosis were present in 5% of them.

**Conclusion:** The present study found an unexpected high incidence of AMA positive PBC. This could be explained by the availability of all extra-hepatic bile ducts in 48.3% and median duration of PSC was 5.0 years. Median (IQR) laboratory parameters were: bilirubin 0.78 mg/dl (0.54, 1.19), albumin 4.4 mg/dl (4.2, 4.6), INR 1.0 (1.0, 1.1), platelets 235 × 10^3/cm (182 × 10^3, 298 × 10^3), ALP 310 U/L (230, 437), GGT 274 U/L (159, 514), ELF and liver stiffness by transient elastography were 9.9 (9.2, 10.9) and 9.85 kPa (7.05, 14.40), respectively. Stage F4 liver stiffness was present in 25.4% of the patients. In 16.5% of all patients, clinical signs of liver cirrhosis were reported with a median (IQR) Child-Pugh score of 5.4 (5.0, 6.0). Median (IQR) values for Quality of Life at baseline were 168 (149, 182) for the Chronic Liver Disease Questionnaire (CLDQ) and 20 (15, 28) score points in the PBC-40 questionnaire (PSC adapted) for the domain fatigue.

**Conclusion:** Baseline characteristics of patients included in this Phase-3 trial NUC-5/PSC represent the typical distribution for a PSC population with active and advanced disease. The investigation of this trial population over a long-term period of 4 years appears adequate to study long-term clinical efficacy of NCA in PSC.

**WED-307**

**Norurchoic acid for the treatment of primary sclerosing cholangitis: baseline data from a phase III trial**

Michael Trauner1, Peter Fickert2, Palak Trivedi3, Gerald Denk4, Martti Färkkilä5, Michael Dill6, Gerda Elisabeth Villadsen7, Christoph Berg8, Kristin Kaasan Jørgensen9, Marcel Vetter10, Tobias Müller11, Beat Mühlhaupt12, Christoph Schramm13, Christian Strassburg14, Heike Bantel15, Tobias Böttner16, Ulrich Beuers17, Alexandre Louvet18, Emina Halhubasic1, Michael Stiess19, Markus Proels19, Michael P. Manns20, 1Medical University of Vienna, Division of Gastroenterology and Hepatology, Department of Internal Medicine III, Vienna, Austria; 2Medical University of Graz, Department of Medicine, Graz, Austria; 3University of Birmingham, NIHR Birmingham Biomedical Research Centre, Birmingham, United Kingdom; 4University Hospital LMU, Department of Medicine II, Munich, Germany; 5University of Helsinki and Helsinki University Hospital, Department of Gastroenterology, Helsinki, Finland; 6University Hospital Heidelberg, Division of Gastroenterology, Heidelberg, Germany; 7Aarhus University Hospital, Department of Hepatology and Gastroenterology, Aarhus, Denmark; 8University Hospital Tübingen, Department of Gastroenterology, Hepatology and Infectology, Tübingen, Germany; 9Akershus University Hospital, Dept. of Gastroenterology, Lørenskog, Norway; 10Friedrich-Alexander-University Erlangen-Nürnberg, Department of Medicine 1, Erlangen, Germany; 11Charité Universitätsmedizin Berlin, Department of Hepatology and Gastroenterology, Berlin, Germany; 12University Hospital Zürich, Swiss-Hepato-Pancreato-Biliary Center and Department of Gastroenterology and Hepatology, Zürich, Switzerland; 13University Medical Centre Hamburg-Eppendorf, Department of Medicine and Martin Zeitz Centre for Rare Diseases, Hamburg, Germany; 14University Hospital Bonn, Department of Internal Medicine I, Bonn, Germany; 15Hannover Medical School, Department of Gastroenterology, Hepatology and Endocrinology, Hannover, Germany; 16University Hospital Freiburg, Department of Medicine II, Freiburg, Germany; 17Amsterdam UMC, Locatie AMC, Department of Gastroenterology and Hepatology, Amsterdam, Netherlands; 18CHRU de Lille, Services des maladies de l'appareil digestif, Lille, France; 19Dr. Falk Pharma GmbH, RandD, Freiburg, Germany.

**Background and aims:** Primary sclerosing cholangitis (PSC) is a devastating inflammatory/fibro-obliterative bile duct disease lacking effective medical therapy. The role of Ursodeoxycholic acid (UDCA) in the therapy of PSC remains unclear. Norurchoic acid (NCA) is a side chain-shortened C23 homologue of UDCA which undergoes chole-hepatic shunting and has potent anti-cholestatic, anti-inflammatory and anti-fibrotic properties in preclinical mouse models of cholestatic liver injury with features of PSC. NCA was effective in reducing serum Alkaline Phosphatase (ALP) levels in a phase II trial. In the ongoing Phase III trial the efficacy and safety of 1500 mg/d of oral NCA and Placebo will be compared in the treatment of PSC.

**Method:** Patients with PSC, ALP >1.5 × ULN and bilirubin ≤4 mg/dl of either sex at the age of 16–75 years, were randomized to a 192-weeks treatment period followed by an open-label extension treatment. Randomized patients received either NCA or Placebo. Stable concomitant UDCA therapy was allowed. The primary efficacy end point was prespecified as partial normalization of ALP levels to <1.5 × ULN and no worsening of overall Nakamura disease stage at week 56 compared to baseline in the intention to treat population. For this purpose, the trial has been designed as a double-blind, randomized, multi-centre trial conducted in the form of a parallel group comparison.

**Results:** 77 sites from 17 European countries participated in the trial. 417 patients were screened, 303 were randomized and 302 received at least one treatment dose. Median age was 39 years, 71.5% were male, median BMi was 24.1, 78.8% were on UDCA, and 64.2% had inflammatory bowel disease, of which 89.2% had ulcerative colitis. Location of PSC–typical alterations were reported for both intra- and extra-hepatic bile ducts in 48.3% and median duration of PSC was 5.0 years. Median (IQR) laboratory parameters were: bilirubin 0.78 mg/dl (0.54, 1.19), albumin 4.4 mg/dl (4.2, 4.6), INR 1.0 (1.0, 1.1), platelets 235 × 10^3/cm (182 × 10^3, 298 × 10^3), ALP 310 U/L (230, 437), GGT 274 U/L (159, 514), ELF and liver stiffness by transient elastography were 9.9 (9.2, 10.9) and 9.85 kPa (7.05, 14.40), respectively. Stage F4 liver stiffness was present in 25.4% of the patients. In 16.5% of all patients, clinical signs of liver cirrhosis were reported with a median (IQR) Child-Pugh score of 5.4 (5.0, 6.0). Median (IQR) values for Quality of Life at baseline were 168 (149, 182) for the Chronic Liver Disease Questionnaire (CLDQ) and 20 (15, 28) score points in the PBC-40 questionnaire (PSC adapted) for the domain fatigue.

**Background and aims:** Autoimmune hepatitis (AIH) is a rare chronic, inflammatory disease with variable presentation, ranging from a mild subclinical course to severe acute icteric disease rarely associated with fulminant hepatic failure. Asymptomatic patients are usually identified following an incidental finding of elevated liver enzymes in blood tests done for various reasons. We investigated the demographics, laboratory tests, liver histology features and disease progression in patients with asymptomatic versus symptomatic presentation of AIH.

**Method:** Clinical, demographic, laboratory and liver histology data were collected from electronic medical records of patients diagnosed with AIH followed in the hepatology outpatient clinic of a tertiary referral medical center in Israel between 2010 and 2021. Patients with features of overlap variants were excluded.

**Results:** One hundred and twenty-eight patients with AIH were included. Fifty one percent of the patients were asymptomatic at presentation. Asymptomatic patients were older at diagnosis (50.7 vs. 41.2 years, OR 1.031, p < 0.01), had higher female predominance (86% vs. 67%, p < 0.05) and among the Jewish population were more frequent from Ashkenazi ethnicity (73% vs. 41%, p < 0.01). The body mass index (BMI) tended to be higher among asymptomatic patients (27.1 vs. 24.4, p = 0.058). Liver enzymes and total bilirubin at diagnosis were lower among asymptomatic patients (ALT-271 vs. 826 U/I, p ≤ 0.0005; AST-261 vs. 743 U/I, p ≤ 0.001; total bilirubin 1.7 vs. 8, p ≤ 0.005). Analysis of pathological reports of liver biopsies performed at diagnosis revealed that only 27% of the asymptomatic patients had no fibrosis (F0 stage) as compared to 45% among the symptomatic patients (OR 0.37, p < 0.05).
Interestingly, a higher proportion of asymptomatic patients progressed to liver cirrhosis as compared with the symptomatic group (37% vs. 21%, p < 0.03).

**Conclusion:** Our data demonstrates differences in demographic and laboratory parameters between patients with symptomatic and asymptomatic presentation of AIH and an increased progression rate to cirrhosis in patients who were asymptomatic at diagnosis. These findings may support screening for liver enzyme elevation in people at high risk to develop AIH.

**WED-309**

**Prevalence and risk factors of osteoporosis in patients with primary biliary cholangitis in Chinese population**

Jialiang Chen, Yao Liu, Yufei Bi, Guiqin Zhou, Xiaojing Wang, Xianbo Wang. Beijing Ditan Hospital affiliated to Capital Medical University, Center of Integrative Medicine, China

**Background and aims:** Osteoporosis has been considered the metabolic bone disease associated with primary biliary cholangitis (PBC), which increases the risk of fractures and mortality in patients with PBC. However, there is a lack of epidemiological data on the prevalence of osteoporosis in patients with PBC from China and even the Asia-Pacific region. This study aimed to assess the prevalence and risk factors for osteoporosis in Chinese population with PBC.

**Method:** The clinical data including bone mineral density information of patients with PBC from January 2013 to December 2021 from a tertiary hospital in China were retrospectively collected and analyzed. We defined individuals with T scores of −2.5 or less in any sites (L1 to L4, femoral neck, or total hip) as having osteoporosis based on dual-energy X-ray absorptiometry.

**Results:** A total of 1272 patients were diagnosed as PBC; 268 (21.1%; 236 women [88.1%]; mean [SD] age, 56.7 [10.6] years; 163 liver biopsies [60.8%]) had a qualified x-ray absorptiometry image at baseline. The prevalence of osteoporosis was 45.5% (95% CI, 39.5%–51.7%) among total population, 34.4% (95% CI, 18.6%-53.2%) among men and 47.0% (95% CI, 40.5%–53.6%) among women, respectively. Osteoporosis was associated with age, fatigue, previous glucocorticoid therapy, menopausal status, body mass index, splenomegaly, gastroesophageal varices, ascites, Mayo risk score, histological stage, alanine aminotransferase, albumin, bilirubin, platelets and international normalized ratio (INR). Multivariate regression analysis identified older age, higher Mayo risk score, lower body mass index, gastroesophageal varices and previous glucocorticoid therapy as the independent risk factors for osteoporosis.

**Conclusion:** Osteoporosis is very prevalent in Chinese population with PBC. Age, body mass index, severity of the disease and previous glucocorticoid therapy are the main risk factors for osteoporosis in PBC.

**WED-310**

**Symptom burden in people living with primary biliary cholangitis does not associate with transient elastography measures**

Inbal Houri, Madeline Cameron, Jonelle Pallotta, Aliya Gulamhusein, Kristel Leung, Gail Wright, Bettina Hansen, Gideon Hirschfield. Toronto General Hospital, University Health Network, Toronto Centre for Liver Disease, Toronto, Canada; Erasmus MC University Medical Center, Department of Epidemiology and Biostatistics, Rotterdam, Netherlands; University of Toronto, IHPME, Canada

**Background and aims:** The symptom burden for people living with primary biliary cholangitis (PBC) significantly impacts quality-of-life. Risk-assessment tools for disease prognosis include importantly transient elastography, a now well-demonstrated surrogate for patient outcome. We sought to evaluate whether a validated symptom burden score (PBC-40) correlated with elastography measures in a large cohort from a dedicated PBC clinic programme.

**Method:** The PBC-40 scores from people living with PBC cared for at the Toronto Centre for Liver Disease between 2018 and 2022 were correlated with clinical, demographic and laboratory data collected as standard of care.

**Results:** 243 patients (55% of the clinic cohort; n = 440) completed a total of 558 questionnaires. Mean age at questionnaire was 59.5 years (SD 10.74), 94% were female, and mean time from diagnosis was 10 years. The symptom burden score was not statistically associated with transient elastography measures.

**Background and aims:** The symptom burden for people living with primary biliary cholangitis (PBC) significantly impacts quality-of-life. Risk-assessment tools for disease prognosis include importantly transient elastography, a now well-demonstrated surrogate for patient outcome. We sought to evaluate whether a validated symptom burden score (PBC-40) correlated with elastography measures in a large cohort from a dedicated PBC clinic programme.

**Method:** The PBC-40 scores from people living with PBC cared for at the Toronto Centre for Liver Disease between 2018 and 2022 were correlated with clinical, demographic and laboratory data collected as standard of care.

**Results:** 243 patients (55% of the clinic cohort; n = 440) completed a total of 558 questionnaires. Mean age at questionnaire was 59.5 years (SD 10.74), 94% were female, and mean time from diagnosis was 10 years. The symptom burden score was not statistically associated with transient elastography measures.
Background and aims: The exposure to certain drugs and/or toxics can trigger liver immune response and unmask a previously unknown or induce de novo autoimmune hepatitis (DI-AIH). However, acute or chronic exposure to the same drugs can also cause drug-induced liver injury with autoimmune features (DILI-AI). Up to now, there are no standardized criteria to differentiate these two entities and the existence of distinct characteristics from idiopathic AIH (i-AIH) is a matter of debate. Therefore, the aims of the current study were to: (1) determine the prevalence of drug exposure among patients diagnosed with PBC, (2) describe the characteristics of DI-AIH and DILI-AI and (3) compare these two entities with i-AIH.

Method: This was a single center retrospective study of 295 patients diagnosed with AIH confirmed by a liver biopsy. Patients were categorized in 3 groups: (1) DILI-AI: patients consuming drugs/toxics known to be associated with DILI-AI and sustained complete biochemical response (CBR) after immunosuppressive treatment withdrawal, (2) DI-AIH: same characteristics, but without an attempt to stop treatment or presenting a relapse after treatment discontinuation and (3) i-AIH: cases without a clear trigger.

Results: Sixty-nine percent of patients (n = 203) were female with a median age of 53 years (interquartile range [IQR]: 39–63). Twenty-three percent (n = 69) were consuming drugs/toxics at diagnosis, 29 (42%) statins. Eleven patients (4%) were categorized as DILI-AI, 58 (20%) as DI-AIH (in 50 of them treatment was never stopped, while 8 relapsed after treatment withdrawal) and 226 (76%) as i-AIH. Patients with drug exposure (DILI-AI/DI-AIH) were older (58 vs. 52, p = 0.05), had higher ALT (867 vs. 555, p = 0.034) and faster CBR (3 vs. 5 meses; p = 0.01) than patients with i-AIH. In contrast, patients with i-AIH had higher rates of portal/perportal fibrosis (62% vs. 47%; p = 0.03) and established cirrhosis (17% vs. 4%; p = 0.008) at diagnosis. No difference in the type of presentation (acute vs. insidious) or in the rate of CBR was noticed, but patients with DILI-AI/DI-AIH had lower levels of ALT and IgG at 12 months of follow-up than patients with i-AIH. Among patients with drug exposure, those with DILI-AI had higher ALT (1334 vs. 734, p = 0.03), lower IgG (12 vs. 17; p = 0.003) and lower simplified score (5 vs. 6; p = 0.012) than patients with DI-AIH. No differences were detected in the time of drug exposure or in the rate of CBR.

Conclusion: Drugs/toxics can trigger AIH in a significant number of patients. The differences between these entities were subtle, but treatment withdrawal was attempted in a minority of cases. Consequently, patients with DILI-AI can be mis-diagnosed being exposed to side effects of unnecessary long lasting treatment regimens.
predicting response to steroids (p < 0.001). The cutoff of SURFASA score is < -2.8 in our patients.

### WED-313

**The natural history and prognosis of primary sclerosing cholangitis: a multi-center, retrospective cohort study in China**

Mingxia Shi1, Li Yang2, Qiuxiang Lin3, Xiaowei Liu4, Lu Zhou5, Yanhang Gao6, Yonghong He7, Huihong Yu8, Yong-Jian Zhou9, Yingmei Tang10, Yiling Yi11, Ying Sun12, Min Lian13, Yanhang Gao6, Yonghong He7, Huihong Yu8, Yong-Jian Zhou9, Yingmei Tang10, Yiling Yi11, Ying Sun12, Min Lian13, Xiong Ma14, Renji Hospital, School of Medicine, Shanghai Jiao Tong University, Shanghai, China, Shanghai Institute of Digestive Disease, Shanghai, China, Division of Gastroenterology and Hepatology, Key Laboratory of Gastroenterology and Hepatology, Ministry of Health, State Key Laboratory for Oncogenes and Related Genes, China; 11First Affiliated Hospital of China Medical University, Department of Gastroenterology, China; 12the Fifth Medical Center of PLA General Hospital, Department of Gastroenterology, China; 13Renji Hospital, School of Medicine, Shanghai Jiao Tong University, Shanghai Institute of Digestive Disease, 145 Middle Shandong Road, Shanghai 200001, China, Division of Gastroenterology and Hepatology, Key Laboratory of Gastroenterology and Hepatology, Ministry of Health, State Key Laboratory for Oncogenes and Related Genes, China

**Background and aims:** Contemporary population-based cohorts describing the natural history and prognosis of primary sclerosing cholangitis (PSC) in Asia are scarce. This study aimed to clarify the disease characteristics and long-term outcomes in patients with PSC, and to compare the prognostic value of the Mayo risk score (MRS), UK-PSC score, and the Amsterdam-Oxford model (AOM) in a real-world clinical setting.

**Method:** We performed a retrospective outcome analysis of patients with PSC referred to 12 centers in China from January 2010 to December 2022. Clinical and laboratory data were collected until the last visit or time of liver transplantation or death. The discriminatory performance of the prognostic scores was assessed with concordance statistics at diagnosis.

**Results:** Of the 536 patients in the cohort, 371 met the primary end point, with a mean age of 43.2 ± 13.9 years, of whom 201 (54.2%) were male, 42.4% with inflammatory bowel disease (IBD). The diagnosis was large duct PSC in 251 (67.7%), PSC with features of autoimmune hepatitis in 61 (16.4%) and small-duct PSC in 59 (15.9%). Cholangiocarcinoma occurred in 1.6%. During a median follow-up of 42.3 (interquartile range 22.7–67.5) months, 16 patients underwent liver transplantation, and 18 patients died. Overall transplant-free survival was 90% at 5 years and 84% at 10 years. At diagnosis, the concordance statistic for the MRS was 0.689 (95% confidence interval [CI] 0.601–0.777), 0.686 (95% CI 0.612–0.760) for the UK-PSC score, 0.693 (95% CI 0.613–0.774) for the AOM.

**Conclusion:** In this large multicenter cohort of patients with PSC in China, patients with PSC are increasingly being diagnosed with a milder phenotype. All prognostic scores developed for PSC (MRS, UK-PSC, and AOM) demonstrated comparable discriminating performance for liver transplantation or death.

### WED-314

**Elevated GGT levels as predictor of non-response to ursodeoxycholic acid in patients with primary biliary cholangitis**

Flor M. Fernandez-Gordón Sánchez1, Elena Gómez Domínguez1, Ana Martín Algibez1, Inmaculada Fernández Vázquez1, 1Hospital Universitario 12 de Octubre, Spain

**Background and aims:** Hyperbilirubinemia is a common finding in primary biliary cholangitis (PBC) patients, and urine total bilirubin (UTB) may be used as a simple surrogate for elevated total serum bilirubin (TSB). However, elevated GGT levels as predictor of non-response to ursodeoxycholic acid (ursodeoxycholic acid) in patients with primary biliary cholangitis (PBC) have not been previously studied.

**Objective:** To determine if elevated GGT levels are predictive of non-response to ursodeoxycholic acid (ursodeoxycholic acid) in patients with primary biliary cholangitis (PBC).**Method:** We performed a retrospective cohort study of 102 consecutive PBC patients treated with ursodeoxycholic acid at Hospital Universitario 12 de Octubre, Spain. The primary outcome was non-response to ursodeoxycholic acid, defined as a decrease in TSB of < 1 mg/dL.

**Results:** Of the 102 patients, 72 (70.6%) met the primary outcome. Elevated GGT levels were significantly associated with non-response to ursodeoxycholic acid (p = 0.046). In the multivariate analysis, elevated GGT levels were an independent predictor of non-response to ursodeoxycholic acid (p = 0.045).

**Conclusion:** Elevated GGT levels are significantly associated with non-response to ursodeoxycholic acid in patients with primary biliary cholangitis.
Background and aims: Isolated gamma glutamyl transferase (GGT) values as predictor of response to ursodeoxycholic acid (UDCA) in patients with primary biliary cholangitis (PBC) are not yet well-defined. We aimed to analyze the predictive value of GGT elevation at diagnosis and after one year of treatment with UDCA in patients with PBC; we aimed to establish a cut-off point to identify patients who are candidates to second-line therapies.

Method: This single center retrospective cohort study included two cohorts of patients diagnosed with PBC treated with UDCA, according to response to UDCA. Non-response was defined according to the Paris II Criteria. The study was developed between 2014 and 2022. Clinical and analytical variables at baseline and at one year of treatment were compared. ANOVA test and Youden Index were used to define optimal cut-off points in the ROC curve.

Results: 179 patients were included, mean age 60 years (51–71.5), 89.38% women, 152 UDCA responders and 27 non-responders. Liver biopsy was required in a higher percentage in non-responders (74.07 vs 34.67, p < 0.001), and had higher GGT values at diagnosis [195.00 vs 93.00, p < 0.008] and at one year of follow-up [127.00 vs 41.00, p < 0.001]. In addition, the alkaline phosphatase (AF) values in the UDCA non-responder group were significantly higher at diagnosis [210.00 vs 122.00, p < 0.001] and at one year of follow-up [197.00 vs 102.00, p < 0.001]. GGT levels ≥ 219 U/l (S 66.7%, E 88.9%, AUC-ROC 0.7778) and AF ≥ 164 U/l (S 61.9%, E 80%, AUC-ROC 0.7095) were established as cut-off points indicative of non-response after one year of treatment with UDCA. Fig. 1.

Figure: GGT (A) and AF (B) cut-off points for non-response at one year of treatment with UDCA.

Conclusion: Elevated baseline GGT levels and after one year of UDCA treatment with UDCA, according to response to UDCA. Non-response was defined according to the Paris II Criteria. The study was developed between 2014 and 2022. Clinical and analytical variables at baseline and at one year of treatment were compared. ANOVA test and Youden Index were used to define optimal cut-off points in the ROC curve.

Background and aims: This study aimed to analyze changes in liver biochemistry after UDCA treatment and their prognostic impacts in patients with primary biliary cholangitis (PBC) using the Korean National Health Insurance System database.

Method: A retrospective cohort study including all consecutive people with an established diagnosis of AIH in adulthood was performed. Exclusion criteria were the presence of overlap syndromes or concomitant liver diseases. Decompensation-free survival was calculated according to Kaplan-Meier estimates; data were censored at the date of the last visit or the occurrence of cirrhosis decompensation.

Results: 166 consecutive people (80% female, median age 52) diagnosed with AIH between 1990 and 2021 and followed-up for a median of 63 (24–125) months at the Gastroenterology Unit of the University Hospital of Padova were included. At diagnosis, 18% of patients were cirrhotic; 9 patients (5.4%) had a historically confirmed diagnosis of CD. People with AIH-CD were treated with significantly lower doses of prednisone at 2 years from diagnosis (2.5 vs 5 mg/day p = 0.007) and at 3 years from diagnosis were more likely to have interrupted steroids (83% vs 31%, p = 0.007) compared to AIH-non-CD. During the follow-up, immunosuppressive therapy withdrawal was more frequent in AIH-CD compared to AIH-non-CD (44% vs. 13%, p = 0.01) while the need for immunosuppressive therapy reintroduction was similar (p = n.s.). We did not find any difference regarding cirrhosis development, cirrhosis decompensation, liver-related deaths or the number of relapses between people with AIH-CD and AIH-non-CD.

Figure: Conclusion: In our cohort, CD is present in 5.4% of people with AIH. In people with AIH-CD, we observed a milder course and a higher possibility of immunosuppressive therapy withdrawal compared to AIH-non-CD.

WED-316 Outcome and prognostic factors of primary biliary cholangitis in South Korea

Kyung Ahkim1, Hwa Young Choi2, Moran Ki2, Eun Sun Jang3, Sook-Hyang Jeong3.

1University of Pukyong National University, Pusan National University, Busan, Korea, Rep. of South; 2Chonnam National University, Kunsan National University, Gwangju, Korea, Rep. of South; 3Christian Medical College, Vellore, India

Background and aims: This study aimed to analyze changes in liver biochemistry after UDCA treatment and their prognostic impacts in patients with primary biliary cholangitis (PBC) using the Korean National Health Insurance System database.

Method: PBC patients who were diagnosed between 2010 and 2014 and had taken national health screening before and after PBC diagnosis were included. The Korean National health screening biennially includes aspartate aminotransferase (AST), alanine aminotransferase (ALT), and gamma-glutamyl transferase (GGT), but not alkaline phosphatase. Liver biochemistry measured 1–2 years before and 1–3 years after PBC diagnosis was regarded at baseline and after UDCA treatment. Adherence to UDCA treatment was assessed by calculating the medication possession ratio. Transplant-free survival was analyzed according to age, sex, UDCA treatment, and liver biochemistry using Kaplan-Meier and Cox regression analyses.

Results: A total of 1,449 patients (female 1,237, mean age 57.8) was included. The proportions of abnormal ALT, AST and GGT significantly
decreased from 64.3%, 66.7, and 90.8% at baseline to 25.2%, 25.0%, and 64.0% after UDCA treatment, respectively. The 5-year transplant-free survival rate was 92.2%. Old age, male, low adherence to UDCA, abnormal AST, and AST/ALT > 1 were associated with poor prognosis among baseline characteristics. Abnormal AST, AST/ALT > 1, and abnormal GGT were also associated with poor prognosis among features after UDCA treatment.

Table 1: Cox regression analysis of risk factors for death or liver transplantation

<table>
<thead>
<tr>
<th>All-cause death or liver transplantation</th>
<th>Hazard ratio (95% confidence interval)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex (vs. female)</td>
<td>Univariable</td>
</tr>
<tr>
<td>male</td>
<td>2.17 (1.49–3.17)</td>
</tr>
<tr>
<td>Age (by 10-year increase)</td>
<td>2.11 (1.81–2.48)</td>
</tr>
<tr>
<td>MPR of UDCA (≥80% vs. &lt;80%)</td>
<td>1.78 (1.36–2.33)</td>
</tr>
<tr>
<td>Baseline liver biochemistry</td>
<td></td>
</tr>
<tr>
<td>AST&gt;ULN (vs. ≤ULN)</td>
<td>2.14 (1.41–3.24)</td>
</tr>
<tr>
<td>AST/ALT&gt;1 (vs. ≤1)</td>
<td>2.59 (1.79–3.73)</td>
</tr>
<tr>
<td>GGT&gt;ULN (vs. ≤ULN)</td>
<td>1.11 (0.60–2.05)</td>
</tr>
<tr>
<td>Posttreatment liver biochemistry</td>
<td></td>
</tr>
<tr>
<td>AST&gt;ULN (vs. ≤ULN)</td>
<td>4.30 (2.73–6.76)</td>
</tr>
<tr>
<td>AST/ALT&gt;1 (vs. ≤1)</td>
<td>1.75 (1.00–3.07)</td>
</tr>
<tr>
<td>GGT&gt;ULN (vs. ≤ULN)</td>
<td>2.01 (1.16–3.47)</td>
</tr>
</tbody>
</table>

MPR, medication possession ratio; UDCA, ursodeoxycholic acid; AST, aspartate aminotransferase; ULN, upper limit of normal; ALT, alanine aminotransferase; GGT, gamma-glutamyl transferase

Conclusion: The poor prognostic factors in PBC patients were old age, male, low adherence to UDCA, baseline AST/ALT > 1 indicating advanced fibrosis, abnormal AST and GGT after UDCA treatment indicating insufficient UDCA response.

WED-317
The association between cholestatic biochemical markers and clinical symptoms in patients with non-end-stage primary sclerosing cholangitis

Tim Middelburg1, Nahid Mostafavi2, Seval Akbulut1, Annika Bergquist3, Olivier Chazouillères4, Astrid Kemgang5, Hanns-Ulrich Marschall6, Stephen Pereira7, Lars Aabakken8, Cyriel Ponsioen1. 1Amsterdam UMC, Locatie AMC, Gastroenterology and Hepatology, Amsterdam, Netherlands; 2Amsterdam University Medical Center, Biostatistics Unit, Gastroenterology and Hepatology, Amsterdam, Netherlands; 3Karolinska University Hospital, Gastroenterology and Hepatology, Sweden; 4Hospital Saint-Antoine Ap-Hp, Hepatology, Paris, France; 5Sahlgrenska University Hospital, Department of Medicine, Gastroenterology and Hepatology, Gothenburg, Sweden; 6Institute of Liver and Digestive Health, University College London and Sheila Sherlock Liver Centre, Royal Free Hospital, London, United Kingdom; 7Rikshospitalet, Gastroenterology and Hepatology, Norway

Email: t.e.middelburg@amsterdamumc.nl

Background and aims: In primary sclerosing cholangitis (PSC) the absence of validated surrogate end points impedes treatment development. We aimed at assessing the correlation between biochemical markers of cholestasis and clinical symptoms in order to evaluate their construct validity as surrogate end point.

Method: Cholestatic biochemical markers and clinical symptoms measured by the simple cholestatic complaint score were collected from non-end-stage PSC patients who participated in the DILSTENT trial. The association between each biochemical marker and clinical symptom from baseline to 12 months post-intervention was explored using univariate and multivariate mixed-effect ordinal logistic regression analysis. Measures of associations were expressed as Odds Ratio (OR). Correlation was determined by using Spearman’s rank correlation and was expressed as r.

Results: Data from 65 patients was included. The median level of alkaline phosphatase (ALP), bilirubin, gamma-glutamyltransferase (GGT), aspartate aminotransferase (AST) and the proportion of patients with a high levels of complaints decreased during follow-up. The levels of ALP, bilirubin and AST were significantly associated with pruritus levels (OR 1.01 (p < 0.001), OR 1.02 (p < 0.001), OR 1.01 (p = 0.004) respectively) in univariate analysis. Only ALP remained significant in multivariate analysis (OR 1.01, p < 0.001). ALP, bilirubin, GGT and AST were not significantly associated with fatigue, right upper quadrant pain or fever. A significant correlation was found between relative change in ALP and change in pruritus from baseline to month 3 post-intervention (r = 0.34; p = 0.02).

Conclusion: ALP is significantly associated with the most exigent symptom of cholestasis, i.e. pruritus. Our results corroborate the hypothesis that ALP has construct validity as a marker of cholestatic itch, thereby supporting its role as potential surrogate end point for clinical trials.

WED-318
Exploring the impact of ursodeoxycholic acid therapy on COVID-19 in a real-world setting

Christophe Corpechot1, Marie Verdoux2, Marie Frank-Soltysik3, Lamiae Grimault4, Jean-Charles Duclos-Vallée5, 1Saint-Antoine Hospital, Assistance Publique-Hôpitaux de Paris, Sorbonne University, Reference Center for Inflammatory Biliary Diseases and Autoimmune Hepatitis, Paris, France; 2Bicêtre Hospital, Assistance Publique-Hôpitaux de Paris, Paris-Saclay University, Department of clinical research, France; 3Bicêtre Hospital, Assistance Publique-Hôpitaux de Paris, Paris-Saclay University, Department of medical information, France; 4Paul-Brousse Hospital, Assistance Publique-Hôpitaux de Paris, Inserm UMR-S 1193, Paris-Saclay University, University Hospital Federation Hepatinov, Villejuif, France

Email: christophe.corpechot@aphp.fr

Background and aims: Very recently, Brevini et al. demonstrated that ursodeoxycholic acid (UDCA)-mediated ACE2 downregulation reduces susceptibility to SARS-CoV-2 infection in vitro, in vivo and in human biliary and pulmonary organoids ex situ perfused. They also observed an association between UDCA therapy and positive clinical outcomes following COVID-19. Given the potentially important implications of this finding, the therapeutic value of UDCA in this infectious setting must to be confirmed. Our aim was to investigate the association between UDCA exposure and the occurrence of hospitalization for COVID-19.

Method: We designed a case-control study in the source population of adult patients followed up at the Assistance Publique-Hôpitaux de Paris (APHP), Paris Hospitals Group, France, through their medical records (APHP health data registry) and pre-diagnosed with primary biliary cholangitis (PBC) or primary sclerosing cholangitis (PSC). Liver transplant patients were excluded. Cases were patients hospitalized >24 h for COVID-19 as the primary diagnosis between 2020/03/01 and 2020/12/31. The first stay of the first hospitalization if multiple stays. Controls were patients from the same source population, not hospitalized for COVID-19 as the primary diagnosis over the same period, secondarily matched on PBC/PSC, age, sex and index date (date of case admission). Exposure was defined by UDCA use prior to index date. The confounding factors, including age, severity of liver disease, autoimmune hepatitis, diabetes, cardiovascular disorders, obesity, alcoholism, chronic obstructive pulmonary disease, renal failure, chronic inflammation of gastrointestinal tract, and hospitalization prior to pandemics, were controlled for by a risk score.

Results: Among 1401 patients with PBC or PSC, 1330 (94.9%) were given UDCA therapy. Out of the 7 cases and 1394 unmatched controls identified during the study period, 6 (85.7%) and 1324 (95.0%) were exposed to UDCA. The matching yielded 6 cases and 52 matched controls. Comparison of exposure between cases (n = 5, 83.3%) and matched controls (n = 48, 92.3%), using a conditional logistic regression model estimated a crude and adjusted odds ratio (95%
Bacteriophage therapy against pathological Klebsiella pneumoniae that determine the clinical course of primary sclerosing cholangitis

Masataka Ichikawa1, Nobuhiro Nakamoto1, Sharon Kredo-Russo2, Eyal Weinstock2, Iddo Nadav Weiner 2, Efrat Khabra 2, Noa Ben-Ishai 2, Nobuhito Taniki1, Rei Morikawa 1, Ryosuke Kasuga 1, Takaya Tabuchi1

In this real-world data study, we could not establish evidence of an association between UDCA use and the occurrence of hospitalized COVID-19, a result that does not support a protective effect of UDCA against SARS-CoV2 infection. However, the high exposure to UDCA in this population as well as the limited number of cases resulted in a lack of statistical power that precludes any definitive conclusion. Larger studies are therefore warranted.

Conclusion: In this real-world data study, we could not establish evidence of an association between UDCA use and the occurrence of hospitalized COVID-19, a result that does not support a protective effect of UDCA against SARS-CoV2 infection. However, the high exposure to UDCA in this population as well as the limited number of cases resulted in a lack of statistical power that precludes any definitive conclusion. Larger studies are therefore warranted.

Reference

Immune-mediated and cholestatic Experimental and pathophysiology

WEDNESDAY 21 TO SATURDAY 24 JUNE

TOP-060
Bacteriophage therapy against pathological Klebsiella pneumoniae that determine the clinical course of primary sclerosing cholangitis

Masataka Ichikawa1, Nobuhiro Nakamoto1, Sharon Kredo-Russo2, Eyal Weinstock2, Iddo Nadav Weiner 2, Efrat Khabra 2, Noa Ben-Ishai 2, Dana Inbar2, Noga Kowalsman2, Ron Mordoch2, Julian Nicenboim2, Myriam Golembo2, Naomi Zak3, Takahiro Suzuki4, Kentaro Miyamoto5, Toshiaki Teratani1, Sota Fujimori1

We detected abundant Kp and Eg in faecal samples from 45 patients with PSC regardless of intestinal complications (Kp: PSC, 82% vs. PSC+IBD, 82%; Eg: PSC, 21% vs. PSC+IBD, 9%; and Eg: PSC, 73% vs. PSC+IBD, 76%). Carriers of both Kp and Eg (n = 28) exhibited higher serum ALP levels and poorer transplant-free survival compared to non-carriers (n = 17). Colonization of PSC-derived Kp in hepatobiliary injury-prone mice enhanced liver Th17 cell responses and exacerbated hepatobiliary injury through bacterial translocation to MLN. Oral administration of the phage cocktail reduced intestinal Kp levels in Kp-colonized mice by 2 log without inducing off-target dysbiosis. Furthermore, oral and intravenous administration of phage cocktail reduced Kp levels in hepatobiliary injury-prone SPF mice, and attenuated liver Th17 numbers, hepatobiliary inflammation, and fibrosis progression. Of note, the amount of Kp in the MLN significantly correlated with the degree of fibrosis in the phage-treated mice, suggesting that a direct targeting of the translocated Kp may be a more appropriate therapeutic approach.

Conclusion: Our results identified a clear association between specific gut microbiota Kp and the clinical course of PSC, and revealed that targeting a single Kp pathogen with a strain-specific phage cocktail is promising for the treatment of PSC.

TOP-064
Development of an in vitro bile-duct-on-a-chip-platform using patient-derived cholangiocytes

Anna Katharina Frank1,2,3,4,9,11, Henry Hoyle1,2,4,5

Development of an in vitro bile-duct-on-a-chip-platform using patient-derived cholangiocytes

Anna Katharina Frank1,2,3,4,9,11, Henry Hoyle1,2,4,5

Background and aims: Primary sclerosing cholangitis (PSC) is a chronic liver disease characterized by progressive biliary inflammation and fibrosis with a frequent complication of inflammatory bowel disease (IBD). We recently reported that specific gut microbiota, Klebsiella pneumoniae (Kp), Proteus mirabilis (Pm), and Enterococcus gallinarum (Eg), were frequently present in faecal samples from patients with PSC+IBD and the combination of these three gut bacteria contributed to the pathogenesis of the hepatobiliary phenotype. As a mechanism of pathogenesis, these bacteria translocated to mesenteric lymph nodes (MLN) and contributed to subsequent T helper 17 (TH17) cell induction in the liver. However, it remains unclear whether the abundance or combination of these microbiota is associated with the clinical outcome of PSC, and whether certain bacteria might serve as therapeutic targets. As a
**Background and aims:** Primary sclerosing cholangitis (PSC) is a progressive bile duct-based liver disease without medical treatment options. Cholangiocytes are the main target of destruction in PSC, yet the exact mechanisms that lead to cholangiocyte damage are not fully understood. A lack of representative disease models available is currently hindering advances in our understanding of PSC development and progression. Current in vitro bile-duct models are limited to the use of murine cholangiocytes and do not offer the inclusion of bile or other disease relevant cell types, such as immune cells. We aimed to develop a representative, robust and simplified in vitro model of a human bile duct that allows us to interrogate the cross-function between cholangiocytes and other disease-relevant components on a cellular level.

**Method:** Cholangiocytes were isolated from the bile ducts of PSC and healthy control patients undergoing routinely performed endoscopic retrograde cholangiopancreatography (ERCP) and propagated as organoids using previously established culture conditions. Cholangiocytes were then seeded into a perfused channel surrounded by a collagen/laminin mixture that resembles the in vivo environment within the bile ducts. Cells were grown for approximately 7 days before channel confluency was reached and then analyzed by fluorescent microscopy.

**Results:** We developed a robust and scalable in vitro platform that resembles the in vivo architecture of a bile duct (Fig. 1A and B). We optimized the chip design and materials for high-throughput analysis, advanced microscopy and drug screening compatibility and adjusted the channel size and coating mixture to maximize physiological resemblance. We further designed a fluidic system that allows incorporation of internal fluids (bile/blood) to the system without the use of tubing. The chip design supports the stable growth of patient-derived cholangiocytes in form of a 3-dimensional gravity perfused bile-duct-like channel. Cholangiocytes grown in the chip form a confluent monolayer channel, express key markers of cellular identity and exhibit strong cell-cell contacts (Fig. 1C).

**Conclusion:** In this proof-of-concept study we provide a robust fluidic platform for culturing patient-derived cholangiocytes in a tubular structure resembling the in vivo architecture of a bile duct. The flexible chip design supports the inclusion of other disease-relevant components, such as bile or relevant immune cells, and can be used in future studies to model various aspects of cholangiopathies in vitro. The use of patient-derived cells further offers possibilities for personalized drug testing approaches.

**FRIDAY 23 JUNE**

**FRI-330**

**Phenotypic diversity and regeneration in a model of Alagille syndrome recapitulate patient heterogeneity**

Linde Sevenants1, Stefaan Verhulst2, Franziska Hildebrandt3, Johan Ankarklev2, Leo van Grunsven2, Noémi K. M. Van Hul1, Emma Andersson1. 1Karolinska Institute, Cell and Molecular Biology, Stockholm, Sweden; 2Vrije Universiteit Brussel, Liver Cell biology research group, Brussels, Belgium; 3Stockholm University, Department of Molecular Biosciences, Stockholm, Sweden

Email: noemi.van.hul@ki.se

**Background and aims:** Alagille syndrome (ALGS) is caused by a mutation in JAG1 or NOTCH2 and is characterized by bile duct paucity. There is a high phenotypic variability in disease presentation and a genotype-phenotype correlation is lacking. An estimated 60–75% of children with cholestatic ALGS will need a liver transplantation (LT), while others will spontaneously recover their biliary system. We use our Jag1Ndr/Ndr model recapitulating hallmark features of ALGS to (1) characterise disease presentation, (2) to identify biomarkers predicting the disease course, and (3) to study mechanisms driving bile duct recovery.

**Figure:** (abstract: TOP-064): The bile-duct-on-a-chip platform. A) Photos and a schematic of the chip. B) A cross section showing the compartments in the chip design. C) Fluorescent staining of cholangiocytes within the bile-duct-chip showing formation of a tubular structure through nuclear staining (DAPI) with expression of key proteins such as E-cadherin and Cytokeratin 19.
Method: Outbred Jag1+/+ and Jag1Ndr/Ndr mice were sacrificed at P30. Plasma was analyzed for liver function (BR, BA, ALP, ALT). IHC was done on liver sections for early biliary marker SOX9, myofibroblast marker aSMA and proliferation marker Ki67. Spatial transcriptomics (ST) was performed on 4 liver sections from regenerating mice and 4 sections from mice with severe condition.

Results: All Jag1Ndr/Ndr pups display strong cholestasis at birth. At P30, three phenotypic groups can be distinguished: mice with (1) a mild phenotype with bile ducts and clear plasma (15 out of 47 mice, representing patients with recovered bile ducts), (2) intermediate severity phenotype with ongoing regeneration and bile infarcts (BIs) (21/47 mice), and (3) regeneration-incompetent mice with severe jaundice and large BIs (11/47 mice, representing patients in need of LT). The BIs in regenerating livers (3–10% of liver surface, preliminary data), were infiltrated by aSMA+ cells and lined by SOX9+ hepatocytes implying ongoing biliary reprogramming in these areas. aSMA− BIs (up to 16% of surface) were predominant in severe Jag1Ndr/Ndr mice, and SOX9+ hepatocytes around the BIs were sparser and scattered. Finally, there was a strong proliferative response in intermediate mice (increase in Ki67+ cells), but not in severe mice. ST sequencing data of regenerating and severe livers with an estimated 200 spatial spots (each spotted array is 100 mm in diameter, and contains mRNA captured from 10 to 60 cells) is currently being analyzed.

Conclusion: Jag1Ndr/Ndr mice recapitulate a broad spectrum of liver disease in ALGS at P30. The data indicate a lack of reparative response in severe mice. We hypothesize that aSMA+ BIs act as signaling centers for hepatocyte conversion and biliary regrowth. Using ST, we are investigating the molecular landscape of the BI microenvironment.

Background and aims: Primary Biliary Cholangitis (PBC) is a progressive autoimmune cholestatic liver disease. Symptoms of pruritus, fatigue and cognitive impairment are common and have a significant negative impact on patients’ quality of life. The PBC-40 is a validated, disease-specific, patient-reported outcome measure with well described and validated cut-offs for ‘clinically significant’ symptoms. The biological mechanisms underpinning these symptoms are poorly understood. The UK-PBC consortium recently published data on an inflammatory proteome associated with disease response. This study further explored the link between the proteome and symptoms in PBC.

Method: An exploratory cohort used O-link serum proteomics of 20 inflammatory markers previously associated with the pathogenesis of PBC were performed on 289 fully-characterised PBC patients from the UK-PBC nested cohort. They were compared to clinically significant symptoms, as assessed using the PBC-40. A validation cohort, using 6 of the markers showing positive associations and a further 5 biologically linked markers, was undertaken using a custom-made multiplex on a symptom heavy cohort of 160 PBC patients (identified from the BANC, RITPBC and UK-PBC cohorts) and 40 healthy controls.

Results: In both the exploratory and validation cohorts, younger age was associated with more severe fatigue (exploratory p = 0.016; validation p = 0.003), and cognitive symptoms (exploratory p = 0.001; validation p = 0.016)
validation \( p < 0.001 \), but not pruritus. Interleukin-6 (IL-6) was positively associated with clinically significant fatigue, as compared with not clinically significant fatigue, in both studies (exploratory: median 2.63 (IQR 0.80) pg/ml vs 2.42 (0.89), \( p = 0.047 \); validation: 1.62 (0.89) vs 1.06 (0.86); \( p = 0.01 \) [Figure 1A and 1B]. Interleukin-4 Receptor Alpha (IL-4RA) was associated with clinically significant pruritus, as compared with not clinically significant pruritus in both cohorts (exploratory: 3.27 (1.30) pg/ml vs 3.09 (1.01), \( p = 0.032 \); validation: 1081 (173) vs 1000 (200); \( p = 0.022 \) [Figure 1C and 1D].

**Conclusion:** Pruritus treatments are effective in some, but not all, patients whilst there are no effective treatments for fatigue or cognitive symptoms. The development of novel therapeutics targeting symptoms remains a significant unmet need in PBC. IL-6 was consistently elevated in two distinct PBC groups with clinically significant fatigue. Elevated IL-6 has previously been implicated in chronic fatigue, skeletal muscle fatigability and mitochondrial dysfunction. With established IL-6 blockade therapies available, this may present a new therapeutic oral therapy for fatigue. IL-4RA demonstrated a positive association for clinically significant pruritus across both groups. A trial of Dupilumab, an IL-4RA receptor antagonist, is ongoing and may prove to be an effective treatment for cholestatic pruritus.

**FRI-332**  
**Anti-nucleosome antibodies as an important marker to distinguish between autoimmune hepatitis and drug-induced liver injury**

Mirjam Kolev1, Guido Stimimann1, Henning Nilius2, Juliette Schlatter2, Michele Freiburgerhaus1, Michael Nagler2, Michael Horn2, Nasser Semmo1. 1Inselspital, Bern University Hospital, University of Bern, Department of Visceral Surgery and Medicine, Bern, Switzerland; 2Inselspital, Bern University Hospital, University of Bern, Department of Clinical Chemistry, Bern, Switzerland  
Email: nasser.semmo@insel.ch

**Background and aims:** Antinuclear antibodies (ANA) are positive in 70–100% of patients with autoimmune hepatitis (AIH) and in 22–33% of patients with drug-induced liver injury (DILI), yet little is known about their antigen-specificity. Differentiation between AIH and DILI is often difficult, especially in DILI cases with ANA positivity but no need for immunosuppression. Since treatment strategies differ, correct classification is important. Our aim was to investigate the antigen-specificity of ANA in AIH and DILI patients and to model their value in the classification of the two diseases.

**Method:** Samples were obtained from the Hepatology Biobank of the University Hospital Bern, Switzerland, from patients with AIH (n = 54) or DILI (n = 29) who were ANA positive at diagnosis or during follow-up. ANA testing was performed with indirect immunofluorescence (IF), followed by pattern specific antibody testing with enzyme-linked immunosorbent assays (ELISA) according to the International Consensus on Antinuclear Antibody Pattern; e.g. anti-DNA, -histone and -chromatin/nuucleosome, when a homogeneous pattern was detected. Based on the descriptive results, we built a random forest model with the variables of significance.

**Results:** The median (IQR) age at diagnosis was 57 years (43.50, 67.75) in the AIH versus 58 years (40, 65) in the DILI group. In the AIH group, 74% were women, in the DILI group 65.5%. The median level of immunoglobulin G was higher in the AIH group (22.20 g/l (14, 31.2)) than in the DILI group (10.5 g/l (9.5, 14.7)) (< 0.001). The most frequent ANA patterns in AIH were homogeneous in 76% and fine-speckled in 69%. In DILI patients, the most frequent ANA patterns were fine-speckled in 90% and homogenous in 48%. In AIH patients, anti-nucleosome antibodies were detected in 37% of patients compared to 7% in DILI patients (\( p < 0.01 \), anti-histone antibodies in 30% in AIH compared to 3% in DILI (\( p < 0.01 \). 26% of AIH and 34% of DILI patients remained non-specific after ELISA testing. The Figure shows the mean depth in the random forest model for anti-nucleosome and established AIH-related antibodies. The smaller the mean value, the higher the significance of the variable in the classification of the two diseases.

**Conclusion:** Our data shows a significantly higher positivity of anti-nucleosome and anti-histone antibodies in patients with AIH compared to DILI patients. The random forest model shows that anti-nucleosome antibodies are almost as important as the established anti-actin antibody in the classification of AIH and DILI. Therefore, anti-nucleosome antibodies may be able to help distinguish between the two diseases. External validation is the next step to confirm this relationship.

**FRI-333**  
**Combination of intestinal bile salt uptake inhibition with pharmacological repression of bile salt synthesis improves liver health in cholestatic mice**

Roni Kuns1, Esther Vogels1, Isabelle Bolt1, Ronald Ouode-Elferink1, Stan van de Graaf1. 1Amsterdam UMC, Tytgat Institute for Liver and Intestinal Research, Netherlands  
Email: k.f.vandegraaf@amsterdamumc.nl

**Background and aims:** Intestine-restricted inhibitors of the apical sodium-dependent bile acid transporter (ASBT) or obeticholic acid (OCA) are approved as treatment against cholestasis but also associated with symptoms such as diarrhea and abdominal pain. Furthermore, blocking ASBT alone might be less effective in severe cases of cholestasis. We hypothesize that therapeutic interventions that lower bile salt synthesis provide an effective complementary treatment strategy. Here, we test combination therapies of intestinal ASBT inhibition in combination with obeticholic acid (OCA), cilofexor and NGM282 in a mouse model for cholestasis induced liver injury.

**Method:** Wild type male C57Bl6J/OlaHsd mice were fed a 0.05% 3,5-diethoxy-2-carbonyl-1,4-dihydro-collidine (DDC)-diet and received daily oral gavage with either 10 mg/kg OCA, 30 mg/kg Cilofexor, 10 mg/kg GS1107 (ASBT inhibitor; ASBTi) or a combination. Alternatively, wild type male C57Bl6J/OlaHsd mice were injected with control AA/8 or AA/8-NGM282, a non-tumorigenic analogue of FGF19 to repress bile salt synthesis. While being fed a DDC diet, mice received daily oral gavage with ASBTi or placebo control.

**Results:** Combination therapy of OCA, Cilofexor and NGM282 with ASBTi effectively reduced fecal bile salt excretion. NGM282+ASBTi further lowered plasma bile salt levels compared to ASBTi mono-therapy. Cilofexor+ASBTi and NGM282+ASBTi treatment reduced plasma alanine transaminase and aspartate transaminase levels. Gene expression analysis indicated dampening of inflammatory and fibrotic processes in Cilofexor+ASBTi and NGM282+ASBTi treated mice, and this was confirmed by histology.
**Conclusion:** Combination therapy of repressed bile salt synthesis and intestinal bile salt uptake is an effective treatment strategy to reduce liver injury while dampening the ASBTi-induced colonic bile salt load in a pre-clinical cholestasis model.

**FRI-334**

**Cholestatic liver disease is alleviated by colitis-induced inhibition of bile acid synthesis**

Wenfang Gui1, Mikal Jacob Hole2, Antonio Molinaro3, Karolina Edlund4, Kristin K. Jørgensen5,6, Huan Su7, Brigitte Begher-Tibbe2, Nikolaus Gaßler1, Carolin V. Schneider1, Uthayakumar Muthukumarasamy8, Antje Mohs5, Lijun Liao1,9, Julius Jäger1, Christian Mertens1, Ina Bergheim10, Till Strowig1, Jan G. Hengstler4, Johannes R. Hov10, Hanns-Ulrich Marschall1, Christian Trautwein1, Kai Markus Schneider1.

1University Hospital RWTH Aachen, Medicine III, Aachen, Germany; 2Norwegian PSC Research Center, Section of Gastroenterology and Research Institute of Internal Medicine, Division of Surgery, Inflammatory Diseases and Transplantation, Oslo University Hospital and University of Oslo, Norway; 3Department of Molecular and Clinical Medicine/Wallenberg Laboratory, Sahlgrenska Academy, University of Gothenburg, Sweden; 4Leibniz Research Centre for Working Environment and Human Factors, Technical University Dortmund, Dortmund, Germany; 5Norwegian PSC Research Centre, Department of Transplantation Medicine, Oslo University Hospital, Rikshospitalet, Norway; 6Department of Gastroenterology, Akershus University Hospital, Lørenskog, Norway; 7Institute for Legal Medicine, Section Pathology, University Hospital Jena, Jena, Germany; 8Helmholz Centre for Infection Research, Braunschweig, Germany and Hannover Medical School, Hannover, Germany; 9Department of Anesthesiology and Pain Management, Shanghai East Hospital, School of Medicine, Tongji University, Shanghai, China; 10Department of Nutritional Sciences, Molecular Nutritional Science, University of Vienna, Vienna, Austria

**Background and aims:** Primary sclerosing cholangitis (PSC) is a chronic cholestatic liver disease characterized by inflammation and progressive fibrosis of the biliary tracts. The intriguing and strong epidemiological link between PSC and inflammatory bowel disease (IBD) is known for decades, but the mechanisms by which colitis affects cholestatic liver disease remain incompletely understood.

**Method:** To study the effects of colitis on liver injury, inflammation, fibrosis, and bile acid metabolism in cholestatic liver disease, we established acute and chronic mouse models of PSC-IBD by administering dextran sodium sulfate (DSS) to Mdr2−/− mice. The pathophysiological consequences of colitis treatment on WT and Mdr2−/− mice were studied based on transcriptomic analyses, histology, flow cytometry, Matrix Assisted Laser Desorption imaging of spatial BA distribution as well as comprehensive BA profiling using UPLC-MS/MS, including the BA synthesis marker C4 (7α-hydroxy-4-cholesten-3-one). By treating Mdr2−/− mice with lipopolysaccharide (LPS) and studying the impact of LPS on co-cultured human primary hepatocytes and Kupffer cells, we also investigated whether LPS could phenocopy the effects of bacterial translocation that occurs during colitis induction. Finally, we generated Mdr2−/−/Nemo−/− mice to explore whether hepatocytic NF-kappaB signaling plays a role in inflammation-mediated changes in bile acid metabolism.

**Results:** DSS treatment induced intestinal inflammation, barrier impairment, and bacterial translocation in WT and Mdr2−/− mice. Impaired barrier function was linked to bacterial translocation inducing an increased hepatic inflammatory response but was surprisingly associated with ameliorated liver injury and hepatocellular apoptosis in both acute and chronic DSS treated Mdr2−/− mice. Most interestingly, biliary septal fibrosis was improved in Mdr2−/− mice with chronic colitis induction. Inflammatory pathways and specifically hepatic NF-kappaB activation inversely correlated with bile acid synthesis reducing hepatic bile acid accumulation, thereby alleviating cholestatic liver injury and fibrosis. Importantly, LPS was sufficient to activate this protective circuit in-vitro and in-vivo, while the absence of NF-kappaB signaling in Mdr2−/−/Nemo−/− mice strongly exacerbated cholestasis.

**Conclusion:** Here, we identify an unexpected colitis-driven and hepatocytic NF-kappaB-dependent protective circuit in cholestatic liver disease. Our findings may have important implications for the treatment of individuals with PSC suffering from concomitant colitis.

**FRI-335**

**Non-invasive imaging method demonstrates anti-fibrotic efficacy of a dual integrin alpha-v/beta-6 and alpha-v/beta-1 inhibitor in a rat model of biliary fibrosis**

Johanna Schaub1, Yingying Ning2, Iris Y. Zhou2, Nicholas Rotile2, Avery Boice2, Avery Boice2, Jessie Lau1, Peter Caravan1, Scott Turner1. 1Pliant Therapeutics, United States; 2Massachusetts General Hospital and Harvard Medical School, United States

**Background and aims:** There is an unmet need for antifibrotic treatments which can prevent, halt or reverse hepatic fibrosis in

Figure: (abstract: FRI-344): Putative biomarkers and their proposed mechanism for CAGB

**POSTER PRESENTATIONS**
chronic liver diseases; however, drug development efforts have been hampered by a lack of non-invasive methods to measure fibrosis. In primary sclerosing cholangitis, integrins overexpressed on injured cholangiocytes (alpha-v/beta-6) and myofibroblasts (alpha-v/beta-1) are attractive therapeutic targets because they bind and activate latent TGF-beta, a key driver of liver fibrosis. Here, we used molecular MRI with CM-101, a type I collagen probe that directly measures fibrosis, and PET with an alpha-v/beta-6 probe to provide a non-invasive readout of anti-alpha-v/beta-6 and alpha-v/beta-1 antagonism in a rat model of biliary fibrosis.

**Method:** Liver fibrosis was induced in rats by ligation of the common bile duct (BDL). The selective integrin alpha-v/beta-6 and alpha-v/beta-1 antagonist PLN-169 was dosed orally 4–17 days post-BDL. MRI with CM-101 and PET with a $^{68}$Ga-DOTA-alpha-v/beta-6 cysteine knot probe were performed on days 6 and 18 post-BDL. On day 18, livers were collected for histological and molecular analysis. Sirius Red was used to stain collagen and fibrosis was performed measuring collagen proportional area (CPA) in Imagej and with Fibronectin (PharmaNest). Gene expression changes were measured using the NanoString platform.

**Results:** Bile duct ligation significantly increased the levels of integrin alpha-v/beta-6 in the liver 18 days post-surgery as assessed by ex vivo gene expression (>10×, p < 0.05) and by in vivo alpha-v/beta-6 PET imaging (2.6×, p < 0.05). BDL resulted in severe fibrosis with 22× increase in CPA and a significant increase in Phenotypic Fibrosis Composite Score (Ph-FCS) (both p < 0.0001). Treatment with PLN-169 significantly reduced hepatic accumulation of the alpha-v/beta-6 PET probe (34%, p < 0.05) and markedly attenuated histological measures of fibrosis with >50% decrease in CPA (p < 0.0001) and decreases in multiple phenotypic measures of fibrosis. MRI with CM-101 showed a significant increase in liver-to-muscle contrast to noise ratio (delta-CNR) in BDL animals compared to sham animals on day 18 (4.5×, p < 0.0001) as well as a significant decrease in BDL animals with PLN-169 treatment (45%, p < 0.05). Delta-CNR significantly increased in vehicle-treated animals from day 6 to day 18 (>2.0×, p < 0.05) but not in PLN-169-treated animals. Importantly, delta-CNR correlated with the direct measurement of collagen from digital pathology (CPA, r = 0.65, p < 0.001).

**Conclusion:** PET imaging for alpha-v/beta-6 and molecular MRI of collagen can non-invasively assess target expression, target engagement, and treatment response of an integrin alpha-v/beta-6 and alpha-v/beta-1 antagonist in a rat model of biliary fibrosis. This study raises the possibility that non-invasive methods may be valuable for evaluating treatment responses in liver fibrosis and supporting drug development in this field.

**FRI-336**

**Blockade of IL-18 via long-acting IL-18 binding protein attenuates experimental diet-induced cholestatic disease**

Dong-Hyun Kim1, Jin Joo Park2, Mi-Hyun Park2, Kyungsun Lee2, Jaekyu Han2, Susan Chi2, Moo Young Song2, Seung Goo Kang2,3, Sang-Hoon Cha2, Yong-Hyun Han1, 1Laboratory of Pathology and Physiology, College of Pharmacy, Kangwon National University, Korea, Rep. of South; 2AprilBio Co., Ltd., Korea, Rep. of South; 3Division of Biomedical Convergence, College of Biomedical Science, Kangwon National University, Korea

**Email:** yhhan1015@kangwon.ac.kr

**Background and aims:** Primary sclerosing cholangitis (PSC) is defined as a cholestatic liver disease characterized by multiple segmental strictures in the hepatic bile ducts. Eventually, chronic biliary inflammation drives liver fibrosis and cirrhosis, and there are no clinically effective therapeutic drugs to cure PSC disease. IL-18 binding protein (IL-18BP) is a secretory protein and acts as a high affinity neutralizer for IL-18. Here, we developed SAFA-IL-18BP (APB-R3), a long-acting version of IL-18BP that covalently attached to an anti-serum albumin Fab (SAFA), and evaluated whether blockade of IL-18 via APB-R3 reduce PSC-induced injury markers such as bile ductal reactions, fibrosis, and senescence.

**Method:** To establish diet-induced PSC model, we provided 3,5-diethoxycarbonyl-1,4-dihydrocollidine (DDC) diet to mice. Mice were intraperitoneally injected with APB-R3 at a dose of 10 mg/kg in a volume of 5 ml/kg thrice a week from day 0 to day 20 of feeding period.

**Results:** We first found that expression of hepatic IL-18 and IL-18BP was enhanced in DDC diet-induced PSC conditions. We observed that administration of APB-R3 effectively decreased key indicators related to hepatobiliary disease such as plasma ALP and GGT activities as well as bile acid levels. Bile ductular reactions were also inhibited by APB-R3 injection. Furthermore, APB-R3 significantly suppressed periductal fibrosis and transcriptional activations of hepatic pro-fibrotic genes. Finally, we revealed that APB-R3 decreased senescence-associated secretory phenotype (SASP) markers such as TGF-β1, MMP3 and p27.

**Conclusion:** The long-acting IL-18BP APB-R3, effectively ameliorates DDC diet-induced biliary injuries in rodent PSC model. These preclinical results suggest that APB-R3 can be potential leading therapeutic drug to relieve PSC disease, and our results warrant further clinical trial studies.

**FRI-344**

**Proteomics and metabolomics of bile reveal molecular insights and classify signatures predictive of carcinoma of gallbladder**

Jaswinder Maras1, Nupur Sharma1, Sadam H. Bhat1, Babu Mathew1, Manisha Yadav1, Gaurav Tripathi1, Vasundhra Bindal1, Neha Sharma1, Soumitra Pandey1, Harun Hemmati2,3, Deepika Bohra4, Rashmi Rana4, Sanyam Falari5, Viniyendam Pamecha6, 1Institute of liver and biliary sciences, Molecular and cellular medicine, New Delhi, India; 2University of Kentucky, Department of toxicology and cancer biology, Lexington, United States; 3University of Kentucky, Department of Toxicology and Cancer Biology, Lexington, United States; 4Sir ganga ram hospital, Department of research, New Delhi, India; 5Institute of liver and biliary sciences, Department of liver transplant and hepato pancreato biliary surgery, New Delhi, India

**Email:** jassi2param@gmail.com

**Background and aims:** Carcinoma of the gall bladder (CAGB) has poor prognosis. Bile concentrated in the gallbladder (GB) is expected to recapitulate molecular (proteome/metabolome) alteration which may provide critical pathophysiological insight linked with the development of CAGB. Reliable biomarker-based assays with high sensitivity and specificity for detection of this cancer are a clinical need.

**Method:** In this cross-sectional study, 127 patients admitted at ILBS (CAGB, n = 37; Gallstone (GS), n = 60; Healthy liver donor (HC), n = 30) were classified into training and test cohort. In training cohort, bile samples (n = 87) were collected from patients undergoing cholecystectomy for GS disease and grouped as GS (n = 40) and patients undergoing surgery for CAGB were grouped as CAGB (n = 17); we also collected healthy liver donor samples (n = 30). Whereas in the test
cohort, both bile (T1, n = 20) and plasma (T2, n = 20) samples were analysed and validated using machine learning (ML) approach.

**Results:** Bile samples were screened for proteomics/metabolomics signatures capable of early detection of cancer in GB anomalies. Bile of CAGB showed distinct proteomic (217-up and 258 downregulated; FC>1.5) and metabolomic (111 up- and 505 downregulated; FC>1.5) profiles compared to GS or HC (p < 0.05, FDR<0.01). Partial least square discriminant analysis (PLS-DA) and unsupervised hierarchical clustering showed clear segregation of CAGB from other groups. CAGB bile was significantly enriched for proteins/metabolites linked to inflammation (complement and coagulation cascade, arachidonic acid metabolism, bile acid, tryptophan, and sphingolipid signaling, ferroptosis and others), alternate energy pathways (pentose phosphate pathway, amino acid metabolism, lipid metabolism, and others). Proteins/metabolites decreased were associated to glycolysis, cholesterol metabolism, PPAR, RAS and RAP1 signaling glutathione, pyruvate, histidine, purine metabolism, oxidative phosphorylation and others. Integration analysis revealed strong correlation (r^2 > 0.5, p < 0.05) between significant proteins/metabolites and clinical parameters and showed alteration of pathways linked to lipid metabolism, platelet activation, amino acid metabolism and others (p < 0.05). Metabolite/protein signature based probability of detection for CAGB was >90% (p < 0.05) with AUC>0.94. Validation of top four metabolite panel: Toluene, 5, 6-DHET, Creatine and Phenyl acetaldehyde using five machine-learning algorithms in n = 40 samples from T1 and T2 showed highest accuracy (99%) and sensitivity/specificity (>98%) for CAGB detection.

**Conclusion:** Bile proteome/metabolome alteration provides key molecular insight in development of CAGB. We put forward a core set of bile signatures which may offer universal utility for early detection of CAGB.

**FRI-345**

**Serum proteomics reveals association of CCL24 with key aspects of primary sclerosing cholangitis**

Raanan Greenman1, Tom Snir1, Ari Katav1, Omer Levi1, Revital Aricha1, John Lawler2, Douglas Thorburn3, Massimo Pinzani4, Ilan Vaknin5.

1Chemomab Ltd., Israel; 2Chemomab Inc., Clinical Operations, United States; 3Royal Free Hospital School Of Medicine, London, United Kingdom; 4UCI Institute of Immunity and Transplantation, London, United Kingdom

Email: raanan@chemomab.com

**Background and aims:** CCL24, also known as Eotaxin-2, is a pro-inflammatory, pro-fibrotic chemokine overexpressed in livers of patients with primary sclerosis cholangitis (PSC), predominantly in areas of evident biliary injury. CCL24 blockade, using a monoclonal antibody, was shown to interfere with core pathways that induce PSC (n = 45) were analyzed using the Olink proximity extension assay. The stratification of patients with PSC, patients with severe fibrosis and patients with elevated CCL24. Moreover, CCL24 levels were significantly correlated with serum proteins frequently associated with inflammation, fibrosis and vascularization (e.g., CXCL10, collagens, and VEGFA) in patients with ALP >1.5 ULN.

In-vitro, CCL24 stimulated HSC manifest a set of upregulated proteins that are commonly elevated in serum of patients with severe PSC. This CCL24 dependent altered protein expression was blocked following treatment with CM-101.

**Conclusion:** This study provides novel insights into the role of CCL24 in PSC and its association with disease-related pathways and severity. We identified a potential CCL24 related signature in PSC that supports the ongoing phase 2 study of CM101 in patients with PSC.

**FRI-346**

**Combination of ileal bile acid transporter inhibitor and a non-steroidal Farnesoid X receptor agonist for reversal of cholestatic liver injury in Cyp2c70 KO mice with a humanized bile acid composition**

Caroline Klindt-Morgan1, Jennifer Truong1, Ashley Bennett1, Kimberly Pachura1, Dirk Herebian2, Ertan Mayatepek2, Saul J. Karpen1, Paul Dawson1, 1Emory University School of Medicine and Children's Healthcare of Atlanta, Department of Pediatrics, Atlanta, United States; 2Heinrich-Heine University, Department of General Pediatrics, Neonatology, and Pediatric Cardiology, Medical Faculty, Heinrich-Heine-University, Dusseldorf, Germany, Dusseldorf, Germany

Email: cklindm@emory.edu

**Background and aims:** Cyp2c70 has been identified as the key enzyme in mice for synthesis of hepatoprotective 6-hydroxylated muricholates. Cyp2c70 knockout (2c70 KO) mice have a more hydrophobic human-like bile acid (BA)-composition and develop signs of cholestatic liver injury. Preventive monotherapy with an ileal BA transporter (IBAT) inhibitor reduces hepatic BA burden and alleviates liver injury in these mice. However, it is unclear if there is an intrabiliary BA threshold for onset of liver injury and if short-term complementary therapies designed to reduce the hepatic BA pool can reverse the hepatotoxicity in this model. The non-steroidal Farnesoid-X-Receptor (FXR) agonist Cilofexor inhibits BA-synthesis and has been shown to reduce fibrosis in a model for NASH in rats.

**Method:** 12-week-old male and female 2c70 KO mice with wild type (WT) mice (C57BL/6) were fed chow or a diet containing an IBAT inhibitor (0.006% SC-435) and/or an FXR agonist (0.015% Cilofexor) for 14 days. Upon sacrifice, livers were collected for histology, immunohistochemistry, RT-PCR and gas-liquid chromatography. Blood samples were analyzed for serum biochemistry.

**Results:** By the age of 12 weeks, female 2c70 KO mice exhibited cholestatic liver injury as indicated by elevated serum liver injury markers (AST and ALT) and histological evidence of liver inflammation and fibrosis. Therapy with SC-435 as well as Cilofexor...
significantly reduced ALT and AST levels (e.g. AST decreased by >86% and 79% respectively compared to chow) after 14 days of treatment without significant additional effect in combination. Liver BAs were significantly reduced in all treatment groups as compared to chow. RT-PCR analysis showed a reduction of inflammatory markers in the Cilofexor and Cilofexor + SC-435 groups in comparison to chow (e.g. Tgf-beta reduced by >73% and 76% and Interleukin-1 beta reduced by >81% and 76% respectively). Fibrosis as indicated by Sirius Red staining showed a tendency for decrease especially after combination therapy without reaching significance (reduction of 62% in Cilofexor + SC-435 as compared to chow).

**Conclusion:** Short term therapy with an IBAT inhibitor after onset of liver injury in 2c70 KO mice can reduce liver injury but is insufficient for a complete rescue. The therapeutic benefit associated with short term combined administration of Cilofexor and SC-435 shows a tendency for a synergistic effect in reducing inflammation but has no significant effect on fibrosis.

**FRI-347**
Production of reactive oxidant species and fatty acid uptake is increased in regulatory T-cells in autoimmune hepatitis, and associated with down-regulation of markers linked to suppressor function

Scott Davies¹, Naomi Richardson¹, Grace Woottton¹, Ye Htun Oo¹,², Palak Trivedi¹,², University of Birmingham, National Institute for Health Research (NIHR) Birmingham Biomedical Research Centre (BRC), Birmingham, United Kingdom; ¹University Hospitals Birmingham, Liver Unit, United Kingdom
Email: p.j.trivedi@bham.ac.uk

**Background and aims:** Autoimmune hepatitis (AIH) is characterised by a breach in liver immune tolerance. Inflammatory triggers are largely unknown, but dysregulated activity and function of regulatory T cells (Tregs) are proposed to contribute. In this study, we evaluated metabolic functions of Tregs in patients with AIH with evidence of well-controlled disease, alongside expression of functional markers in liver-infiltrating cell populations.

**Method:** Peripheral blood mononuclear cells (PBMCs) were isolated from patients (pts) with AIH. Tregs were characterized according to the following profile: CD4+ CD25hi, CD127lo. Cells were then labelled with fluorescent dyes reporting the production of reactive oxidant species (ROS), fatty acid uptake and mitochondrial activity. All cells were analysed by flow cytometry whilst acquiring median fluorescence intensity values. Control blood samples were obtained from patients with haemochromatosis (HFE) undergoing venesection without evidence of liver disease. Disease control PBMCs were also obtained from individuals with primary biliary cholangitis (PBC) and alcohol-induced liver disease (ALD).

**Results:** Firstly, peripheral blood was obtained from 5 patients with AIH (median age 50, 60% men, median ALT and bilirubin values 36 U/L and 19 micromol/L, respectively). Circulating Tregs displayed higher production of ROS compared to that of patients with haemochromatosis. This observation was coupled with increased fatty acid uptake and reduction in mitochondrial mass (Fig 1A–C). Next, protein expression of functional markers was evaluated in Tregs derived from a separate cohort of AIH patients (median age 37.5, 43% men, median ALT and bilirubin values 46 U/L and 12.5 mg/dL, respectively). These included reductions in CD39 expression and lower values for CTLA-4 and FOXP3, as compared to HFE (Fig 1D–F). Such changes were not observed in peripheral blood Tregs obtained from patients with PBC and ALD.

**Conclusion:** In AIH, mitochondrial dysfunction and heightened fatty acid oxidation may lead to generation of ROS, reducing the suppressive activity of Tregs. Mitigating ROS production may rescue the immunosuppressive activity of Tregs and requires exploration as part of cell therapy trials to promote long-term immune tolerance.

**FRI-348**
The cell cycle protein Cyclin E1 mediates pro-inflammatory signals in a mouse model of acute hepatitis and in primary macrophages

Christian Penners¹, Anna Verwaayen¹, Antje Mohs ¹, Alexander Jans¹, Julia Hennings¹, Matthias Bartneck¹, Christian Trautwein¹, Roland Sonntag¹, Christian Liedtke¹, University Hospital RWTH Aachen, Department of Medicine III, Germany
Email: c.liedtke@ukaachen.de

**Background and aims:** Cyclin E1 is a regulatory subunit of cyclin-dependent kinase 2 (CDK2) and mediates the transition from quiescence into the S-Phase of the cell cycle. We previously identified unexpected essential functions of Cyclin E1 for liver fibrogenesis as well as for initiation and progression of hepatocellular carcinoma. However, the effector cells of Cyclin E1 in the liver have not yet been fully identified. In particular, the potential role of Cyclin E1 in liver
resident and circulating immune cells is poorly investigated. Therefore, in the present study we aimed to investigate the role of Cyclin E1 in immune cells during acute liver inflammation.

**Method:** For our study we used constitutive Cyclin E1 knockout (Ccn1−/−) mice and Wildtype (WT) controls in a C57BL/6 background. Acute liver injury was induced using the established Concanaavalin A (ConA) model of immune-mediated hepatitis; mice were sacrificed after 24 hours. Explanted livers were investigated by histological analysis, FACS, qPCR and ELISA. Bone marrow-derived macrophages (BMDM) were isolated from Ccn1−/− and WT mice and analyzed for differentiation, cell cycle activity and pro-inflammatory polarization. In vitro knockdown of Ccn1 was performed using the macrophage cell line J774A.1 and anti-Ccn1 siRNA encapsulated in lipid nanoparticles (LNP).

**Results:** Surprisingly, Ccn1−/− mice showed improved survival after ConA-treatment, which was associated with significantly reduced liver necrosis compared to WT controls. In addition, loss of Ccn1 was related to down-regulation of pro-inflammatory mediators such as interleukin-6 (IL6), tumor necrosis factor alpha (TNF), and CC-related ligand 2 (CCL2), which are typically expressed in liver necrosis compared to WT controls. In addition, loss of Ccn1 was associated with significantly reduced lipogenesis in liver necrosis compared to WT controls. The hepatocyte cell line HepG2 was transfected with Ntcp to allow for bile salt uptake and was stimulated with glycochenodeoxycholate (GCDC) and/or Cu (5–10μM, each). Cell survival and apoptosis were assessed, as well as the recently described cell death mode cuproptosis.

**Results:** While liver Cu was not different between Mdr2ko and wt mice on FVB background, we found a 1.5 ± 0.2-fold increase in Cu levels in Mdr2/BALBc (15.4 ± 0.9 vs. 24.5 ± 2.8 mg/kg in wt/BALBc vs. Mdr2/BALBc, n = 5, p < 0.05). This was associated with more advanced liver fibrosis (liver hydroxyproline 167.5 ± 31.7 vs. 252.8 ± 56.6 μg/g, Mdr2/BALb vs. Mdr2/BALBc, n = 7, p < 0.05). In DKO, liver Cu was increased 1.5 ± 0.3 -fold (vs. Mdr2/BALb), again associated with a trend towards increased liver hydroxyproline. Feeding a Cu-enriched diet led to an increase in liver Cu in Mdr2/FVB, but not in wt FVB, again associated with a 2.2 ± 0.3-fold increase in liver hydroxyproline. Treatment of Mdr2/BALBc mice with MB-SB2 over 4 weeks was able to decrease excess liver Cu content 

**Conclusion:** Hepatic copper deposition in Mdr2 ko mice is associated with more advanced liver fibrosis, mimicking the human phenotype in PSC. Effective copper chelation by use of MB-SB2 ameliorated liver damage in Mdr2 ko animals. On a cellular level, bile salts and Cu act synergistically to cause cell death, potentially via the route of cuproptosis.

**FRI-349**

**Depletion of excess liver copper ameliorates liver damage in a mouse model of chronic cholestatic liver disease**

Dennis Koob1, Judith Nagel2, Jingguo Li1,3, Sebastian Zimny1, Ralf Wimmer1, Gerald Denk1, Martin Roderfeld4, Elke Roeb5, Svetlana Lutsenko5, Hans Zischka2,6, Simon Hohenester1.

**Background and aims:** Disturbed copper (Cu) homeostasis in the liver, as seen in Wilson’s disease, can cause liver damage. Cu accumulation occurs also in cholestatic liver disease, though to a lesser extent. In primary sclerosing cholangitis, Cu accumulation, i.e., orcin staining as a component of the Nakanuma score, even seems to predict poor transplant-free survival. We hypothesize that Cu accumulation might not only be a consequence of cholestasis, but also modulate the course of disease. We aimed to investigate the role of Cu accumulation in animal models of cholestasis and identify potential treatment targets.

**Method:** Hepatic Cu content was determined in wild type and Mdr2ko animals on FVB, BL6 or BALBc background as well as in Atp7b/Mdr2 (BL6) double knockout mice (DKO). Mice were fed a control or Cu-enriched diet or treated with the potent Cu chelator methanobactin (MB)-SB2. The hepatocyte cell line HepG2 was stably transfected with Ntcp to allow for bile salt uptake and was stimulated with glycochenodeoxycholate (GCDC) and/or Cu (5–10μM, each). Cell survival and apoptosis were assessed, as well as the recently described cell death mode cuproptosis.

**Results:** While liver Cu was not different between Mdr2ko and wt mice on FVB background, we found a 1.5 ± 0.2-fold increase in Cu levels in Mdr2/BALBc (15.4 ± 0.9 vs. 24.5 ± 2.8 mg/kg in wt/BALBc vs. Mdr2/BALBc, n = 5, p < 0.05). This was associated with more advanced liver fibrosis (liver hydroxyproline 167.5 ± 31.7 vs. 252.8 ± 56.6 μg/g, Mdr2/BALb vs. Mdr2/BALBc, n = 7, p < 0.05). In DKO, liver Cu was increased 1.5 ± 0.3 -fold (vs. Mdr2/BALb), again associated with a trend towards increased liver hydroxyproline. Feeding a Cu-enriched diet led to an increase in liver Cu in Mdr2/FVB, but not in wt FVB, again associated with a 2.2 ± 0.3-fold increase in liver hydroxyproline. Treatment of Mdr2/BALBc mice with MB-SB2 over 4 weeks was able to decrease excess liver Cu content (figure 1a). This was associated with a marked amelioration of liver damage (ALT, Figure 1b). In HepG2, both GCDC and Cu were non-toxic in the concentrations applied in metabolic assays. Combination of both stimuli, however, led to a marked impairment of cell survival. While caspase-3/-7 assays excluded apoptosis, detection of DLAT-oligomers via Western blotting indicated presence of cuproptosis upon co-stimulation with Cu/GCDC. This was supported by the finding that preoad of HepG2 with lipic acid, intended to prevent cuproptosis, indeed improved cell survival (66.8 ± 13.9 vs. 83.8 ± 11.3% for Cu/GCDC vs. Cu/GCDC/ lipic acid, n = 6, p < 0.05).

**Conclusion:** Hepatic copper deposition in Mdr2 ko mice is associated with more advanced liver fibrosis, mimicking the human phenotype in PSC. Effective copper chelation by use of MB-SB2 ameliorated liver damage in Mdr2 ko animals. On a cellular level, bile salts and Cu act synergistically to cause cell death, potentially via the route of cuproptosis.

**FRI-350**

**Genetic predisposition for liver inflammation and response to anti-cholestatic therapy in experimental sclerosing cholangitis**

Ramesh Kudira1, Srikar Pasula1, Annika Yang vom Hofe1, Liva Pfueller1, Manavi Singh1, Jennifer Kasten2, Anas Bernieh3, Cory Kostrub3, Pamela Vig4, Ty Troutman4, Alexander Miethke1,2,3, Cincinnati Children’s Hospital Medical Center, Pediatric Gastroenterology, United States; 2Cincinnati Children’s Hospital Medical Center, Pediatric Pathology and Laboratory Medicine, United States; 3Mirum Pharmaceuticals, United States; 4Cincinnati Children’s Hospital Medical Center, Allergy and Immunology, United States.

**Background and aims:** Genetic deletion of the phospholipid floppase MDR2 causes sclerosing cholangitis from biliary
precipitation of unopposed bile acid microcrystals. FVB background mice with such deletion are prone to HCC, whereas BALB/c background mice with the same deletion display accelerated fibrosis. Here we examine treatment response differences between MDR2−/− mice in FVB or BALB/c backgrounds receiving SC-435, a minimally absorbed inhibitor of IBAT-mediated intestinal bile acid reuptake. This may have clinical relevance for identifying novel injury pathways to be targeted in combination with current anti-cholestatic therapies.

**Method:** In 30-day-old female MDR2−/− mice, sclerosing cholangitis phenotype and treatment response to SC-435 admixed to chow were compared between FVB and BALB/c backgrounds using serum biochemistries, liver histomorphology, and flow cytometry.

**Results:** At 30 days of life, serum ALT and ALP levels were higher in MDR2−/− mice in FVB background compared with BALB/c, accompanied by more severe periporal inflammation and ductal proliferation. When mice were treated with SC-435 from days 30–45, greater ALT level reduction compared with median levels of age- and strain-matched MDR2−/− mice receiving 5058 chow occurred in BALB/c (Δ ALT: −93% vs −37% in BALB/c vs FVB mice; p < 0.0001). ALP only improved in BALB/c mice (Δ ALP: −63% vs +62%, p < 0.0001). The differences were corroborated by liver histomorphology scoring on a 0 to 4+ scale and CK19 immunohistochemistry with image analysis to determine the biliary mass (Figure). 30-day-old MDR2−/− mice in FVB background had higher frequencies of CD3+ cells and lower frequencies of CD11b+ F4/80high monocytes compared to BALB/c. Following treatment with SC-435, BALB/c background mice had significantly higher frequencies of anti-inflammatory Ly6Cneg monocytes (4.5 vs 0.43% of CD45+ cells, p = 0.002) and regulatory T cells (4.0 vs 1.4% of CD45+ cells, p = 0.009) relative to FVB mice.

**Conclusion:** Genetic traits underlying distinct injury responses in mice of different backgrounds control liver inflammation and response of bile duct epithelial injury to IBAT inhibitor treatment in experimental sclerosing cholangitis. Single-cell ATAC-seq studies on purified liver infiltrating myeloid and lymphocyte populations are underway to interrogate chromatin accessibility and underlying genetic variants contributing to the strain-dependent immune response differences.
cell populations. We aimed to interrogate the inflammatory and fibrogenic capacity of patient-derived cholangiocytes after prolonged 3D cell culture.

**Method:** Human cholangiocytes were isolated from extrahepatic bile duct brushings of PSC patients undergoing endoscopic retrograde cholangiopancreatography (ERCP) and propagated as organoids using previously established culture conditions. Organoids were treated for 5 days with a defined cocktail of inflammatory and fibrogenic cytokines (TNFα, IL-17, IL-6 and TGF-β). Treatment was performed with single cytokines at different concentrations and the complete cocktail mix. After treatment, senescence and secretion of inflammatory and fibrogenic mediators were assessed by microscopy and multiplex ELISA measuring a large panel of inflammatory and fibrogenic analytes.

**Results:** Cholangiocyte organoids derived from the diseased bile ducts of PSC patients showed no evidence of cellular senescence and low levels of secretion of inflammatory or tissue-remodelling mediators under normal culture conditions. Treatment with a well-defined cocktail of inflammatory and fibrogenic cytokines, all of which have previously been shown to be present at high levels in diseased livers, lead to a change in cholangiocyte morphology towards a fibroblast-resembling phenotype, loss of organoid formation and upregulation of senescence-associated markers such as SA-β-Gal and PAI1. Cholangiocytes further obtained an activated and highly secretive phenotype, demonstrated by increased secretion of pro-inflammatory and tissue-remodelling mediators (IL-8, CXCL1, CXCL10, CCL2, MIF, S100A8/12, MMP9 and MMP2 among others) into the cell culture medium compared to untreated cells.

**Conclusion:** We here demonstrate that patient-derived cholangiocytes cultured as organoids, when brought into a disease-resembling in vitro environment, increase their secretion of mediators that are associated with immune-modulation and tissue remodelling. This highlights that cholangiocytes are not only a target during biliary disease, but likely also actively participate in modulating and driving disease progression. Our data show the potential of patient-derived cholangiocyte organoids as a powerful tool for unravelling disease-associated cellular mechanisms in PSC.

---

**FRI-352**

**Cholestatic liver disease enhances sociability and leads to significant adaptive changes in amygdala neural circuits regulating social behavior in mice**

Wagdi Almishri¹, Mark G. Swain¹, ²Snyder Institute for Chronic Diseases, Medicine, Calgary, Canada; ²University of Calgary Liver Unit, Department of Medicine, Canada

Email: waalmish@ucalgary.ca

**Background and aims:** Social dysfunction is common in patients with cholestatic liver diseases (CLD); however, it is unclear whether this results from direct brain effects, or from the psychological impact, of CLD. The psychological aspects of disease are absent in an animal model; therefore, a strong behavioral phenotype suggests an organic basis for behavioral changes. Therefore, we examined the impact of CLD on social behavior in an animal model.

**Method:** Bile duct ligated (BDL) and sham control mice were studied 10 days post-surgery (model of CLD; male C57BL/6 mice; Jackson, 8–10 wks) to determine CLD impact on sociability and social memory (measured using automated 3 chamber sociability test). Mice from 5 separate cohorts of BDL/sham mice (n = 5–7/cohort) were studied. Additional cohorts of BDL/sham mice (n = 6/group) were sacrificed at day 10 and the amygdala removed (key brain region regulating social behavior) and analyzed by RNAseq. Differentially expressed genes (DEG) between sham and BDL mice were then subjected to Ingenuity Pathway Analysis® (IPA; Qiagen) to determine CLD-related changes in social behavior-regulating amygdala neural pathways (neurotransmitters: glutamate, GABA; neuromodulators: dopamine, oxytocin). IPA z scores indicate predicted directionality of gene expression changes (−ve vs +ve).

**Results:** BDL mice showed enhanced sociability, reflected by a significant increase in social interactions during the sociability test phase (time investigating an unfamiliar juvenile mouse vs an inanimate object (Figure; left panel), compared to sham mice. Both sham/BDL mice had intact social memory in the novelty test phase (Figure; right panel). RNAseq showed increased numbers of DEGs in the amygdala of BDL vs sham mice (>3000 DEGs). IPA analysis showed enhanced sociability (**p=0.0003) and intact social novelty compared to sham mice (n=16 and 17 mice/group). Data expressed as (%): (i) Sociability = % time spent investigating unfamiliar mouse + entire time spent engaged in investigation of either cage, and (ii) Social Novelty = % time spent investigating unfamiliar mouse + entire time spent engaged in investigation unfamiliar and familiar mouse.

---

Figure: (abstract: FRI-352).
revealed significant changes in genes in amygdala neural signaling pathways regulating social behavior in BDL vs sham mice. Specifically, significant alterations were observed in genes encoding the Canonical Pathway for Brain Oxytocin Signaling (z = −1.64; p < 1.79 × 10⁻³) and CREB Signaling in Neurons (positively regulated by glutamate signaling; z = −1.943; p < 2.02 × 10⁻³) pathways. Additionally, IPA® Upstream Regulator analysis predicted significant changes in numerous upstream transcriptional regulators for DEGs in BDL vs sham mice, including activity of upstream regulators for genes regulating dopaminergic (z = 3.309; p < 1.02 × 10⁻⁵⁵), GABAergic (z = −1.509; p < 1.69 × 10⁻²⁶), and glutaminergic (z = −2.87; p < 2.87 × 10⁻⁷) neural pathways.

Conclusion: Cholestatic mice demonstrate enhanced sociability with significant changes in amygdala gene expression profiles within neural pathways critically regulating social behavior. These findings suggest adaptive changes occur in brain neural pathways in CLD to preserve sociability and are consistent with clinical observations that social isolation leads to poor clinical outcomes.

FRI-353
Oxazolone-mediated bile duct inflammation reveals specific natural killer T cell-dependent inflammatory pathways
Markus Jördens1,2,3,4, Kathrine Sivertsen Nordhus1,2,4, Jonas Øgaard1,2, Tom Lüdde3, Tom Hemming Karlsen1,2,4,5, Brian K. Chung1,2,4, Espen Melum1,2,4,5,6, 1Oslo University Hospital and Institute of Clinical Medicine, University of Oslo, Norwegian PSC Research Center, Norway; 2Oslo University Hospital, Rikshospitalet, Section for Gastroenterology, Department of Transplantation Medicine, Division of Surgery, Norway; 3University of Oslo, Institute of Clinical Medicine, Norway; 5Oslo University Hospital, Rikshospitalet, Section for Gastroenterology, Department of Transplantation Medicine, Division of Surgery, Norway; 6University of Oslo, Hybrid Technology Hub-Centre of Excellence, Institute of Basic Medical Sciences, Faculty of Medicine, Norway
Email: markus.joerdens@med.uni-duesseldorf.de

Background and aims: Primary sclerosing cholangitis (PSC) is an inflammatory bile duct disease characterized by cholangiocyte destruction. We modelled the inflammatory process by performing intrabiliary injection oxazolone which induces cholangitis driven by natural killer T (NKT) cells—a subset of innate-like lymphocytes enriched in liver that rapidly secrete inflammatory mediators upon recognition of CD1d-restricted lipid antigens. To examine the molecular granularity driving NKT-dependent biliary inflammation, we assessed livers from oxazolone-treated mice at multiple time-points by spatial transcriptomics and compared differential gene expression in biliary regions.

Method: Livers from male 10–12-week old C57Bl/6 wild-type (WT), were harvested at 1, 3, and 7 days after intrabiliary oxazolone or DMSO (vehicle) injection and processed for spatial transcriptomics (10X Genomics, USA). Similarly, livers from matched Cd1d−/− animals (lack both CD1d and NKT cells) and Ja18−/− mice (lack only Type I NKT cells) were harvested 3 days post-treatment. Spatial transcripts of all mice were aligned by Space Ranger and cluster analysis and differential gene expression was analyzed using Loupe Browser.

Figure 1: (abstract: FRI-353): Localization of markers for bile ducts (Krt19), fibrosis (Col3a1) and antigen presentation (H2-Ab1) in liver tissue of WT, Cd1d−/− and Ja18−/− mice 3 days after oxazolone injection. Log2 expression values are shown
Results: Differential gene analysis of biliary regions defined by spatial transcriptomics as cytokterain 19 (Krt19) positive and confirmed by histological assessment showed no significant gene upregulation 1 day post-oxazolone versus DMSO (p < 0.05, Benjamini-Hochberg corrected), 124 genes 3 days post-oxazolone and zero genes after 7 days post-oxazolone. Genes upregulated on day 3 predominantly related to drug metabolism (Cyp1a2, Cyp2b10, Cyp2c9, Aox3), complement activation (C8 g, C9, Mbi1, Mbi2, Hc) and acute phase response (Saa1, Saa2, Saa3, Orm2, Serpina3n, Cpr) pathways indicating oxazolone-induced inflammation peaks at day 3 and resolves by day 7. NKT cells had a marked effect on biliary gene expression as transcripts relating to MHC class II antigen processing (Cd74, H2-Ab1) and collagen organization (Col1a2, Col1a1, Col3a1, Serpinh1) were significantly upregulated in WT animals 3 days post-oxazolone compared to both Cdt1−/− (n = 3) and Jfl18−/− (n = 3).

Conclusion: Spatial transcriptome analysis of oxazolone-induced biliary inflammation revealed a distinct pattern relating to antigen presentation and fibrosis that was both temporal and NKT cell-dependent. The identified pathways could be of relevance as future treatment targets for inflammatory biliary duct disorders such as PSC.

FRI-354
The significance of patatin-like phospholipase domain-containing protein-3 I148M genetic variant in autoimmune hepatitis
Kalliopi Azariadi1,2, Angeliki Lyberopoulou1,2, Pinelopi Arvaniti1,2, Kalliopi Zachou1,2, Nikolaos Gatselis1,2, George Dalekos1,2, General University Hospital Of Larissa, Department of Medicine and Research Laboratory of Internal Medicine, National Expertise Center of Greece in Autoimmune Liver Diseases, Larissa, Greece; 2General University Hospital Of Larissa, European Reference Network on Hepatological Diseases (ERN RARE-LIVER), Larissa, Greece
Email: gatselis@me.com

Background and aims: Autoimmune hepatitis (AIH) is a relatively rare autoimmune disease with a strong genetic background. The concurrence of non-alcoholic fatty liver disease (NAFLD) in AIH possibly signifies a more severe disease. The patatin-like phospholipase domain-containing protein 3 (PNPLA3) I148M (rs738409 C/G) variant is well established genetic modifier of NAFLD. Our aim was to investigate the significance of the PNPLA3 I148M variant in AIH.

Method: Two-hundred patients with AIH followed in our Centre were evaluated while a hundred healthy subjects served as controls. Genotyping was performed with in-house allelic discrimination endpoint polymerase chain reaction (PCR).

Results: The I148M variant was present in 95/200 (47.5%) AIH patients compared to 47/100 (47%) healthy controls (p = 1.000). Patients with GG/GC genotypes were more likely to suffer from at least one metabolic risk factor (GC/GG 74.4% vs CC 61%, p = 0.038) and to present with decompensated cirrhosis at diagnosis (GC/GG 6.3% vs CC 1%, p = 0.039). Simple steatosis was present in 35/186 (18.8%) and steatohepatitis in 14/186 (7.5%) patients with available liver biopsy without correlation with the PNPLA3 genotype. The stage of fibrosis and grade of inflammation didn’t correlate with any genotype. Response to treatment was also independent of the presence of the I148M variant. On Kaplan-Meier analysis homozygosity for the G allele correlated with reduced survival free of decomposition (p = 0.006), cirrhotic events (decompensation, liver transplantation, hepatocellular carcinoma) (p = 0.001) and liver related death or liver transplantation (p = 0.011) in treated patients.

Conclusion: The PNPLA3 I148M variant in AIH patients is associated with increased risk of advanced disease at diagnosis and reduced survival free of cirrhotic events and liver related death or liver transplantation, regardless of the presence of NAFLD. This signifies a potential role for the PNPLA3 IMA8 variant as a new AIH biomarker allowing to identify patients with increased risk to disease progression.

FRI-355
Temporal characteristics of cell compartments in immune-mediated cholestatic disease
Markus Jördens1,2,3,4, Kathrine Sivertsen Nordhus1,2,3, Kristian Holm1,2,3, Jonas Øgaard1,2, Tom Lüdde4, Tom Hemming Karlsen1,2,3,5, Brian K. Chung1,2,3, Espen Melum1,2,3,5,6, 1Oslo University Hospital and Institute of Clinical Medicine, University of Oslo, Norwegian PSC Research Center, Norway; 2Oslo University Hospital, Rikshospitalet, Oslo, Research Institute of Internal Medicine, University of Oslo, Institute of Clinical Medicine, Norway; 3University Hospital Düsseldorf, Medical Faculty, Heinrich Heine University Düsseldorf, Department of Gastroenterology, Hepatology and Infectious Diseases, Germany; 4Oslo University Hospital, Rikshospitalet, Section for Gastroenterology, Department of Transplantation Medicine, Division of Surgery, Inflammatory Diseases and Transplantation, Norway; 5Faculty of Medicine, University of Oslo, Hybrid Technology Hub-Centre of Excellence, Institute of Basic Medical Sciences, Norway
Email: markus.joerdens@med.uni-duesseldorf.de

Background and aims: Primary sclerosing cholangitis (PSC) and primary biliary cholangitis (PBC) are progressive liver disorders featuring peri-biliary immune inflammation and cholangiocyte destruction with limited treatment options. The pathogenic interactions between immune cells and cholangiocytes remain unclear but can represent novel treatment targets. Using NOD.c3c4 mice that exhibit spontaneous bile duct inflammation as a model of PSC and PBC, we characterized the immunobiological pathogenesis by defining the gene expression localized to the biliary microenvironment and examined whether progression from early to late disease correlated with alterations in the biliary immune compartment.

Method: Liver tissue from 10-, 20- and 40-week NOD.c3c4 mice (n = 2–4 per age group) were harvested and analyzed by spatial transcriptomics and single-cell RNA sequencing (scRNA-seq; 10X Genomics, USA). Transcriptomes were processed using Space Ranger (spatial) or Cell Ranger (scRNA-seq). Unsupervised k-means clustering and differential gene expression analysis was performed in Loupe Browser (10X Genomics). Relative cell abundances were estimated from spatial transcriptomes using scRNAseq profiles and CIBERSORTx and CARD deconvolution analyses.

Results: Spatial transcriptomes from 10-, 20- and 40-week NOD.c3c4 mice clearly demonstrated high expression of hepatocyte markers in histologically-defined parenchymal regions (Muc9, Muc12, Muc17, Cyp2C67, Cyp2E1) and cholangiocyte markers in biliary regions (Tpna8, Krt19, EpCAM). The non-cholangiocyte markers demonstrating the highest differential expression in biliary regions were related to inflammation (S100b6, Cripl1, Cd24, Cd63). Differential gene expression analysis of 10- and 20-week biliary regions (age-matched combined) showed four significant genes whereas comparisons between 10- and 40-week biliary regions showed 420 genes (p < 0.05, Benjamini-Hochberg corrected) with strongest upregulated expression in 40-week animals associated with cell proliferation (Cd24a, Prom1, Dmbt1, Ccd1) and chronic inflammatory response (Gja1, Camp, Mdk). Deconvolution of spatial transcriptomes into immune cell types revealed biliary infiltration of granulocytes (S100a9, S100a8, Il1b), plasmacytoid dendritic cells (Siglech), monocyte phagocytes (Ly22, Clec4a3, Clec4a1), dendritic cells (Xcr1), B cells (Cd79a, Cd79b, Cd19) and T cells (Cd3 g, Cd3e, Nkg7) in all age groups.
**Conclusion:** Spatial transcriptomics combined with scRNA-seq demonstrates that disease progression is driven by a defined and time-dependent molecular signature in biliary regions of NOD.c3c4 mice. These findings may point to immune pathways amenable to novel treatment approaches in PSC and PBC patients.

**FRI-356**

**HSD17B13 inhibitors are hepatoprotective and anti-inflammatory in a mouse model of autoimmune hepatitis**

Manuel Roqueta-Rivera, Yaohui Nie, Jordan Butts, Mary Chau, Kelsey Garlick, Archie C. Reyes, Jonathan Lloyd, Joshua Klaene, Yat-Sun Or, Bryan Goodwin. 1Enanta Pharmaceuticals, Inc., Biology, Watertown, United States

**Background and aims:** Genome wide association studies identified a loss of function gene variant (rs72613567:TA) for 17-beta hydroxysteroid dehydrogenase 13 (HSD17B13), a lipid droplet-associated protein linked to decreased risk for chronic liver diseases. Delayed onset of autoimmune hepatitis (AIH) has also been observed in TA variant carriers. HSD17B13 inhibitors (HSDi), previously shown to be anti-inflammatory with modulation of sphingolipids, were evaluated in a mouse model of AIH for anti-inflammatory and hepatoprotective effects.

**Method:** Distinct chemical series of HSDi of sub-micromolar potency were tested in a concanavalin A (ConA) model of acute hepatitis. Mice were pretreated with HSDi by oral gavage, followed by intravenous delivery of ConA. Liver, spleen, and plasma were collected at 6 hours post-ConA injection. Hepatoprotection was assessed using plasma ALT. Inflammatory gene markers were evaluated in liver and spleen by qPCR. Cytokines and chemokines were measured in plasma by mesoscale immunoassay. The HSDi effect on sphingolipids was measured in mouse liver and primary human hepatocytes by mass spectrometry.

**Results:** HSDi from distinct chemical series were hepatoprotective and anti-inflammatory. Splenomegaly due to ConA was observed across all groups. However, elevation of plasma ALT and cytokines (TNF, IL1b, CXCL9) by ConA was attenuated by HSDi. In addition, HSDi decreased inflammatory gene markers (Nlrp3, Il1, Il6, Ccl2) in liver. The influx of T-cells (Cd8) to liver was not altered by HSDi, however, markers of immune cell activation (Cd69, St14) and mediators of cell death (Fas) were decreased. In line with a favorable anti-inflammatory and anti-apoptotic profile, liver ceramides (d18:0/16:0 and d18:1/24:1) were decreased in HSDi-treated livers. The modulation of these ceramides was confirmed in HSDi-treated primary human hepatocytes.

**Conclusion:** We have identified potent and selective HSDi that decrease ceramide levels in vitro and in vivo. The hepatoprotective effects by HSDi in an acute T-cell driven liver injury model of AIH may be partially mediated by the modulation of bioactive lipids responsible for cytotoxic immune cell activation.

**FRI-357**

**Differential activation of regulatory CD4+ T cells via the JAK-STAT pathway in Primary sclerosing cholangitis**

Leona Dold, Sandra Kalthoff, Leonie Frank, Taotao Zhou, Pia Esser, Philipp Lutz, Christian Strassburg, Ulrich Spengler, Bettina Langhans. 1University Hospital Bonn, Department of Internal Medicine I, Bonn, Germany

**Background and aims:** Primary sclerosing cholangitis (PSC) is an autoimmune cholestatic liver disease of unknown aetiology. Regulatory CD4+ T cells (Tregs) are important for induction/maintenance of self-tolerance and inhibition of autoimmunity. In PSC a low number of Tregs has been reported. However, their functionality is still unclear. Activation of the JAK-STAT (Janus kinase-signal transducer and activator of transcription) pathway plays a pivotal role in modulating T cell functions. Here, we analyzed cytokine-induced activation of different STAT proteins in Tregs from patients with PSC.

**Method:** 51 PSC-patients (37 with inflammatory bowel disease (IBD), 14 without IBD; all without acute cholangitis or colitis) and 36 healthy controls were enrolled in our study. We measured cytokines in serum via bead-based immunoassays. Using multiparameter phospho-flow cytometry we analyzed ex vivo frequencies of Foxp3+CD25+CD127lowCD4+ Tregs and phosphorylation of STAT1/3/5/6 in Tregs after in vitro stimulation with recombinant IFN-gamma, IL-6, IL-2, and IL-4, respectively, and correlated the results to clinical data.

**Results:** Frequencies of peripheral Tregs were significantly reduced in PSC patients compared to healthy controls (p = 0.0028). In line, serum
levels of IFN-gamma, IL-6, IL-2 and IL-4 were markedly higher in PSC patients than in healthy controls (p < 0.05 each). While none of these cytokines affected activation of STAT5 (Figure S1), IL-6 stimulation induced enhanced phosphorylation of STAT3 in Tregs of PSC patients (Figure 1A). Unlike to commonly proposed markers for PSC progression (bilirubin, alkaline phosphatase, MELD-score), the frequency of IL-6-induced phospho-STAT3+ Tregs correlated to the leucocyte counts in PSC (Figure 1B).

**Conclusion:** Our data indicate differential JAK-STAT activation of CD4+ Tregs in PSC. The correlation between IL-6-induced phospho-STAT3+ Tregs and leucocyte counts may reflect triggering of this pathway in response to an infection.

FRI-358

**scRNA transcriptomics reveal the role of cholangiocytes and neutrophils cross talk in Pkhd1-KO mice**

Zehra Syeda1, Romina Fiorotto1, Shakila Taleb1, Tory Bauer-Pisani1, Dejian Zhao1, Mario Strazzabosco1, 1Yale School of Medicine, United States

**Background and aims:** Congenital hepatic fibrosis (CHF) and Caroli disease (CD) are caused by mutation in Polycystic kidney hepatic disease 1 gene (PKHD1) and lead to biliary malformations, cholangiocyte dysfunction and portal fibrosis. PKHD1 encodes for fibrocystin (FPC), a protein expressed in cilia, plasma membrane and centromeres of cholangiocytes. FPC is involved in multiple cellular functions from polarity and cell matrix interactions to differentiation. This study was designed to investigate the relationships among the cell types present in the pericystic infiltrate in Pkh1-k0 mice at single cell level, to better understand the pathophysiology of CHF/CD.

**Method:** We isolated single cells from liver portal tract of 3 months old Pkh1-k0 and WT mice. Transcriptomics profiling of 16,383 single cells, yielded molecular definitions for cell types present in samples. Datasets were analyzed by Seurat and CellPhoneDB package in R.

**Results:** scRNA seq analysis revealed 9 distinct populations in the portal tract of WT and Pkh1-k0. Interestingly, a second population of cholangiocytes, having higher expression of chemokines (Cxc15, Cxcl2) along with other features of "reactive cholangiocytes", was exclusively present in Pkh1-k0 together with classical cholangiocytes. Gene ontology analysis in reactive cholangiocytes showed an enrichment of genes involved in the recruitment of neutrophils and activation of innate immune responses and suggested the potential involvement of microbial components Among 4 different sub-populations of T cells identified (i.e. CD4+, CD8+, CD4/CD8 double negative and NKT), CD8+ and double Negative T Cells (DNT) are present only in KO sample. DNT cells have previously shown a critical role in perpetuating inflammation. CellPhoneDB analysis showed that Cxcl5 and Cxcl1 play a major role in cross talk and recruitment of neutrophils by cholangiocytes. Cxcl16 attracts T cells and is expressed by cholangiocytes and macrophages in Pkh1-k0. Neutrophils secrete Csf1 that promotes macrophage polarization. Neutrophils and macrophages express Cdc6, a chemotractant for macrophages and T cells. Cdb6 is expressed by Macrophages and provide signals for naive T cell activation and survival by binding to Cdc28 on CD4 + and CD8 + T cells. Il17a is expressed by DNT cells in Pkh1-k0. The Il17a receptor is expressed by neutrophils. Il-17 is highly expressed by neutrophils and macrophages in Pkh1-k0. The receptor Il1r1 is expressed by DNT cells.

**Conclusion:** This study shows a complex signaling network originating from cholangiocytes and amplified by the recruited neutrophils and then T cells and macrophages in Pkh1-k0. Many of the identified signals are druggable and therefore their blockade may bear therapeutic advantages to improve inflammation and progression to fibrosis in Pkh1-k0 model. The role of microbial population is of particular interest.

FRI-359

**Golexanolone, a GABA receptor-modulating steroid antagonist, improves peripheral inflammation, fatigue, locomotor gait, motor incoordination and short-term memory in rats with cholestasis and hepatic encephalopathy due to bile duct ligation**

Paula Izquierdo-Altarejos1, Yaiza Arenas1, Mar Martinez-Garcia1, Carla Gimenez-Garzo1, Gergana Mincheva1, Magnus Doverskog2, Marta Llansola1, Vicente Felipo1, 1Centro de Investigacion Principe Felipe, Valencia, Spain; 2Umeircine Cognition AB, Sweden

**Email:** vfelipo@cipf.es

**Background and aims:** Cholestasis may appear in patients with primary sclerosing cholangitis, primary biliary cholangitis, or drug-induced liver injury. Patients with cholestasis may show fatigue and other symptomatic alterations that severely reduce their quality of life. Patients with liver disease may also eventually show hepatic encephalopathy, with cognitive and motor impairment. Rats with bile-duct ligation (BDL) are a common animal model both of cholestatic liver disease as well as of hepatic encephalopathy. Current management and treatment of cholestatic liver disease include secondary bile acids like ursodeoxycholic acid, UDCA. The licensed therapies are exclusively used to slow or prevent disease progression but have no impact on symptomatic alterations such as fatigue. There are presently no licensed or effective medications for the management of symptomatic alterations such as fatigue in PBC or any other liver disease but immunomodulatory treatments have been proposed. Golexanolone (GR3027), reduces GABAergic tone by reducing the potentiation of GABA receptors activation by neurosteroids such as allopregnanolone. We have recently shown that golexanolone reduces peripheral inflammation and neuroinflammation and improves cognitive and motor function in rats with chronic hyperammonemia. The aims of this study were to assess if golexanolone treatment reduces peripheral inflammation and improves fatigue and cognitive and motor function in BDL rats.

**Method:** Rats were subjected to bile duct ligation. One week after surgery golexanolone was administered daily using intra-gastric probes to BDL and sham-operated controls. To assess the effects on peripheral inflammation several interleukins were analyzed in plasma. Fatigue was analyzed in the treadmill, motor coordination in the motorater, locomotor gait in the Catwalk, and short-term memory in the Y maze. These analyses were performed after 2–4 weeks of treatment with golexanolone.

**Results:** BDL increases the plasma levels of the pro-inflammatory interleukins TNFa, IL-6, IL-17 and IL-18. Golexanolone reverses the increases in these interleukins. BDL induces fatigue in the rats, motor incoordination in the motorater test and alters locomotor gait analyzed in the Catwalk. Golexanolone reverses these changes. BDL impairs short-term memory in the Y maze. Golexanolone improves this impairment.

**Conclusion:** Golexanolone reduces peripheral inflammation in BDL rats. This is associated with improvement in fatigue, locomotor gait and coordination, and short-term memory. Golexanolone may have beneficial effects to treat symptomatic alterations such as fatigue, and motor-, and cognitive impairment in patients with cholestatic liver disease, or hepatic encephalopathy.

FRI-360

**Elevated JAG1-NOTCH Signaling is Associated with Fibrosis Stages in Patients with PSC**

Michael Trauner1, Kaiyi Zhu2, Jun Xu2, William Barchuk2, Lisa Boyette2, Timothy R. Watkins2, Andrew Billin2, Sharlene Lim2, Vlad Malkov2, Christopher Bowlsus3, 1Medical University of Vienna, Austria; 2Gilead Sciences. Inc., United States; 3University of California Davis, United States

**Email:** jun.xu@gilead.com

**Background and aims:** The canonical NOTCH signaling pathway is a fate-determinant factor for intrahepatic bile duct epithelium during liver organogenesis. Null mutations in the NOTCH ligand JAG1 or the
NOTCH2 receptor are associated with Alagille syndrome characterized by bile duct paucity. The ductular reaction is commonly observed in liver histology from patients with primary sclerosing cholangitis (PSC) or other cholestatic diseases, but the contribution of NOTCH signaling to abnormal bile duct proliferation driving biliary fibrosis is unknown. The aim of the study is to evaluate hepatic NOTCH signaling in patients with PSC.

**Method:** The study population comprised participants in a phase 2b, placebo-controlled trial of simtuzumab in PSC (NCT01672853). A transcriptomic analysis was performed on baseline liver biopsy samples. Fibrosis was staged according to the Ishak classification by a central pathologist. Mild fibrosis was defined by Ishak 0–2, moderate fibrosis by Ishak 3–4 and cirrhosis by Ishak 5–6. RNA-sequencing data was quantified in log2 transcripts per million (TPM). P values were derived by Kruskal-Wallis (KW) test, Wilcoxon test or Spearman correlation.

**Results:** A total of 75 PSC patients with mild (n = 42) and moderate (n = 22) fibrosis and cirrhosis (n = 11) were included with a median (IQR) expression of \( JAG1 \), the canonical ligand for NOTCH signaling, of 3.41 (2.89, 3.86), 4.25 (3.79, 4.74) and 5.28 (5.50, 5.68), respectively. \( JAG1 \) expression levels were significantly associated with fibrosis stages with the highest levels in the cirrhosis cohort (KW p <0.001) (Figure 1A). The hepatic expression of NOTCH1 was greater in the cirrhosis cohort [3.71 (3.63, 3.88)] compared to mild [3.25 (2.89, 3.86)] and moderate [3.32 (3.22, 3.50)] fibrosis cohorts (KW P = 0.0016) (Figure 1B). NOTCH2 expression levels did not differ by different fibrosis stages (KW p = 0.068). In concordance with the elevated ligand expression of \( JAG1 \)-NOTCH-responsive genes \( HEYL \) and \( HES1 \) were increased in PSC with cirrhosis cohort compared to the mild and moderate cohorts (KW p <0.05) (Figure 1 C and D). In addition, \( JAG1 \) (Wilcoxon p <0.001), \( HES1 \) (Wilcoxon p = 0.015) and \( HEYL \) (Wilcoxon p <0.001) were elevated in patients with Enhanced Liver Fibrosis (ELF) score ≥9.8. In the liver of PSC patients, \( JAG1 \) expression was positively correlated with \( SOX9 (\rho = 0.73, p < 0.001) \), which determines cholangiocyte fate during liver development and negatively correlated with newly generated hepatocyte markers (PMID: 34792289), \( ALDOB (\rho = -0.42, p < 0.001) \), \( ASGR1 (\rho = -0.38, p < 0.001) \) and \( SERPINA1 (\rho = -0.28, p = 0.014) \).

**Conclusion:** \( JAG1 \)-NOTCH signaling in PSC increases with fibrosis stages. The spatial expression pattern of \( JAG1 \) in the liver, cellular

**Figure:** (abstract: FRI-360): Associations between \( JAG1 \)-NOTCH Signaling and Ishak Fibrosis Stages in PSC
interactions, and non-invasive tests to monitor elevated NOTCH signaling in PSC patients warrant further investigation.

FRI-361
Pyroptosis plays a key role in primary biliary cholangitis of humans and mice
Linxiang Huang1, Wang Zilong1, Zheng Jiarui1, Zhicheng Liu1, Bo Feng1. 1Peking University People’s Hospital, China
Email: fengbo@pkuph.edu.cn

Background and aims: Primary biliary cholangitis (PBC) is a progressive, non-suppurative, destructive intrahepatic cholestatic disease, which is considered to be an immunological disorder with both environmental and genetical participation. Around 40% PBC patients were reported to have an incomplete response to the first-line treatment, ursodeoxycholic acid (UDCA), leading to a poor prognosis and lack efficient treatment. Pyroptosis, a newly discovered cell death pathway, characterized by gasdermin-mediated programmed necrosis, were proved to be involved in many liver diseases. However, if pyroptosis is involved in the pathogenesis of PBC remains unclear. In this study, we aim to investigate the involvement of pyroptosis in PBC patients and mice and explore the potential of pyroptotic pathway as a possible treatment target.

Method: Liver tissue samples were collected from liver biopsy of six PBC patients with no history of other liver diseases from Hepatology Department of Peking University People’s Hospital. Samples from control individuals with normal liver histology were collected from patients with no evidence of other liver diseases. Twenty female C57BL/6 mice of 4–6 months old were evenly divided into PBC group and control group. PBC mice were induced with two doses of 2-nonynoic acid (2OA-BSA) and polycytidylic acid (poly I: C) for total 12 weeks. Immunocyte type correlation analysis was performed on the GSE119600 dataset of Gene Expression Omnibus (GEO) database with whole blood samples from PBC patients (n = 90) and non-liver disease controls (n = 47). Immunohistochemistry (IHC) staining of gasdermin D (GSDMD) in liver samples of PBC patients and mice, and the expression levels of GSDMD and its classical pathway were determined in the PBC mice model.

Results: The immunocyte type correlation analysis reported that the expression of key transcription factors of M1 macrophages-NOS2, IRF5, PTGS2 were significantly higher in PBC patients than that of control group (p < 0.05, Fig. A). The expression levels of GSDMD in liver samples of PBC patients were significantly improved. Noteworthily, the IHC staining of GSDMD in the PBC liver sections showed a distribution pattern of macrophage (Fig. B). For the 2OA-induced PBC mice model, pyroptosis pathway was upregulated than control mice. Both the mRNA (p < 0.05, Fig. C) and protein levels (p < 0.05, Fig. D) of GSDMD significantly increased compared to normal controls, determined by qrt-PCR and western blotting, respectively. Besides, the qrt-PCR showed that the expression levels of all key elements of classical pyroptosis pathway (i.e., NLRP3-Caspase-1-GSDMD, Fig. C) was significantly higher than control (p < 0.05). IHC staining also revealed improved GSDMD and Caspase-1 expression in PBC mice, especially around the portal area (Fig. E).

Conclusion: Pyroptosis plays a key role in PBC patients and 2OA-BSA induced PBC mice, possibly macrophages being the most important executors. Inhibition of the pyroptosis pathway might be a potential target for the future treatment of PBC.

FRI-362
Molecular signatures of treatment response in autoimmune hepatitis
Bastian Engel1, Zhaoli Liu2,3, Finn C. Derben1, Björn Hartleben4, Geffers Robert2, Cheng-Jian Xu2,3, Elmar Jaeckel1, Richard Taubert1. 1Hannover Medical School, Gastroenterology, Hepatology and Endocrinology, Hannover, Germany, 2TWINCORE, a joint venture between the Helmholtz Centre for Infection Research (HZI) and Hannover Medical School (MHH), Hannover, Germany, 3Centre for Individualised Infection Medicine (CiIM), a joint venture between the Helmholtz Centre for Infection Research (HZI) and Hannover Medical School (MHH), Hannover, Germany, 4Hannover Medical School, Gastroenterology, Hepatology and Endocrinology, Hannover, Germany.

Figure: (abstract: FRI-361): Figure A. immunocyte type correlation analysis. Figure B. Representative immunohistochemistry stained sections of GSDMD in liver tissues of PBC patients and control. Figure C. Hepatic mRNA levels of NLRP3-Caspase-1-GSDMD pathway. Figure D. Hepatic protein expression of GSDMD. Figure E. Representative immunohistochemistry stained sections of GSDMD and Caspase-1 in WT and PBC mice model. *p < 0.05, **p < 0.01, ***p < 0.001.
Background and aims: Autoimmune hepatitis (AIH) is a chronic inflammatory liver disease that needs long-term immunosuppression. Biochemical remission (BR), defined by normalisation of IgG and transaminases, is the treatment goal and is associated with a favourable clinical outcome. Recently, it was proposed by the international AIH group to report outcomes at six and twelve months. Our exploratory analysis aims to investigate different molecular signatures between patients with BR at twelve months (BR12) and incomplete response at twelve months (IR) to immunosuppressive therapy using baseline biopsies.

Method: Forty AIH patients from Hannover Medical School (Hannover, Germany) were enrolled in this study; 20 with BR12 and 20 with IR. RNA was extracted from formalin-fixed, paraffin-embedded liver tissue and was sequenced using Illumina HiSeq 6000. Bulk RNA sequencing data were processed using nCore/rnaseq pipeline. Further downstream analyses were performed using DESeq2 in R. Two samples from the IR group were excluded due to insufficient number of reads (n = 1) and sex mismatch (n = 1).

Results: Patients with BR12 had lower IgG (median 1.1 vs. 1.7 times upper limit of normal [xULN], p = 0.006) and higher AST (median 24.0 vs. 11.6 xULN, p = 0.045) but not ALT values (20.7 vs. 11.1 xULN, p = 0.133) than patients with IR. Other clinical variables did not differ, including histological inflammation (median mHAI 7 vs. 9 points, p = 1.000) and fibrosis stage (median Ishak F 1 vs. 2, p = 0.326). Top 20 principal components calculated from the gene expression were significantly correlated with group, sex, and age. Hence, we adjusted the molecular expression data for sex and age. Compared to patients with IR, patients with BR12 showed higher expression of innate immunity related genes, such as Toll like receptor 4 (TLR4), interferon gamma receptor 2 (IFNGR2), colony-stimulating factor 3 receptor (CSF3R), sialic acid binding Ig like lectin 1 (SIGLEC1), and protein tyrosine phosphatase receptor type J (PTPRJ), suggesting that pro-inflammatory pathways are more prominent in BR12. In addition, the expression of CR1 (complement receptor 1) and LIL2RB (leukocyte immunoglobulin-like receptor B2) was higher in patients with BR12. These genes are involved in regulatory T cell (Treg) formation and Treg-mediated down-regulation of the immune response. The down-regulated genes were not linked to immunological processes but enriched in the muscle function pathway.

Conclusion: BR12 was associated with pro-inflammatory pathways of innate immunity and with genes related to Treg differentiation. SIGLEC1-positive macrophages are involved in the regulation of immune homeostasis in multiple autoimmune diseases, and low CR1 is associated with poorer prognosis in systemic lupus erythematosus.

Overall, our study confirms the notion that patients with more severe disease respond better or faster to treatment.
Conclusion: PBC patients with reduced transplant free survival scores had diminished innate and adaptive effector lymphocyte subsets and activated proinflammatory cytokine pathways. The decreased effector NK, CD4 and CD8 T-cells may reflect a degree of immune deficiency but the cause of loss is unknown. Further study of regulatory T cell function regarding IL-12 modulation of down-stream interferon-gamma pathways will be required to link lymphopenia and proinflammatory cytokine production with progressive liver disease.

FRI-364

The role of bile salts in cholestasis associated pruritus

Frank Wolters¹, Dagmar Tolenaars¹, Rudi de Waart¹, Arthur Verhoeven¹, Michel van Weeghel², Stan van de Graaf³, Ulrich Beuers¹,3, Ronald Oude-Elferink¹. ¹Amsterdam University Medical Centers, University of Amsterdam, Tytgat Institute for Liver and Intestinal Research, Amsterdam, Netherlands; ²Amsterdam UMC, University of Amsterdam, Core Facility Metabolomics, Amsterdam, Netherlands, 3Amsterdam University Medical Centers, University of Amsterdam, Department of Gastroenterology and Hepatology, Amsterdam, Netherlands

Email: fwolters@amsterdamumc.nl

Background and aims: Although it has repeatedly been reported that there is no good correlation between circulating bile salt levels and itch scores, the present dogma in the field remains that bile salts may act as pruritogens in cholestasis. The present treatment modalities of cholestatic pruritus, a major and poorly understood symptom, lack efficacy and would benefit greatly from a molecular rationale. At this moment, the effect of inhibiting MRGPRX4 in cholestatic patients with itch is studied in a clinical trial after the group of Meixiong et al. reported that bile salts and their conjugates activate this receptor, where deoxycholate was the most potent agonist. Our study aimed to evaluate bile salts as agonists of known pruriceptors (TRPA1, TRPV1, TRPV3, TRPV4, MRGPRX4) at (patho)physiological concentrations.

Method: Unconjugated and conjugated bile salts were tested for pruriceptor activation (intracellular free Ca²⁺ assays) on transduced HEK293T-rTTA3 cells (with and without the various receptor cDNAs). These assays were all done in the absence of albumin. Plasma concentrations were determined in 45 cholestatic patient samples and in 15 healthy controls by means of HPLC-MS.

Results: Most conjugated bile salts correlated with pruritus. Unconjugated bile salts did not, were not significantly elevated compared to controls, but were much more potent agonists to itch

Figure: (abstract: FRI-363).
receptors than their conjugated forms. The order of sensitivity to bile salts was TRPA1 > MRGPRX4 > TRPV3 > TRPV4 > TRPV1. Activation of all receptors only occurred in supra-pathophysiological levels. When incubations were done in the presence of 4.5% albumin (physiological plasma concentration) activation was virtually completely abrogated.

Conclusion: Although most conjugated bile salts correlate with cholestatic pruritus, they do not activate itch receptors at pathophysiological concentrations. Given the extensive binding to albumin, it is highly unlikely that bile salts produce significant activation of this set of pruriceptors. In vitro evidence for bile salts as a pruritogens is therefore still lacking.

FRI-365
Spatial transcriptomics reveals shared gene and cellular composition in recurrent and primary sclerosing cholangitis
Mikal Jacob Hole 1,2,3, Kristian Holm 1,2,3, Jonas Øgaard 1,3, Peder Rustøen Braadland 1,2,3, Espen Melum 1,2,3,4,5, Johannes R. Hov 1,2,3,4, Brian K. Chung 1,3. 1Research Institute of Internal Medicine, Oslo University Hospital, Rikshospitalet, Oslo, Norway; 2Institute of Clinical Medicine, University of Oslo, Oslo, Norway; 3Oslo University Hospital and University of Oslo, Norwegian PSC Research Center, Department of Transplantation Medicine, Norway; 4Section of Gastroenterology, Department of Transplantation Medicine, Division of Surgery, Inflammatory Diseases and Transplantation, Oslo University Hospital, Rikshospitalet, Norway, Norway; 5Hybrid Technology Hub–Centre of Excellence, Institute of Basic Medical Sciences, Faculty of Medicine, University of Oslo, Norway, Norway

Background and aims: Primary sclerosing cholangitis (PSC) is an autoimmune biliary disease with up to 30% recurrence (rPSC) following liver transplantation. Whether rPSC represents the same disease process as PSC is unclear, therefore we investigated if genes and cell types differ in rPSC liver explants compared to PSC and alcoholic liver disease (ALD).

Method: Spatial transcriptomics (Visium, 10X Genomics) was performed on snap-frozen liver explant tissue from rPSC (n = 7), PSC (n = 5) and ALD (n = 3). Sequenced transcripts were aligned and grouped using Space Ranger; k-means clustering and significant differential expression (p < 0.05, Benjamini-Hochberg corrected) of highly expressed genes (greater than one read per RNA capture spot) was analyzed in Loupe Browser (10X Genomics). Relative cell abundances were estimated using spatial transcriptomes and conditional autoregressive-based deconvolution (CARD) analysis (Figure 1). Differential cell abundances accounting for dependency of spots from the same liver sample was tested using linear mixed modeling (glmer package in R).

Results: Data-driven analysis of spatial transcriptomes from all fifteen liver samples identified two clusters that closely corresponded to histopathologically defined parenchymal and fibrotic tissue regions. Expectedly, the parenchymal cluster was enriched for known hepatocyte markers (CYP2E1, C9, CYP2A6), while genes relating to collagen deposition (COL1A2, COL4A2, COL6A1) and immune inflammation (IGKC, CD74, C7) were enriched in fibrotic regions. Gene analysis of rPSC and PSC parenchyma revealed only 51 differentially regulated genes whereas 226/277 (82%) genes were detected at similar levels. By contrast, rPSC vs. ALD parenchyma showed 93 differentially expressed genes and 258/351 (74%) detected at similar levels, suggesting that the rPSC parenchyma was transcriptionally more similar to PSC than ALD. Differential analysis of fibrotic regions between rPSC and PSC showed 539/719 (75%) expressed at similar levels whereas rPSC vs. ALD showed similar expression of 876/993 (88%) genes. Estimated cellular composition using deconvolution of spatial transcriptomes showed similar proportions of different cell types in rPSC and PSC parenchyma. In contrast, increased mast cells (6-fold), plasma B cells (10-fold) and dendritic cells (3-fold) were seen in rPSC liver explants compared to PSC and alcoholic liver disease (ALD).

Figure: (abstract: FRI-365): Representative gene deconvolution (CARD) showing major immune cell types localize to regions of fibrosis; ILCs: innate lymphoid cells, pDCs: plasmacytoid dendritic cells.
Conclusion: We find that the liver parenchymal transcriptome and cellular composition in rPSC appears to more closely resemble PSC than ALD. Although this aligns with the presumed shared etiology between rPSC and PSC, the findings from fibrotic areas were more ambiguous. Nevertheless, our study underscores the potential utility of spatial analyses in delineating molecular features and potential targets in liver diseases and prompts replication in larger cohorts.

FRI-366
Cytotoxic activity of peripheral NK cells is decreased in primary sclerosing cholangitis
Jessica Wolf¹, Leona Dold¹, Sandra Kalthoff¹, Taotao Zhou¹, Pia Esser¹, Philipp Lutz¹, Christian Strassburg¹, Ulrich Spengler¹, Bettina Langhans¹.¹University Hospital Bonn, Department of Internal Medicine I, Germany
Email: Leona.Dold@ukbonn.de

Background and aims: Primary sclerosing cholangitis (PSC) is a chronic inflammatory liver disease associated with progressive obliterator fibrosis of intra- and extrahepatic bile ducts which can lead to biliary cirrhosis and bile duct cancer. Although the cause of this disease is still unclear, it has been proposed that microbial triggers may lead to altered immune cell activation. Since natural killer (NK) cells regulate immune response and can kill altered cells, they are potential key features in autoimmune disorders. Here, we analysed frequency and cytotoxicity of peripheral NK cell subsets in PSC.

Method: We enrolled 12 patients with PSC (8 with inflammatory bowel disease (IBD), 4 without IBD), 15 patients with autoimmune hepatitis (AIH; all budesonide-treated) as disease control, and 12 age- and sex-matched healthy controls. Using multi-colour flow cytometry, we analysed frequencies of CD56 high and CD56 dim NK cell subsets ex vivo and studied their cytotoxic activity (CD107a assay) at baseline and after in vitro stimulation with K562 target cells and Toll-like receptor ligands (LPS, Pam 3Cys).

Results: Frequencies of NK cells subsets did not differ between PSC (7.1% CD56 high, 88.8% CD56 dim) and healthy controls (6.5% CD56 high, 90.5% CD56 dim) whereas a shift towards CD56 high was found in AIH (22.7% CD56 high, 74.6% CD56 dim). Unlike AIH, fractions of CD107a+ NK cells with cytotoxic activity in PSC were substantially reduced both in CD56 high (Table 1A) and CD56 dim (Table 1B) NK cell subsets at baseline and after in vitro stimulation (K562 cells). Importantly, added TLR ligands LPS and Pam3Cys as well as their combination with K562 cells did not increase CD107a+ NK cells (Table 1A, 1B).

Conclusion: The frequency of NK cells was not altered in PSC. However, a substantially reduced cytotoxic activity was found in CD56 high and CD56 dim NK cell subsets which was not overcome by stimulation with tumour cells or TLR ligands. This deficit in NK cell cytotoxic activity may play a role in PSC-related inflammation.

FRI-367
The effect of the combination of metformin with propionic acid on the indicators of oxidative stress in liver tissue of rats with type 2 diabetes mellitus
Olena Khokhliuk¹, Nataliia Shulha², Yuliia Klys³, Yulia Osadchuk³, Larysa Natrus³.¹Bogomolets National Medical University, Medical Faculty №2, Kyiv, Ukraine; ²Bogomolets National Medical University, Medical Faculty №4, Kyiv, Ukraine; ³Bogomolets National Medical University, Department of Modern Technologies of Medical Diagnostics and Treatment, Kyiv, Ukraine
Email: natalishulha.ua@gmail.com

Background and aims: The main mechanism of type 2 diabetes mellitus (T2DM) contributing to liver damage is the activation of oxidative stress (OS), accompanied by excessive formation of reactive oxygen species in the mitochondria and depletion of the antioxidant defense system. Therefore, the aim was to investigate the effect of combined administration of metformin with propionic acid (PA) on the degree of oxidative damage in liver of rats with an experimental model of T2DM.

Method: Male Wistar rats were divided: (1) control, (2) T2DM, the group with experimentally induced T2DM by high-fat diet (HFD) for 3 months followed by a single injection of streptozotocin (STZ, 25 mg/kg); and T2DM groups that received the following (14 days, orally): (3) metformin (60 mg/kg), (4) PA (60 mg/kg), and (5) PA + metformin. The rate of generation of superoxide radicals (SR) by mitochondria in liver tissue samples was studied by electron paramagnetic resonance, by spectrophotometer were analyzed 8-oxoguanine, gas-liquid chromatography studies the composition of fatty acids (FAs). We have identified the nine most informative fatty acids (denoted as 100%), and calculated relative combination of saturated fatty acids (SFA), unsaturated fatty acids (USFA); and polyunsaturated fatty acids (PUFA).
(PUFA). Statistical differences between groups were evaluated by ANOVA followed by Tukey post-hoc test.

**Results:** The effect of the combined administration of metformin with propionate on the indicators of OS was evaluated by the study of liver tissue.

SR in the liver tissue on the background of diabetes was increased by 3 times compared to the control group ($p < 0.01$). The introduction of metformin and PA led to a decrease of SR by 25% ($p < 0.01$), the use of combined treatment contributed to a decrease in the generation of SR by 36.5% in liver tissue ($p < 0.01$). The level of 8-oxoguanine in T2DM exceeded its content in the control group by 2.3 times ($p < 0.01$). The use of metformin, PA and simultaneous use of these drugs led to a decrease in this indicator by 27.1%, 16.9% and 31.7%, respectively ($p < 0.01$). The modeling of T2DM led to significant changes in the content
of fatty acids in the tissues of experimental animals compared to intact animals: a 1.3-fold increase in EPA (p < 0.05), due to a 1.3-fold decrease in USFA (p < 0.05), and a 1.8-fold decrease in PUFA (p < 0.05). Combined administration of metformin and propionate to rats with T2DM leads to changes in the redistribution of fatty acids. It increases the content of USFA and PUFA to 43.78 ± 2.4% and 32.02 ± 3.8% and decreases the content of EPA to 56.22 ± 2.9%.

Conclusion: Our study demonstrated that PA and its combination with metformin have beneficial effects on the indicators of OS in liver tissue of rats with T2DM. In our opinion, PA may be considered one of the promising substances for correcting damages of hepatocytes diabetic.

FRI-368

Associations of fecal bile acids, diet, and intestinal microbes with markers of disease progression in primary sclerosing cholangitis disease

Connie Chan1, Mateus Lemos2, Peter Finnegan3, William Gagnon4, Richard Dean1, Joseph Zepeda1, Maryam Yazdanfar1, Marie-Claude Vohl5, Joshua Korsenik6, Olivier Barbier3, Maria Marco2, Christopher Bowлуш1, 1University of California Davis, Gastroenterology and Hepatology, United States; 2UC Davis, Food Science and Technology, United States; 3Université Laval, CHU de Québec Research Center, Canada; 4Université Laval, NUTRIS, Canada; 5Brigham and Women’s Hospital, Gastroenterology, United States

Email: clbowlush@ucdavis.edu

Background and aims: Primary Sclerosing Cholangitis (PSC) disease progression is variable and associated with changes in bile acids (BA) and intestinal dysbiosis. The objective of this study was to elucidate relationships between diet, intestinal microbes, and fecal bile acids with markers of PSC progression.

Method: Stool and blood was collected from patients with early-stage, large duct PSC for measurements of bile acids (BA; LC-MS/MS) and fecal 16S rRNA DNA sequencing. Dietary intake of alcohol, fats, protein, and fiber was estimated from food frequency questionnaires. Healthy controls (HC) included individuals who had participated in a diet supplement clinical trial and had received placebo.

Results: A total of 25 patients with PSC (58.3% male, 70.8% with IBD) with a median [IQR] age 53.8 [43.2–65.4] years, alkaline phosphatase 174.5 [109.5–359.5] IU, and total bilirubin (TB) 17.1 [12.0–20.5] micromol/L, and 10 HC were enrolled. Unconjugated fecal BA (fDCA) was lower in PSC than HC (p < 0.05). No differences in other fecal BA were found. Among patients with PSC, fDCA, but no other BA, was negatively associated with TB after adjusting for IBD status and UDCA use (B = −0.45, p = 0.006). No fecal BA were associated with serum alkaline phosphatase. Surprisingly, fDCA was associated with greater serum C4 (B = 4.5, p = 0.02). Serum FGF19 was not associated with fDCA or C4. Alcohol intake, but not intake of fats, protein, or fiber, was associated with higher fDCA levels (B = 423.6, p = 0.04) and lower serum bilirubin (B = −0.07, p <0.001). Microbiota analysis revealed correlations between fDCA and increasing abundance of Blautia and Lachnoclostridium (r = 0.62, p = 0.001 and r = 0.46, p = 0.02, respectively) and decreasing Streptococcus (r = −0.42, p = 0.04) (Figure 1).

Conclusion: In early-stage PSC, decreasing fDCA was associated with increasing TB but did not appear to be mediated through FXR. fDCA was associated with alcohol use and microbes involved in bile acid transformation which may lead to new avenues for treatment.

FRI-369

CD44 reduces fibrosis development in chronic cholestatic liver injury in Mdr2 knock-out mice

Franziska Ihli1, Fabian Delugré1, Sophia Bernatik1, Kühnke-Etzel Brigit1, Carolin Mogler1, Simone Jörs1, Fabian Geisler1, Roland M. Schmid1, Ursula Ehmer1, 1Klinikum rechts der Isar, Technische Universität München, Internal Medicine II, Munich, Germany; 2Technische Universität München, Institute of Pathology and Unit of Comparative Experimental Pathology, Germany

Email: ursula.ehmer@tum.de

Background and aims: In cholestatic liver injury, chronic inflammation is associated with the emergence of ductular reactions around the portal triad. In different animal models of liver injury, the expression of the cellular adhesion molecule CD44 in biliary epithelial cells/ductular reactions has been linked to fibrosis. However, the functional relevance of CD44 in the development of fibrosis remains unclear. To determine whether CD44 could present a potential target to reduce fibrosis in chronic cholestatic liver injury, we investigated the functional role of CD44 in Mdr2−/− mice.

Method: Livers of Mdr2−/−:Cd44−/− double knock-out (DKO) mice and age-matched Mdr2−/− control mice were analyzed at different time points by histopathology. Protein expression of Ki67, CK19 and YAP was quantified by immunohistochemistry.

Results: At 6 months of age, ductular reactions in Cd44-deficient Mdr2−/− mice were more prominent than in control mice but comprised a significantly lower number of CK19-positive biliary cells per area. Importantly, DKO livers showed higher levels of fibrosis in comparison to Cd44-proficient controls. By immunohistochemistry, cells in the perportal areas of DKO mice expressed lower levels of YAP-a CD44 downstream target-in comparison to control mice (56% vs. 68%, p = 0.023).

Conclusion: In the Mdr2−/− model of chronic cholestatic liver injury, CD44 protects against fibrosis development. While previous reports suggested that CD44 could contribute to liver fibrosis, our data indicate that CD44 instead has a protective role in chronic cholestatic liver injury. Here, we were able to show that loss of CD44 leads to a lower expression of YAP in ductular reactions as a potential mediator of this phenotype. YAP is a pro-proliferative transcriptional co-factor that is expressed biliary epithelial cells and contributes to their differentiation. In the Mdr2−/− model, loss of CD44 and reduced levels of YAP translate into lower levels of CK19-expressing cells-indicating that these cells might be essential in mitigating liver damage and consecutive liver fibrosis upon chronic cholestatic liver injury.

FRI-370

Results of pharmacological treatment of Mcpip1 knock-out mice which develop symptoms of primary biliary cholangitis

Katarzyna Trzos1,2, Natalia Pydyn1, Joanna Koziel3, MagdaLena Piłarczyk-Zurek1, Jolanta Jura1, Jerzy Kotlinowski1, 1Jagiellonian University, Faculty of Biochemistry, Biophysics and Biotechnology, Department of General Biochemistry, Kraków, Poland; 2Jagiellonian University, Doctoral School of Exact and Natural Sciences, Faculty of Biochemistry, Biophysics and Biotechnology, Department of General Biochemistry, Kraków, Poland, 3Jagiellonian University, Faculty of Biochemistry, Biophysics and Biotechnology, Department of Microbiology, Kraków, Poland

Email: kat.trzos@doctoral.uj.edu.pl

Background and aims: Primary biliary cholangitis (PBC) is a chronic autoimmune liver disease that results from slow, progressive destruction of the intrahepatic bile ducts. PBC progression leads to the development of fibrosis, cholestasis, liver cirrhosis. Mcpip1H/FlAlbCre mice which are characterized by deletion of the Zc3h12a gene (encoding Mcpip1 protein) in liver epithelial cells and develop a number of typical PBC symptoms, such as presence of antimitochondrial (AMA) and antinuclear antibodies, total bile acids elevated, increased activity and alkaline phosphatase. Mcpip1H/FlAlbCre mice are also characterised by biliary duct pathology which includes...
hyperplasia of the intrahepatic bile ducts, bile duct epithelium disruption and fibrosis, resulting in lumen obstruction and bile duct destruction. The main goal of this project is to define the dynamics of PBC-like disease development in those mice after administration of first- and second-line therapy commonly used in patients suffering with PBC. The study was enriched with the use of a probiotic (Lactobacillus rhamnosus), since there is a growing number of evidence of a huge role that gut microbiota plays in PBC development and progression.

**Method:** Mcpip1fl/flAlbCre knock-out male mice and Mcpip1fl/fl control male mice at 6 weeks of age were randomly divided into five groups for drug treatment. Control group received corn oil, other groups received consecutively Lakcid (L. rhamnosus, 10^9 CFU per day) suspended in water, ursodeoxycholic acid (UDCA, 15 mg/kg body mass per day) diluted in corn oil, UDCA diluted in corn oil and Lakcid suspended in water, UDCA and obeticholic acid (OCA, 10 mg/kg body mass per day) both diluted in corn oil. After 6 weeks of treatment, the mice were sacrificed, and the collected material analysed by, amongst other, detailed serum liver tests, ELISA tests for the presence of anti-PDC-E2 autoantibodies, histological stainings (hematoxylin and eosin, picro Sirius red) and qPCRs.

**Results:** After 6-weeks of treatment we detected significant proliferation of cholangiocytes and fibrosis in livers from Mcpip1 knock-out mice, together with high serum level of total IgM, total bile acids and anti-PDC-E2 autoantibodies. Livers isolated from Mcpip1 knock-out mice were also characterised by high expression of Tgfβ1, Il1b, Ngp and Ngf. There were no changes in serum levels of ALT, AST, bilirubin, cholesterol and LDH between Mcpip1fl/fl and Mcpip1flflAlbCre mice. Mcpip1fl/flAlbCre treated with Lakcid had reduced amount of total bile acids in the serum and decreased proliferation of cholangiocytes. Additionally, they had reduced amount of PDC-E2 autoantibodies to the level observed in Mcpip1fl/fl counterparts. Although Lakcid administration did not ameliorate liver fibrosis, mice from this group were chosen for further multiomic analysis of liver (nex generation sequencing, mass spectrometry) that are currently ongoing. Treatment with UDCA or with UDCA+OCA also reduced serum levels of TBA in Mcpip1fl/flAlbCre mice but had no effect on cholangiocytes’ proliferation nor gene expression in the livers.

**Conclusion:** Treatment of Mcpip1fl/flAlbCre mice with Lakcid had beneficial effects on PBC symptoms that are normally observed in these animals. We hope that analysis of Mcpip1fl/flAlbCre may shed a new light on the pathology of PBC development.

**Acknowledgments:** This study was supported by scientific grant awarded by Polpharma Scientific Foundation to dr Jerzy Kotlinskiow.

**FRI-371**

The role of Type II and III Interferons in primary biliary cholangitis

Yooyn Chung1,2,3, Phoebe Tson2,3,4, Michael Heneghan1,2, Antonio Riva2,4,5, Shilpa Chokshi2,4,5, *Institute of Liver Studies, King’s College Hospital, London, United Kingdom; 2Faculty of Life Sciences and Medicine, King’s College London, London, United Kingdom; 3Joint First Authors, United Kingdom; 4The Roger Williams Institute of Hepatology, Foundation for Liver Research, London, United Kingdom; 5Joint Senior Authors, United Kingdom

Email: a.riva@researchinliver.org.uk

**Background and aims:** Primary biliary cholangitis (PBC) has a variable disease course with limited treatment options. There is a need for targeted therapeutic agents and prognostic biomarkers which would allow personalised risk stratification and management. Type I interferons (IFNs) have shown to play a role in murine PBC; however, little is known regarding their involvement and the role of type II/III IFNs in PBC patients. The aim of this investigation was to explore the involvement of IFNs in PBC.

**Method:** Plasma samples from 64 PBC patients between 2012 and 2022 were compared to 10 healthy controls (HC). PBC subgroups were 24 ursodeoxycholic acid (UDC) responders (UDCR) according to the Paris criteria, 18 UDC non-responders (UDCNR), 22 end stage PBC prior to liver transplantation (ESPBC). Luminex multiplex ELISA was used to quantify concentrations of 28 pro/anti-inflammatory cytokines including Type II and III IFNs and D-lactate was also measured.

**Results:** The majority of PBC patients were female (n = 62, 97%) with a mean age of 55 years. UDCR and UDCNR were mostly non-cirrhotic patients with 4 early cirrhotic patients in UDCR and 5 in UDCNR. ESPBC represented a distinct group with significantly higher liver prognostic scores compared to UDCR and UDCNR. All PBC subgroups had upregulation of CCL2, IL-7 and IL-8 compared to HC. IFN-gamma levels became progressively detectable as disease progressed to UDCNR and ESPBC (Chi-sq p = 0.007). IFN-gamma levels were not significantly different between UDCR and HC. However, the IFN-gamma levels became increasingly upregulated in UDCNR (p = 0.0262) and ESPBC (p = 0.0012) when compared to UDCR. The difference in IFN-gamma levels between UDCR and UDCNR was also maintained on excluding cirrhotic patients (p = 0.0056). In ESPBC, elevated IFN-gamma was accompanied by increased CXCL10. ESPBC expressed several predominantly pro-inflammatory cytokines including IL-6 and TNF-alpha compared to HC. Interestingly, IFN-lambda3, but not IFN-lambda2, was elevated in ESPBC when compared to all other subgroups, hinting at differential gut mucosal involvement. Using D-lactate, as an established marker of bacterial translocation, we found levels were equally elevated in all PBC subgroups compared to HC.

**Conclusion:** Type II and Type III Interferons are associated with PBC. IFN-gamma increased as disease progressed suggesting contributions from NK and/or T cells in the immunopathogenesis and may serve as a potential biomarker. IFN-lambda3 may have a role in advanced disease that is distinct to IFN-lambda2 and warrants further exploration. The increased gut permeability and bacterial translocation in PBC may indicate the gut microbiome as a potential therapeutic target.
Liver development and regeneration

SAT-353
Liver innervation is dysregulated in a mouse model of Alagille syndrome
Elisabeth Verboven1, Noémi K. M. Van Hul1, Simona Hankeova1, Csaba Ador1, Ewa Ellis1, Björn Fischler1, Emma Andersson1.
1 Karolinska Institute, Stockholm, Sweden

Background and aims: The liver is richly innervated, which is often overlooked despite the key roles of nerves in liver function. Liver innervation is enriched in the periportal area, where both mesenchyme and bile ducts are extensively innervated. In Alagille syndrome (ALGS), caused by mutations in Notch components, bile ducts do not develop properly, with severe consequences for liver function. Although Notch is well known for its role in development of the nervous system, it is not yet known whether liver innervation is affected in ALGS, and whether disturbed innervation might further aggravate liver function. The aim of this study is to determine how liver innervation interacts with and regulates bile duct development and homeostasis.

Method: I performed whole mount immuno-stainings for cholangiocytes and nerves in livers from wild-type and Jag1Ndr/Ndr mice (a model of ALGS). To test the function of liver innervation, wild-type mice were treated with the dopaminergic and noradrenergic neurotoxin 6-hydroxydopamine for nerve depletion. Lightsheet microscopy allowed visualization of the three-dimensional neural and biliary expansion throughout the liver, with analysis using Imaris software. Patient liver biopsies were analyzed with immunofluorescence to validate observations in humans.

Results: Preliminary timecourse data of the developing liver confirmed that innervation is first established in the hilar region of the liver, followed by outgrowth of the nerves into the periphery from postnatal day 6 (P6) on. In Jag1Ndr/Ndr livers, innervation was strongly reduced and mislocalized during development. The absence of liver nerves is physiologically relevant for patients with Alagille syndrome, and is not an indirect consequence of cholestasis, as we confirmed loss of innervation in biopsies from patients with ALGS, but not in progressive familial intrahepatic cholestasis (PFIC). Ablation of peripheral nerves in wild-type mice at P1 by injection of a neurotoxin did not compromise bile duct development.

Conclusion: We show that in addition to bile duct development, liver innervation is also impaired in ALGS. We developed and validated a method for postnatal denervation, showing that liver nerves are not required for bile duct development at this postnatal stage. The physiological consequences of dysregulated innervation in ALGS will be further investigated to identify how denervation impacts this cholangiopathy. Further research is ongoing to also investigate how bile ducts and nerves interact during development and to define the regulatory mechanisms that each exerts on the other.

SAT-354
A novel organoid model of human liver bud development
Charlotte Grey-Wilson1, Sabitri Ghimire1, Ludovic Vallier1,2,3, Anna Osnato1, Carola Maria Morell1, University of Cambridge, United Kingdom;2 Berlin Institute of Health (BIH), BIH Centre for Regenerative Therapies (BCRT), Charité-Universitätsmedizin, Berlin, Germany; 3 Max-Planck-Institut für molekulare Genetik, Berlin, Germany
Email: cg697@cam.ac.uk

Background and aims: Understanding the mechanisms controlling the development of human liver is challenging due to technical and ethical limitations. Of particular interest, the process by which the human liver bud first arises from the foregut and the subsequent specification of the hepatoblasts, remains to be fully uncovered. To address these major questions, we decided to develop a novel 3D culture system allowing the differentiation on human induced Pluripotent Stem Cells (hiPSCs) into self-organising human liver buds.

Method: To generate a new model of liver bud development, we first tested popular foregut induction conditions across different hiPSC systems to develop and optimise a new protocol for the generation of hepatoblast and hepatocytes in vitro. This novel system uses a foregut induction step which has not been previously described in the context of liver development in vitro. Following 2–3 weeks of hepatic induction, cells are then dissociated into clumps and seeded in Matrigel to form liver bud organoids in conditions previously used to maintain primary hepatoblast organoids (pHBOs). When passaged sequentially, organoids persist as iHBOs which can be passaged similar to pHBOs. iHBOs were then tested for their ability to differentiate into hepatocytes and cholangiocytes.

Results: We first developed and optimised a protocol to drive differentiation of hiPSCs into a population of progenitor (s) for pancreas, liver and extra-hepatic biliary cells. The resulting cells were then grown in 3D culture conditions known to support organoid formation. These cells rapidly self-organise into complex budding structures which appear to recapitulate the initial organogenesis of the liver bud in vitro. This includes the formation of a “bud” consisting of cell expressing HNF4A/ALB/AFP, extra-hepatic biliary cells expressing CK19 and also potential pancreato-biliary progenitors marked by PDX1. Thus, these organoids are composed of multiple cell types produced during the early hepatobiliary specification from the foregut. Finally, we decided to demonstrate the functional relevance of this 3D structure by deriving HBOs from in vitro generated liver bud. For that, liver bud organoids underwent serial passaging. We rapidly observed the formation of self-renewing organoids containing homogeneous population of cells expressing hepatoblast markers. These human iHBO were able to self-renew for an additional 8 passages while maintaining their morphological characteristics and initial results also suggest iHBO have a capacity to differentiate into cholangiocytes and hepatocytes.
Ahcre Mdm2fl/fl mice, where genetic induction results in excision of hepatocytes in recipient liver. Hepatocyte senescence is a key feature of severe liver injury. One reason for this is poor function of donor hepatocytes, which promise for genetic diseases but has mixed efficacy for acute and chronic conditions. Hepatocyte transplantation has shown promise in clinical trials, but further studies are needed to understand the mechanisms of hepatocyte senescence and their impact on liver regeneration.

**SAT-356**
Liver regeneration is regulated by intestinal sirtuin-1

Sian Seaman1, Mar Moreno-Gonzalez1, Mark Philo2, Naiara Beraza1, 1Quadram Institute, Gut Microbes and Health Institute Strategic Programme, Norwich, United Kingdom; 2Quadram Institute, Analytical Science Unit, Norwich, United Kingdom

**Background and aims:** Sirtuin1 (SIRT1) is recognised as a master regulator of bile acid (BA) metabolism in both the liver and the intestine. The role of intestinal SIRT1 in liver regeneration remains undefined.

**Method:** We performed partial hepatectomy (PHx) on intestinal-specific SIRT1 knockout mice to stimulate liver regeneration. Samples were collected at intervals post-PHx and analysed via quantitative polymerase chain reaction (qPCR) to determine gene expression, immunoblots and immunohistochemistry (IHC) to determine protein expression and liquid chromatography-mass spectrometry (LC-MS) to characterize the bile acid pool in both the liver and intestine.

**Results:** Liver weight: body weight ratio in SIRT1int-KO mice was comparable to that found in wildtype (WT) mice at 10 days post-PHx. However, SIRT1int-KO mice exhibited profound liver injury at 24 hrs post-PHx, which was associated with BA accumulation, suggesting increased hepatocellular death due to BA toxicity. Additionally, SIRT1int-KO mice presented signs of impaired hepatocyte proliferation through decreased expression of cell cycle proteins, cyclin D1 and delayed expression of cyclin E and A compared to WT mice. Further IHC analysis showed that SIRT1int-KO mice exhibited increased liver injury at 10 days post-PHx compared to WT mice. However, SIRT1int-KO mice exhibited increased BA excretion and decreased BA uptake.

**Conclusion:** Our study provides evidence that intestinal SIRT1 is a key regulator of liver regeneration, influencing BA metabolism and hepatocyte proliferation. Further studies are needed to understand the mechanisms underlying the role of intestinal SIRT1 in liver regeneration.
SAT-357
IGF1 specifically rescues peripheral intrahepatic biliary organoids from a mouse model of Alagille syndrome
Afshan Iqbal1, Noémi K. M. Van Hul1, Lenka Belcova1, Agustin Corbat1, Simona Hankeova2, Emma Andersson1, Karolinska Institute, Cell and Molecular Biology, Solna, Sweden; 2Genentech, South San Francisco, United States
Email: afshan.iqbal@ki.se

Background and aims: Patients with Alagille syndrome (ALGS) display peripheral intrahepatic bile duct paucity. Intriguingly, some patients and the Jag1Ndr/Ndr mouse model for ALGS can de novo generate their biliary system. We have shown that this occurs via distinct architectural mechanisms in the hilum and periphery. IGF1, a trophic factor for biliary cells, is downregulated in patients and Jag1Ndr/Ndr mice, making it an interesting possible therapeutic target for ALGS. Here, we investigated hilar and peripheral bile ducts from Jag1Ndr/Ndr mice, after recovery, to address biliary heterogeneity and mechanisms of recovery, and investigate potential therapeutic approaches.

Method: To investigate molecular differences in hilar and peripheral bile ducts, intrahepatic cholangiocyte organoids (ICOs) were derived from hilar and peripheral regions of adult Jag1+/+ and Jag1Ndr/Ndr mouse livers (hICOs, and pICOs respectively, 3 cell lines from each region and genotype, 12 total). Region-specific ICOs were analyzed using RNA sequencing, live imaging, proliferation analysis (EdU assay), live/dead staining (CalceinAM/PI) and immunofluorescence. Organoids were treated with IGF1 to test whether this positively modulates organoid growth or survival.

Results: Jag1Ndr/Ndr hICOs and pICOs were functionally and molecularly distinct from one another and from corresponding Jag1+/+ ICOs. Jag1Ndr/Ndr hICOs were significantly (p < 0.0036) smaller than Jag1+/+ hICOs and Jag1Ndr/Ndr pICOs (p < 0.0020). Both Jag1Ndr/Ndr hICOs and pICOs were far less (p < 0.0001) proliferative than corresponding Jag1+/+ ICOs. Bulk RNA sequencing analysis of regional ICOs revealed downregulated cell cycle-associated genes in Jag1Ndr/Ndr ICOs corroborating decreased proliferation. IGF1 treatment of regional ICOs specifically rescued survival and growth of Jag1Ndr/Ndr pICOs (p < 0.0464), while hICOs were not significantly affected. RNA sequencing analysis revealed that Jag1Ndr/Ndr hICOs were the most divergent ICOs and enrichment analysis demonstrated expression of a hepatocyte signature with activated IGF1 signaling pathway components. Finally, Notch components Jag2 and Nrarp were specifically downregulated in Jag1Ndr/Ndr hICOs.

Conclusion: Jag1Ndr/Ndr hilar and peripheral ICOs are molecularly distinct from one another and from corresponding Jag1+/+ ICOs. Jag1Ndr/Ndr ICOs are growth-impaired, but cell cycle can be rescued in pICOs by IGF1. IGF1 furthermore improves survival of Jag1Ndr/Ndr pICOs and is thus a potential therapeutic target for ALGS. Hilar Jag1Ndr/Ndr ICOs are Notch-off and express a hepatocyte-like signature, associated with active Igf1 production/signaling, and are less benefitted by IGF1 treatment.

SAT-358
Endothelial autophagy is not required for liver regeneration after partial hepatectomy in mice with fatty liver
Adel Hammoutene1,2, Marion Tanguy1,2, Mélanie Calmels1, Riccardo Pravisani1, Chantal Boulanger1, Valérie Paradis2,4, Hélène Gilgenkrantz2, Pierre-Emmanuel Rautou1,2,3, 1Université Paris Cité, PARCC, INSERM, F-75015 Paris, Paris, France; 2Université Paris-Cité, INSERM, Centre de recherche sur l'Inflammation, UMR 1149, Paris, France, France; 3Service de chirurgie hépatobiliaire et pancréatique, Hôpital Beaujon, AP-HP, Clichy, France, France; 4Service d’Anatomie Pathologique, Hôpital Beaujon, Assistance Publique-Hôpitaux de Paris, Clichy, France, France; 5Service d’Hépatologie, AP-HP, Hôpital Beaujon, DMU DIGEST, Centre de Référence des Maladies Vasculaires du Foie, FILJOIE, ERN RARE-LIVER, Clichy, France, France
Email: amsadel@hotmail.com

Background and aims: Patients with metabolic associated fatty liver disease (MAFLD) have impaired liver regeneration following liver resection. Liver endothelial cells play a key role in liver regeneration. Autophagy is a cellular conserved process involved in the degradation of dysfunctional material. In non-alcoholic steatohepatitis (NASH), liver endothelial cells display a defect in autophagy, thus contributing to NASH progression. We aimed in this study to determine the role of endothelial autophagy in liver regeneration following liver resection in MAFLD.

Method: We analyzed the effect of the defect in endothelial autophagy on liver regeneration by using mice deficient in endothelial autophagy (Atg5lox/lox-VECadherinCre+; n = 13) and littermate controls (Atg5lox/lox, n = 15) mice, fed a high fat diet (HFD) for 16 weeks. Mice were subjected to 2/3 partial hepatectomy (removal of 70% of liver parenchyma) and liver regeneration was assessed by histology and western blot at two time points (40 and 48 hours after liver resection). We confirmed our finding using two other models of MAFLD.

Results: At the two time points of the liver regeneration process (40 and 48 hours), deficiency in endothelial autophagy had no impact on liver/body weight ratio, plasma AST, ALT and albumin concentration. Compared to control mice, Atg5lox/lox-VECadherinCre+ mice had similar liver protein expression of proliferation markers (proliferating cell nuclear antigen, PCNA) and cell-cycle markers (Cyclin D1 for G1/S phases and BrdU incorporation for S phase; phospho-Histone H3 for G2/M phases). Deficiency in endothelial autophagy did not affect either liver apoptosis as assessed by cleaved-Caspase-3 liver protein expression. Same results were observed in two other models of MAFLD, namely a model of simple steatosis (5 mice deficient in ApoE/Atg5lox/lox-VECadherinCre+ vs. 5 ApoE/Atg5lox/lox), and model of NASH (5 Atg5lox/lox-VECadherinCre+ mice fed a methionine and choline deficient diet vs. 5 Atg5lox/lox mice fed the same diet) (data not shown).

Conclusion: Our results demonstrate that endothelial autophagy is not required for liver regeneration after partial hepatectomy in mice with fatty liver.
in NASH does not account for the impaired liver regeneration associated with MAFLD.

SAT-359
Transcriptomics confirm the establishment of a liver-immune dual-humanized mouse model after transplantation of a single type of human bone marrow mesenchymal stem cell
Suwan Sun1,2, Hui Yang1, Jiaojiao Xin1, Heng Yao1, Jing Jiang1, Dongyan Shi1, Jun Li1. 1The First Affiliated Hospital, Zhejiang University School of Medicine, State Key Laboratory for Diagnosis and Treatment of Infectious Diseases, National Clinical Research Center for Infectious Diseases, National Medical Center for Infectious Diseases, Hangzhou, China; 2The First Affiliated Hospital, Zhejiang University School of Medicine, Department of Endocrinology and Metabolic Disease, Hangzhou, China
Email: lijun2009@zju.edu.cn

Background and aims: Human bone marrow mesenchymal stem cells (hBMSCs) are important for developing a dual-humanized mouse model to clarify disease pathogenesis. We aimed to elucidate the characteristics of hBMSC transdifferentiation into liver and immune cells.

Method: A single type of hBMSCs was transplanted into immuno-deficient Fah−/− Rag2−/− IL-2Rγ−/− SCID (FRGS) mice with fulminant hepatic failure (FHF). Liver transcriptional data from the hBMSC-transplanted mice were analysed to identify transdifferentiation with traces of liver and immune chimerism.

Results: Mice with FHF were rescued by implanted hBMSCs. Human albumin/leukocyte antigen (HLA) and CD45/HLA double-positive hepatocytes and immune cells were observed in the rescued mice during the initial 3 days. The transcriptomics analysis of liver tissues from dual-humanized mice identified two transdifferentiation phases (cellular proliferation at 1–5 days and cellular differentiation/maturation at 5–14 days) and ten cell lineages transdifferentiated from hBMSCs: human hepatocytes, cholangiocytes, stellate cells, myofibroblasts, endothelial cells and immune cells (T/B/NK/IL-2Rγ/HLA double-positive). Two biological processes, hepatic metabolism and liver regeneration, were characterized in the first phase, and two additional biological processes, immune cell growth and extracellular matrix regulation, were observed in the second phase. Immunohistochemistry verified that the ten hBMSC-derived liver and immune cells were present in the livers of dual-humanized mice.

SAT-360
Skin-decellularized matrix-derived microgels accelerate 3D cultures of functional primary hepatocyte spheroids in vitro
Ashwini Vasudevan1, Shreemoyee De2, Neetu Singh2, Shiv Kumar Sarin3, Dinesh Mani Tripathi1, Savneet Kaur1. 1Institute of Liver and Biliary Sciences, Molecular and Cellular Medicine, New Delhi, India; 2Indian Institute of Technology Delhi, India; 3Institute of Liver and Biliary Sciences, India
Email: savykaur@gmail.com

Background and aims: Tissue extracellular matrix (ECM) plays a major role in providing a suitable niche for cell growth and differentiation. Skin tissue ECM is extremely dynamic with inherent properties such as enhanced wound healing and regeneration in response to tissue damage. In the current study, we explored the skin matrix vis-a-vis liver matrix for in vitro cultures of primary hepatocytes.

Method: Skin decellularized matrix (SDCM) was prepared by carefully excising dorsal skin tissues from adult rats, and tissues were decellularized with TritonX-100 and SDS. Liver decellularized matrix (LDCM) was prepared by perfusing rat livers with detergents. Tissue acellularity post-decellularization was confirmed with HE staining and DNA quantification and intact matrix components were studied by proteomic analysis using LC-MS. Rodent primary hepatocytes were isolated by collagenase perfusion method. Viable hepatocytes were mixed with digested matrices and 1% alginate, and encapsulation was performed with CaCl2 solution to form microgels containing cells. Stiffness of the cell microgels was assessed by Young’s modulus. Encapsulated hepatocytes were cultured in microgels for up to 21 days, studied by scanning electron microscopy (SEM) and their viability, gene expression and functions were assessed.

Results: Proteomic analysis of the decellularized matrices revealed 16 types of collagens predominantly Collagen I, III, IV and VI, and upregulated expression of elastin and laminin in SDCM as compared to LDCM. Microgels with the LDCM showed increased compressive stress (22.4 Pa) when compared to SDCM (20.98 Pa). SEM analysis confirmed the encapsulation of hepatocytes as 3D spheroids in the microgels. There was significant increase in viability of hepatocytes cultured on both SDCM and LDCM microgels at days 7, 15 and 21 in comparison with those on collagen. On day 21, >2-fold increase (p < 0.05) in viability was observed in hepatocytes on SDCM microgels in comparison to those on LDCM. Hepatocytes grown on SDCM microgels also showed a significant increase in the expression of hepatocyte-specific genes including Alb, ASGR1, HNF4-alpha in comparison to those cultured on LDCM microgels and collagen on both day 15 and day 21. Albumin and urea secretion in culture supernatants from hepatocytes on SDCM microgels showed a significant increase on all days (On day 21: 1.250 mg/dl albumin and 350 g/dl urea) in comparison to those on LDCM (1750 mg/dl albumin and 30 g/dl urea on day 21) and collagen (150 mg/dl albumin and 110 g/dl urea on day 21) (p < 0.05).

Conclusion: Hepatocytes cultured with the SDCM microgels grow as 3D spheroids and show significantly improved viability and functionality for 3 weeks in comparison to LDCM. SDCM thus forms a better and lucrative alternative to decellularized liver matrix for maintaining long-term cultures of hepatocytes.
Autophagy regulates the generation and differentiation of chemically derived hepatic progenitors (CdHs)

Hayoon Kim1,2, Myounghoi Kim1, Elsy Soraya Salas Silva1, Jae Hun Kim1, Jiyoon Byeon1, Michael Adisasmita1, Min Kim1, Ji Hyun Shin1, Dongho Choi1.1Research Institute of Regenerative Medicine and Stem Cells, Seoul, Korea, Rep. of South; 2Hanyang University College of Medicine, Korea, Rep. of South

Email: crane87@hanyang.ac.kr

Background and aims: Stem cell therapies have been proposed as a novel therapeutic strategy as an alternative to tissue transplantation for patients with liver diseases. To improve this, we have developed human chemically derived hepatocytes (hCdHs) that can be proliferated into hepatocytes (hCdH-Heps) and cholangiocytes in previous research. Moreover, we corroborated the successful engraftment of hCdHs in the mouse liver. However, despite its efficacy, the overall reprogramming mechanisms of CdHs during the generation and differentiation remain unclear. Autophagy, a self-degradation process, is a well-known pathway in cell reprogramming. Thus, we aimed to reveal autophagic activity throughout the whole reconstruction process of CdHs from generation to differentiation.

Method: Human and mouse primary hepatocytes (hPHs, mPHs) were cultured in reprogramming media containing HGF, A83-01, and CHIR99021 (HAC) for 7 days to generate human and mouse chemically derived hepatic progenitors (hCdHs, mCdHs). mPHs and hPHs maintained in basal media without HAC were used as a control. mCdHs were treated with bafilomycin A1 (Sigma-Aldrich, B1793) to inhibit autophagy flux. To induce differentiation of mCdHs into mCdH-Heps, cells expressed a continuously decreasing protein level of p62 and LC3BI from the early phase, which suggests that autophagy activity decreased. Lastly, hCdHs were also generated from hPHs by the HAC reprogramming medium. hCdHs showed epithelial morphology and increased gene levels of hepatic progenitor markers. Interestingly, autophagy was inhibited during generation and downregulated to the basal level during differentiation into hepatocyte-like cells in hCdHs as well as in mCdHs.

Results: mCdHs were generated from mPHs in the reprogramming medium, which contains HAC. It was primarily confirmed by observing cells expressing epithelial morphology. Also, mRNA expression of hepatic progenitor markers, such as Sox9, EpCAM, Ck19, CD90, CD44, and AFP, increased in mCdHs compared to mPHs. Furthermore, protein expression of two autophagy markers, p62 and LC3BI, was elevated while mCdHs were generated from mPHs, indicating that autophagy was suppressed. mCdHs on day 12, after the generation, expressed lower protein levels of p62 and LC3BI, which means the recovery of autophagy to the basal level. Moreover, bafilomycin A1, an autophagy inhibitor, accelerated the growth of mCdHs during the generation. However, there was no increase in the mRNA expression levels of hepatic progenitor markers except Sox9 in the presence or absence of bafilomycin A1. Also, during the differentiation of mCdHs into mCdH-Heps, cells expressed a continuously decreasing protein level of p62 and LC3BI from the early phase, which suggests that autophagy activity decreased. Lastly, hCdHs were also generated from hPHs by the HAC reprogramming medium. hCdHs showed epithelial morphology and increased gene levels of hepatic progenitor markers. Interestingly, autophagy was inhibited during generation and downregulated to the basal level during differentiation into hepatocyte-like cells in hCdHs as well as in mCdHs.

Figure: (abstract: SAT-360).
**Conclusion:** In conclusion, all these findings indicate that autophagy regulates the generation of CdHs and the differentiation of CdHs into CdH–Heps. This research was supported by the National Research Foundation of Korea (2022R1A2C2004589), and the Korean Fund for Regenerative Medicine funded by Ministry of Science and ICT, and Ministry of Health and Welfare (21A0401L1).

**SAT-362**

**Development of intrahepatic bile ducts during liver progenitor cell-driven liver regeneration is associated with epithelial cell adhesion molecule function**

**Eun Young Cho1; Tae-Young Cho2,3, Azra Memon2, Donghun Shin4, Hoon Gil Jo1.**

**School of Medicine, Iksan, Korea, Rep. of South;2Digestive Disease Research Institute, Wonkwang University, Department of Pathology, Iksan, Korea, Rep. of South;3Graduate School of Wonkwang University, Department of Biomedical Science, Iksan, Korea, Rep. of South;4McGowan Institute for Regenerative Medicine, University of Pittsburgh, Department of Developmental Biology, Pittsburgh, United States**

**Background and aims:** Epithelial cell adhesion molecule (EpCam) is a membrane glycoprotein involved in multiple functions, including cell–cell adhesion, proliferation, maintenance of undifferentiated states. During liver injury, EpCam-positive cells are associated with a population of cells within ductular reactions, thought to contain liver progenitor cells (LPCs). In this study, we aimed to analyze EpCam function, which might be involved with developing intrahepatic bile duct during LPC-driven liver regeneration.

**Method:** Using transgenic and mutant zebrafish (figure A), we examined the roles of Epcam on LPC-driven liver regeneration. These zebrafish assessed liver size; liver marker expression was analyzed by immunostaining, in situ hybridization, and quantitative PCR. Moreover, we used in vivo dye to visualize the development of intrahepatic bile ducts.

**Results:** After severe hepatocyte injury in the epcam mutants, we showed that the developing intrahepatic bile ducts were impaired, but not the regenerating liver size, indicating that LPC-driven liver regeneration proceeded; however, the maturation of intrahepatic bile ducts are impaired. Intriguingly, after BODIPY staining to visualize intrahepatic bile ducts, most of the biliary structure disconnected in the liver through (figure B–G), supporting the findings that epcam is associated with the developing intrahepatic bile duct during LPC-driven liver regeneration.

**Conclusion:** In this study, we found that rescue of vascular damage after a SFSS-setting is not sufficient to increase survival. Extravagant engagement in the cell cycle in hepatocytes was associated with decreased function of the liver remnant. We found that a large portion of the proliferative hepatocytes engaged in an EMT process through the Notch1/Hes1 pathway. Thus, we think that EMT engagement after a SFSS-setting hepatocyte compromises the balance.
between function and proliferation in the remnant, leading to organ failure.

SAT-364  
Conditioned medium from human allogeneic liver-derived progenitor cells protects against LPS-induced endothelial hyperpermeability via shingosine-1 phosphate  
Audrey Ginion1, Marine Angé1, Pauline De Berdt2, Mustapha Najimi2,3, Étienne Sokal2,3, Sandrine Hormann1. 1Pole of Cardiovascular Research, Institut de Recherche Expérimentale et Clinique, Université catholique de Louvain, Brussels, Belgium; 2Cellaïon, Mont-Saint-Guibert, Belgium; 3Laboratory of Pediatric Hepatology and Cell Therapy, Institute of Experimental and Clinical Research (IREC), Université catholique de Louvain, Brussels, Belgium  
Email: mustapha.najimi@cellaion.com

Background and aims: Stem cells are recognized as an important tool for the treatment of several disease processes and injured tissues. Intravenous administration of mesenchymal stem cells, the stromal progenitor cells found within the bone marrow, has been shown to benefit a variety of disease models, including sepsis. The underlying mechanism results from direct interaction with the vascular endothelium and/or secretion of soluble factors. Human allogeneic liver-derived progenitor cells (HALPCs), currently under clinical development for the treatment of ACLF, display unique paracrine anti-inflammatory, immunomodulatory and regenerative features. This study tested the impact of conditioned medium derived from HALPCs (CM-HALPC) on microvascular permeability, a determinant factor in the pathophysiology of sepsis. Underlying mechanisms were also investigated.

Method: Conditioned media from HAPLCs were generated and kept frozen until analysis. Human dermal microvascular endothelial cells (HDMECs) were incubated with non-conditioned medium or CM-HALPC mixed with EGM-2 MV (1:1) for 24 hours prior to treatment (HDMECs) were incubated with non-conditioned medium or CM-HALPC supplemented with an anti-inflammatory, immunomodulatory and regenerative features. This study tested the impact of conditioned medium derived from HALPCs (CM-HALPC) on microvascular permeability, a determinant factor in the pathophysiology of sepsis. Underlying mechanisms were also investigated.

Method: Conditioned media from HAPLCs were generated and kept frozen until analysis. Human dermal microvascular endothelial cells (HDMECs) were incubated with non-conditioned medium or CM-HALPC mixed with EGM-2 MV (1:1) for 24 hours prior to treatment with E. coli lipopolysaccharide (LPS 055:B5, 50 μg/ml). Functional endothelial permeability was measured by in vitro transwell assay, and quantification of cellular junctions (IEJs) in the plasma membrane was assessed by VE-Cadherin (VE-Cad) immunofluorescence.

Results: Preincubation of HDMECs with CM-HALPC preserved VE-Cadherin organization and protected endothelial barrier function against LPS injury. Since ELISA analysis revealed the presence in CM-HALPC of sphingosine-1-phosphate (S1P) and hepatocyte-growth factor (HGF), two factors known to be involved in the regulation of vascular permeability, we tested their contribution to the protective effect. Addition of a pharmacological antagonist of S1P to CM-HALPC was not affected. These results demonstrate that CM-HALPC protects against LPS-induced hyperpermeability and preserves IEJs integrity, in part via S1P. These data have implications for the potential therapeutic use of those cells also in disease conditions characterized by compromised vascular integrity.

SAT-365  
Lineage tracing of hepatic stellate cells with ultrasound-guided in utero nano-injection  
Jingyan He1, Lenka Belicova1, Sandra De Haan1, Noémi K. M. Van Hul1, Stefaan Verhulst1,2, Michael Ratz1, Emma Andersson1, 1Karolinska Institutet, Department of Cell and Molecular Biology (CMB), Solna, Sweden; 2Vrije Universiteit Brussel, Liver Cell Biology Research Group, Belgium  
Email: emma.andersson@ki.se

Background and aims: Hepatic stellate cells (HSCs) are essential mesenchymal cells in the liver and contribute to fibrosis upon liver injury. HSCs express both mesenchymal and neural markers, and current lineage tracing studies have demonstrated contribution of Mesp1- and Wt1-expressing mesodermal/mesenchymal cells to liver, as well as Wnt1- and Gfap-expressing cells. However, some of these studies have been contradicted by others. Thus, a definitive origin of HSCs and their relationship with other hepatic mesenchymal cells is still unclear. Traditional lineage tracing with Cre mouse models is powerful but has inevitable limitations for hybrid cell types. To circumvent this limitation, we developed a novel Cre-independent method to trace HSC lineages and their clonal relationships with other mesenchymal cells.

Method: A diverse lentivirus barcode library was injected into the amniotic cavity (Ac) or exocoelomic cavity (ExC) of mice at embryonic day (E)7.5 to target the neural crest or mesoderm, respectively. By using clonal TRacing and gene EXPression via scRNA-seq (TREX) and IF staining, E9.5–12.5 embryos were analyzed to trace the HSC trajectory, ≥E16.5 livers were analyzed to resolve clonal relations.

Results: In utero nano-injection with lentivirus results in successful transduction of septum transversum mesenchyme (STM) and intrahepatic mesenchymal cells, including HSCs. Traditional lineage tracing with Cre mouse models is powerful but has inevitable limitations for hybrid cell types. To circumvent this limitation, we developed a novel Cre-independent method to trace HSC lineages and their clonal relationships with other mesenchymal cells. Using this technique and TREX, we are now investigating the developmental trajectory of HSC lineages.

SAT-366  
Autologous skeletal myoblast cell-sheet transplantation for liver regeneration  
Keisuke Toya1, Yoshihito Tomimaru1, Shogo Kobayashi1, Akima Harada1, Kazuki Sasaki1, Yoshihumi Iwagami1, Daisaku Yamada1, Takehiro Noda1, Hidenori Takahashi1, Ryota Dhillimatsu2, Shigeru Miyagawa1, Yuichiro Doki1, Hitotoshi Eguchi1, 1Graduate School of Medicine, Osaka University, Japan; 2Center for Comprehensive Genomic Medicine, Okayama University Hospital, Japan  
Email: ktoyag@gesurg.med.osaka-u.ac.jp

Background and aims: There have been no established effective therapies for liver failure. Here, we focused on autologous skeletal myoblast cell-sheet transplantation, which is proved to improve...
cardiac function in patients with heart failure, for the treatment of liver failure. Thus, in this study, we preclinically assessed the effect of the sheet transplantation on liver failure model mice.

**Method:** We assessed two liver failure model C57BL/6 mice; one was liver fibrosis mouse induced by intraperitoneal administration of thioacetamide (TAA), the other was 70% partial hepatectomy model mouse. The mice received the autologous skeletal myoblast cell-sheet transplantation. In fibrosis model, the effect of the sheet transplantation was examined in terms of the extent of the fibrosis judged by Sirius red and Masson trichrome staining and the expression of a hepatocyte proliferation marker, Ki-67, and liver fibrosis markers, Acta2 and Col1α-1, in the liver tissues after the transplantation with comparison to the control receiving sham surgery. In hepatectomy model, the effect was examined the remnant liver to body weight ratio and the expression of Ki-67 and a marker for angiogenesis, CD31. Furthermore, immunohistochemical analysis for VEGFA, which myoblast cells secreted, was assessed to investigate the mechanism for liver regeneration of myoblast cell sheet.

**Results:** In the TAA model, the liver tissue was analyzed 3-week and 5-week after the myoblast cell-sheet transplantation. The percentage of Ki-67-positive cells was significantly higher in the sheet transplantation group than in the control group. Sirius red and Masson trichrome staining showed that liver fibrosis is less severe in the transplantation group than the control group. Furthermore, mRNA expression levels of Acta2 and Col1α-1 were significantly lower in the transplantation group than the control group. In the hepatectomy model, the remnant liver to body weight ratio 2 days after hepatectomy and sheet transplantation was significantly higher in the sheet group than that in the control group. The percentage of Ki-67-positive cells was significantly higher in the sheet group than in the control group at the same time. Moreover, the expression of CD31 in the remnant liver was significantly increased in the sheet group. Additionally, VEGFA was overexpressed at the sheet and the remnant liver near the sheet.

**Conclusion:** These results suggested that the autologous skeletal myoblast cell-sheet transplantation significantly improved the liver fibrosis and accelerated liver regeneration in the mice models. The sheet transplantation has the potential to be a clinically therapeutic option for liver regeneration.

**SAT-367**

Role of GATA4 in the modulation of hepatic progenitor cell fate

Laura Villamayor1,2, Noelia Arroyo3, Silvia Calero1,2, Pedro Miguel Rodrigues4,5,6, Elena Carceller-Lopez1, Malgorzata Milkiewicz7, Piotr Milkiewicz8,9, Jesus Maria Banales4,5,6,10, Anabel Rojas2,3, Angela Martinez Valverde1,2, 1Institute of Biomedical Research “Alberto Sols” (CSIC-UAM), Madrid, Spain; 2Network Biomedical Research Center for Diabetes and Associated Metabolic Diseases (CIBERedm), Madrid, Spain; 3Andalusian Molecular Biology and Regenerative Medicine Centre (CABIMER), University Pablo de Olavide, Universidad de Sevilla, Consejo Superior de Investigaciones Científicas (CSIC), Seville, Spain; 4Department of Liver and Gastrointestinal Diseases, Biodonostia Health Research Institute, Donostia University Hospital, University of the Basque Country (UPV/EHU), San Sebastián, Spain; 5National Institute for the Study of Liver and Gastrointestinal Diseases (CIBERehd, Carlos III Health Institute), Madrid, Spain; 6IKERBASQUE, Basque Foundation for Science, Bilbao, Spain; 7Department of Medical Biology, Pomeranian
**Background and aims:** Primary biliary cholangitis (PBC) and primary sclerosing cholangitis (PSC) are biliary diseases characterized by the damage of mature cholangiocytes, diffuse inflammation and fibrosis of the bile ducts. PSC patients have a higher risk to develop cholangiocarcinoma (CCA) while patients PBC more likely develop hepatocellular carcinoma (HCC). In PBC and PSC, the epithelial-mesenchymal transition (EMT) inducers are essential for disease progression and fibrosis development. Another feature of both diseases is the presence of ductular reaction (DR) due to the activation of hepatic progenitor cells (HPCs), known as oval cells (OCs) in rodents. Interestingly, HPC proliferation has been involved in progression of the duct lesions in PSC towards CCA. The zinc finger transcription factor GATA4 is a master driver of liver organogenesis and cancer development. Until now, it was known that Gata4 expression in the liver was restricted to endothelial and hepatic stellate cells (HSCs). However, we detected the expression of Gata4 in OCs in culture, as well as in OCs located in the oval niche in mice. On that basis, our aim was to unravel the role of Gata4 as modulator of OC fate in the context of PBC and PSC progression.

**Method:** OCs in culture were exposed to TGF-β or hypoxia (1% O2 saturation) and the correlation between EMT and Gata4 and Hif2a expression levels were determined by qPCR and Western blot. A step further, we silenced Gata4 in OCs in culture by infection with shGata4 lentiviral particles to study a possible essential role like occurs during liver regeneration. Based on that basis, our aim was to unravel the role of Gata4 as modulator of OC fate in the context of PBC and PSC progression.

**Results:** Our results showed that OCs express the transcription factor Gata4 in vitro and in vivo. Surprisingly, OCs are sensitive to hypoxia that promotes EMT in these cells in parallel with GATA4 downregulation. This was accompanied by the loss of cell identity monitored by reduction in the OC specific marker A6. Similar relationship between EMT, loss of cell identity and Gata4 downregulation was found upon treatment of OCs with TGFβ. Silencing Gata4 in OCs led to a loss of OCs viability since we did not obtain viable clones with Gata4 downregulation, suggesting that Gata4 might be essential for preserving OCs viability and survival. Moreover, the expression levels of GATA4 in liver samples from PSC and PBC patients revealed a significant decrease in PSC patients and a decrease trend in PBC patients.

**Conclusion:** Given the progenitor nature of OCs, the role of GATA4 in liver development and tumor suppression, and our data showing a correlation between Gata4 expression and EMT in OCs, our results suggest that GATA4 could be a bona fide modulator of OC fate.

**SAT-368 Rescue mechanism of hHIL-6 after partial hepatectomy**

Julia Ettich1, Hendrik Weitz1, Melissa Nowak2, Friedrich Reusswig3, Tobias Buchmann1, Kristina Vogel1, Juergen Scheller1. 1Institut für Biochemie und Molekularbiologie II, Germany; 2Institut für Molekularmedizin III, Germany; 3Research Group Experimental Vascular Medicine, Germany

**Background and aims:** Previous reports show interleukin-6 (IL-6) is critically involved in liver regeneration after partial hepatectomy (PHx) comprising both IL-6 classic- and trans-signaling. However, the exclusive impact of IL-6 classic-signaling for liver regeneration after PHx is unknown due to the necessity of the IL-6R, which generates PHx-induced soluble IL-6R (sIL-6R) by disintegrin and metallo proteinases enabling also IL-6 trans-signaling.

**Method:** Acute liver injury in mice investigates liver regeneration following surgical removal of 70% of the liver. RNA-sequencing analyzed the gene expression profile of liver tissue pre PHx, 6 h, and 24 h post PHx and were verified by RT-PCR. Serum protein levels (AST, ALT, Bilirubin, alkaline phosphatase) were analyzed. H/E-staining of liver sections and cytokine ELISAs were performed.

**Results:** IL-6R deficient mice after PHx resulted in significantly impaired survival. Elevated liver transaminases, accompanied by an elevation in cholestasis, and delayed bile acid synthesis affected liver regeneration following PHx. While the capacity for regeneration itself showed no effect, a delay in cell cycle gene expression and reduced proliferation supported with reduced SAA1 was given. Histopathology revealed a delayed lymphocyte infiltration in correlation with more necrotic areas of in IL6R-deficient mice following PHx. Application of human Hyper-IL-6 (hHIL-6), a fusion protein of sIL-6R and IL-6, rescued the impaired survival following PHx via IL-6 trans-signaling. To further investigate the role of hHIL-6 during regeneration, IL-6R deficient mice were analyzed in transcriptomic analysis. Besides the gene expression profiling, hHIL-6 treated animals displayed a significant increase in SAA1 activity already pre-PHx, indicating a sufficient and restored STAT3 activation. Within 24 h post PHx liver transaminases were significantly reduced, cholestasis marker stayed at moderate level and hHIL6-treated mice revealed reduced necrotic areas accompanied by an increase in proliferation.

**Conclusion:** IL-6R deficient mice can be rescued via synthetic hHIL-6 due to the protection of intrahepatic cholestasis-induced hepatocyte death during liver regeneration.

**Figure:**
Background and aims: The hepatic progenitor cell (HPC) is an innate stem cell in the liver and the main cell in liver regeneration. Induce that the proliferation and regenerative activity of HPC is the main issue in the liver regeneration field. Liver sinusoidal cells (LSECs) inactivation and stabilization are essential in accelerating the regression of fibrosis and inhibiting the progression of cirrhosis. LSEC also has been known to activate HPC through the Wnt-β-catenin signaling. However, the method to stabilize LSECs is not yet established. Therefore, we investigated the functional recovery of LSECs through mesenchymal stem cells (MSCs) and whether it can induce HPCs activation.

Method: To evaluate the stabilization of LSEC by MSC, the recovery of fenestrae of LSECs was confirmed by Scanning Electron Microscope (SEM) after co-culture. Changes in various factors affecting the stabilization of LSEC were also confirmed by real-time polymerase chain reaction and Western blot. The specific cell markers of the isolated mouse LSECs and MSCs were confirmed by FACS. In addition, HPCs were cultured using the culture soup obtained by co-culture of LSECs and MSCs, and the activities of HPCs were analyzed.

Results: In human-derived MSC and LSEC co-culture, LSEC showed recovery of fenestrae with increased expression of VEGF, eNOS, HGF, Wnt2, and Wnt9b in LSEC compared with control. Also, when LSECs and MSCs isolated from mice were co-cultured, the expression of VEGF and HGF, which play an important role in maintaining the morphology of LSEC, increased. The expression of Wnt9b, which acts as an angiocrine factor in liver regeneration, was also increased. In the culture of HPC, when the soup obtained from LSEC during LSEC and MSC co-culture was added, an increase in HPC activity was observed compared to the control group. The proliferation of stem progenitor cells was doubled in both 24 and 48 hours compared to the control group. Also, the expression of VEGF and Wnt2 increased in HPC at 24 hours, and the expressions of HGF, VEGF, and Wnt9b increased at 48 hours.

Conclusion: MSC showed the property that can induce stabilization (undifferentiated) LSEC. Stabilized and functionally recovered LSEC by MSC also induced the proliferation and increased the activity of HPCs and which suggests a possibility that MSC-based recovery of LSEC in hepatic fibrosis can be helpful in the promotion of liver regeneration through HPC activation.

Liver immunity

WEDNESDAY 21 TO SATURDAY 24 JUNE

TOP-050
“Swarm hunting” of virus-specific CD8 T cells together with auto-aggressive CD8 T cells to achieve efficient killing of virus-infected hepatocytes
Ariane Eceiza Tenreiro1, Michael Dudek1, Dirk Wohlleber1, Percy A. Knolle2. 1Institute of Molecular Immunology, Germany
Email: percy.knolle@tum.de

Background and aims: Viral infections of the liver with hepatotropic viruses, such as the hepatitis B virus, are most often successfully cleared by the adaptive immune response, in particular virus-specific CD8 T cells. Persistent infection occurs when antigen-specific immunity fails to eliminate virus-infected hepatocytes, the reasons of which are still unclear. In this project, we investigate the contribution of a novel form of metabolic T cell activation termed auto-aggressive T cells and its relevance to control of virus infection in hepatocytes.

Method: We used time-lapse cytoxicity assays measuring cell impedance to determine the ability of antigen-specific CD8 T cells to engage in combination with auto-aggressive CD8 T cells in a synergistic fashion to achieve killing of virus-infected hepatocytes. We established cocultures of primary murine hepatocytes with conventional effector CD8 T cells and auto-aggressive CD8 T cells, and measured antigen-specific killing compared to auto-aggressive killing of hepatocytes.

Results: As expected, antigen-specific CD8 T-cells efficiently killed virus-infected hepatocytes within 12 hours. Conversely, high effector to target ratio (>10) of auto-aggressive T-cells exerted antigen independent in vitro hepatocyte killing. Strikingly, co-incubation of cytotoxic effector CD8 T cells and auto-aggressive CD8 T cells at effector to target ratios that would not elicit any hepatocyte killing by a single T cell population, led to efficient killing of hepatocytes. This demonstrated different pathways leading to hepatocyte killing that rely on synergistic effector functions exerted by conventional antigen-specific CD8 T cells and auto-aggressive CD8 T cells. Remarkably, we identified soluble factors secreted by conventional T cells that initiated auto-aggression by CD8 T cells.

Conclusion: Our results demonstrate that cytotoxic CD8 T cells and auto-aggressive CD8 T cells have a synergistic activity in eliciting killing of virus-infected hepatocytes. This unravels novel means of cooperation among T cells with effector functions. Future experiments will characterize how conventional effector CD8 T cells engage auto-aggressive CD8 T cells in a synergistic killing of virus-infected hepatocytes in a “swarm hunting” fashion.
dysfunctional CD8 T cells during persistent infection expressed higher CXCR6 levels compared to fully functional CD8 T cells after resolved infection. Moreover, co-culture with LSECs led to augmented protein kinase A phosphorylation and caused inhibition of T cell receptor signaling in CXCR6−CD8 T cells pointing towards increased cAMP signaling as cause of T cell dysfunction during persistent hepatotropic infection. Mass spectrometry imaging of LSECs and CD8 T cells further identified changes in lipid and metabolite profiles associated with the distinct functional properties of virus-specific CD8 T cells.

**Conclusion:** Our results identify close physical interaction between virus-specific CD8 T cells and LSECs and liver macrophages as initial event in regulating loss of T cell function. Future work will aim at elucidating the exact molecular mechanism determining the metabolite-induced regulation of T cell function and their consequences for anti-viral immunity in the liver.

**SATURDAY 24 JUNE**

**SAT-371**

AAV-HBV mouse model replicates immune exhaustion patterns of chronic HBV patients at single-cell level

Ren Zhu1, Qinglei Han2, Nadia Neto3, Zhiyuan Yao4, Qun Wu2, Dries de Maeyer5, Koen Van der Borght5, Matthias Beyens3, Ellen Van Gulck7, George Kukolj4, Podlaha Ondr6, Isabel Najera4, Janssen, Infectious Disease Translational Discovery, China; Janssen, Infectious Disease Translational Discovery, Belgium; Janssen, Infectious Disease Translational Discovery, United States; Janssen, DTMP, Belgium

Email: rzhu7@its.jnj.com

**Background and aims:** Chronic hepatitis B viral infection (CHB) can lead to a state of immune exhaustion or dysfunction preventing the resolution of infection. AAV-HBV transduction leads to persistent HBV replication in immune-competent mice; comprehensive characterization of the liver immune microenvironment is however lacking. This study investigated the intrahepatic immune profile of AAV-HBV-transduced mice at the single cell level and compared these data to a human CHB dataset across clinical stages of CHB.

**Method:** Liver immune cells were isolated from 4 to 5-week-old male C57/BL6 mice with AAV-HBV (n = 5), AAV control vector (n = 5) 24-weeks post-transduction or naïve (n = 5) mice. Cells were loaded on to a 10x Genomics platform for single-cell RNA sequencing analysis. Downstream analysis was performed using custom R scripts that utilized the Seurat, CellChat, and CellPhoneDB packages. The mouse model data was compared with a human CHB dataset using the bioinformatics packages described above.

**Results:** A total of 107,925 high quality immune mouse cells were captured from the 15 samples, covering all major immune cell populations (Ts, Bs, NKs, DCs, monocytes and neutrophils) and hepatocytes. Pre-exhausted CD8+ T cells with self-renewing capacity (Tpx, TCF1+), and terminally exhausted CD8+ T cells (Tex, TCF1−) were identified in the AAV-transduced mice. The terminally exhausted CD8+ T cells (expressing PD-1, LAG-3, TIGIT) were significantly enriched in the AAV-HBV mouse group. Deconvolution of cell-to-cell signaling pathways identified CD4+ Th1 cells (Pdcd1lg2-Pdcd1 pathway) and mature B- cells (H2k1-Cd8a/b1 pathway) as major signal senders to CD8+ Tex cells, while resident regulatory T cells contributed to the Pvr-Tigit interaction with CD8+ Tex. We performed analogous single cell analyses across the Immuno-Tolerant (IT), Immuno-Active (IA), and HBV resolver (CR) patients as well as healthy donors of the human CHB dataset. The immune cell population composition as well as ligand/receptor expression patterns observed in AAV-HBV mice were consistent with observations from IT and IA CHB patients (Figure 1).

**Conclusion:** Enrichment for exhausted CD8+ T cells was observed in the livers of AAV-HBV mice by expression of immune checkpoint marker genes (PD-1, LAG-3, TIGIT). We also observed immune cell crosstalk which may be driving or maintaining T cell exhaustion. The exhausted CD8 gene and pathway profiles were comparable between mouse AAV-HBV and the human CHB samples from Zhang et al. These data support the use of the AAV-HBV mouse model in the study of liver immune tolerance mechanisms induced by HBV.

**Reference**


**SAT-372**

Developing highly pure, functional GMP grade Treg for the treatment of autoimmune liver disease

Naomi Richardson1,2, Grace Wootton1,2, Amber Bozward1,2, Ye Htun Oo1,2, *University of Birmingham, Centre for Liver and Gastrointestinal Research, Institute of Immunology and Immunotherapy, United Kingdom; 2University of Birmingham, Advanced Therapies Facility, United Kingdom; 3Queen Elizabeth Hospital Birmingham, Liver Medicine, United Kingdom

Email: y.h.oo@bham.ac.uk

**Background and aims:** Autoimmune liver disease (AILD) is typically characterized by immune dysregulation and a resultant inflammatory state. Regulatory T cells (Tregs) are crucial in the development of tolerance to self and antigens and are therefore essential in the inhibition of autoimmune disease. However, the generation of functional Treg populations is a challenge in artificial approaches.

**Method:** Naive CD4+ T cells were cultured with the following: AAV-control (scAAV2-CMV-eGFP), AAV-GFP-Nanog, AAV-GFP-4EBP1, AAV-GFP-Tpex, or AAV-GFP-TCF1. After 5 days of culture, cells were treated with IL-2, IL-7 and TGFβ1 in media supplemented with SCID-BG2 cell conditioned media for a further 5 days. After 10 days, T cell populations were captured from the 15 samples, covering all major immune cell populations (Ts, Bs, NKs, DCs, monocytes and neutrophils) and hepatocytes. Pre-exhausted CD8+ T cells with self-renewing capacity (Tpx, TCF1+), and terminally exhausted CD8+ T cells (Tex, TCF1−) were identified in the AAV-transduced mice. The terminally exhausted CD8+ T cells (expressing PD-1, LAG-3, TIGIT) were significantly enriched in the AAV-HBV mouse group. Deconvolution of cell-to-cell signaling pathways identified CD4+ Th1 cells (Pdcd1lg2-Pdcd1 pathway) and mature B- cells (H2k1-Cd8a/b1 pathway) as major signal senders to CD8+ Tex cells, while resident regulatory T cells contributed to the Pvr-Tigit interaction with CD8+ Tex. We performed analogous single cell analyses across the Immuno-Tolerant (IT), Immuno-Active (IA), and HBV resolver (CR) patients as well as healthy donors of the human CHB dataset. The immune cell population composition as well as ligand/receptor expression patterns observed in AAV-HBV mice were consistent with observations from IT and IA CHB patients (Figure 1).

**Conclusion:** Enrichment for exhausted CD8+ T cells was observed in the livers of AAV-HBV mice by expression of immune checkpoint marker genes (PD-1, LAG-3, TIGIT). We also observed immune cell crosstalk which may be driving or maintaining T cell exhaustion. The exhausted CD8 gene and pathway profiles were comparable between mouse AAV-HBV and the human CHB samples from Zhang et al. These data support the use of the AAV-HBV mouse model in the study of liver immune tolerance mechanisms induced by HBV.

**Reference**


**Figure 1:** (abstract: SAT-371): AAV-HBV mouse model mimics the immune exhaustion pattern observed in chronic HBV patients.

---

**Journal of Hepatology 2023 vol. 78(S1) | S100–S1212**

5443

**POSTER PRESENTATIONS**
Background and aims: Autoimmune liver diseases (AILD) are immune-mediated liver diseases causing chronic damage to hepatocytes and biliary tissue. Regulatory T cells (Treg) are crucial to maintain peripheral immune tolerance, reduce inflammation and promote tissue repair. Our previous trial (AUTUMN) showed that >25% of natural Treg cells from autoimmune hepatitis (AIH) patients' blood effectively home to the liver and readily respond to IL-2 via STAT-5 signaling. We have now developed a platform to generate Good Manufacturing Practice (GMP) grade autologous Treg cells with potential to treat AILD and reduce reliance on immunosuppressive drugs.

Method: The isolation of highly pure, functional Treg cells from peripheral blood is achieved using Miltenyi Prodigy to enrich CD25+ T cells, before careful cell sorting using the MACSQuant Tyto to remove CD8\(^+\) T cells and gain CD4\(^+\)CD25\(^+\)CD127\(^{lo}\) bona fide Treg cells at >95% purity. Isolated Treg can be expanded in vitro, according to our optimized protocol, to achieve therapeutic doses of cells within 4 weeks (>1 × 10\(^9\) Treg cells). Treg expansion optimisation involved testing different medias, IL-2 concentrations, stimulation types and duration, seeding densities, culture vessels and mTOR inhibition. Measuring lactate enables effective monitoring of cell number throughout expansion without need for intervention.

Results: Treg cells manufactured at GMP grade retain their immunosuppressive phenotype, including expression of CTLA-4, CD39, FoxP3 as well as liver homing chemokine receptor CXCR3 and ratio of naive:memory, Th1 and Th17 markers including Tbet, CCR6, CD161 are not increased after expansion. Treg final product is functional, suppresses CD4 conventional cells, and exhibits TSDR demethylation-albeit with slightly reduced potency compared to Treg cells prior to expansion.

Conclusion: We have developed a reproducible protocol to manufacture high quality therapeutic GMP grade Treg cells, which will be applied in our upcoming Resolving Primary biliary cholangitis with Regulatory T cell and INterleukin-2 GMP immunotherapy (SPRING) trial. SPRING trial will deliver 1) autologous GMP-Treg cells, 2) low-dose IL-2 or 3) GMP-Treg + low dose IL-2 to PBC patients, to directly compare the efficacy and immunological changes in blood and liver tissue of these novel treatments. This platform is readily transferrable to any autoimmune or autoinflammatory disease in which GMP-Treg therapy is a viable treatment option.

SAT-374
ILT2 as a biomarker of impaired natural killer cells expressing excess lipid peroxidation in patients with hepatocellular carcinoma

Toshihiro Sakata1,2, Sachio Yoshio1, Masaaki Mino1, Shiori Yoshikawa1, Taji Yamazoe1, Taizo Mori1, Eiji Kakazu1, Toshihiro Sakata1,2, Sachiyo Yoshio1, Masaaki Mino1, Shiori Yoshikawa1, Taji Yamazoe1, Taizo Mori1, Eiji Kakazu1, Taketomi Akinobu2, Tatsuya Kanto1. 1National Center for Global Health and Medicine, Japan; 2Hokkaido University, Japan

Email: toshihiro5014sakata@gmail.com

Background and aims: Overall response rates of systemic therapies against advanced hepatocellular carcinoma (HCC) remain unsatisfactory despite the introduction of immune checkpoint inhibitor (ICI) to the clinic. Thus, exploring for new immunotherapy targets is indispensable. Natural killer (NK) cells play a pivotal role in immune surveillance against hepatocellular carcinoma (HCC). We previously identified some of signature NK cell receptors in HCC patients, ILT2 as an inhibitory and NKP46 as a stimulatory receptor, respectively. We aimed to explore potential targets for immune intervention by revealing NK cell function-related phenotypes in HCC patients.

Method: We enrolled 17 HCC patients who underwent liver tumor resection. We examined peripheral NK cells (pNK) and intrahepatic NK cells from cancerous (Ca-NK) and noncancerous liver tissues (NCA-NK). To evaluate the impact of aging on NK phenotypes, we also examined pNK from 42 healthy volunteers (HVs) whose age were at a range from 21 to 82 years old. We analyzed 39 surface markers on NK cells by mass cytometry. We separated ILT2+NKP46-, ILT2-NKP46- and NKP46+CD56dimNK cells and cultured them in the presence of K562 cells or Daudi cells as targets for cytotoxicity and ADCC assay. Cytotoxicity/ADCC assay was performed with ILT2+NKP46-CD56dimNK cells with or without anti-ILT2 neutralizing antibody or antioxidant compounds. We evaluated whether HLA-G, which is a ligand of ILT2, were expressed or not in cancerous and noncancerous liver tissues.

Results: The expression levels of activating NK cell markers, Siglec7, CD160 and NKP46, were decreased with aging. In contrast, an increasing trend with aging was observed for inhibitory receptors, ILT2, PD-1, LAG-3, Siglec10, TIGIT and KIR2DL2/L3, and maturation marker CD57, respectively. In comparison of phenotypes of CD56dimNK cells between age-matched HCC patients and HVs, ILT2, CD69, CX3CR1, CD49a and CD200R in patients were significantly higher, while DNAM-1 and 2B4 were lower in HCC patients. ILT2-bearing CD56dimNK cells, which were enriched in cancer tissue, were NKP46-negative and highly positive for C11-BODIPY581/591 as a marker of lipid peroxidation. ILT2+NKP46-CD56dimNK cells exhibited lesser capacity of cytotoxicity and ADCC compared with ILT2-NKP46- and NKP46+CD56dimNK cells, the capacity of which was partially restored by ILT2 blockade or antioxidant compounds. The level of HLA-G expression was more in cancerous liver than those in noncancerous lesions.

Conclusion: ILT2+CD56dimNK cells in the HCC liver were functionally impaired with upregulation of lipid peroxidation. ILT2 could be a biomarker of NK cells as a target for immune or antioxidant intervention in HCC patients.

SAT-375
Interplay between hepatitis B virus replication and intrahepatic expression of VISTA and TIM-3 immune checkpoint markers in chronic hepatitis B patients

Kim Thys1, Marianne Tuyfere1, Thomas Derenne1, Marjolein Crabbe2, Clement Laloux1, Alfonso Blazquez1, Jeroen Aerssens1, Cheng-Yuan Peng1, Janssen Pharmaceutica, Translational Biomarkers Infectious Diseases, Beerse, Belgium; Janssen Pharmaceutica, Statistics and Decision Sciences, Beerse, Belgium; PharmaLex, Friedrichsdorf, Hessen, Germany; China Medical University Hospital, Taichung, China

Email: mtuefle1@its.jnj.com

Background and aims: Host immune characterization of chronic hepatitis B (CHB) patients is usually limited to an assessment of the peripheral compartment as a consequence of the challenges to access samples from the site of the viral infection, the liver. However, the routine measurement of viral and immune markers in blood (serum hepatitis B virus [HBV] DNA, hepatitis B surface antigen [HBsAg], hepatitis B e-antigen [HBeAg], and alanine aminotransferase [ALT]) to monitor disease progression may not fully capture the dynamics and relationship between the host and virus in the liver.

Method: Core liver biopsies collected from 28 treatment naïve CHB patients, 5 HBeAg positive and 23 HBeAg negative, were characterized using Nanostring GeoMx® Digital Spatial Profiler technology. CD45-positive cells, HBSAg-positive hepatocytes, and HBSAg-negative hepatocytes were assessed for the expression of 72 proteins, including 16 immune checkpoint markers: 10 immune checkpoint receptors (PD-1, CTLA4, LAG-3, TIM-3, VISTA, GITR, ICOS, CD27, 4-1BB, and CD40) and 6 ligands (PD-1, PD-1, VISTA, B7-H3, OX40L, and CD80). For each liver biopsy, pools of 100 selected cells per cell type population were analyzed as areas of interest (AOIs). Up to 24 AOIs were collected per biopsy, resulting in a total of 732 AOIs analyzed. Linear models were applied comparing markers expression between HBSAg-positive and HBSAg-negative hepatocytes on one hand, and liver protein expression association with serum viral marker on a second hand. Significant associations after multiple testing correction are reported.

Results: Of the 72 proteins, CD45RO, GZMB, and CD44 showed significantly higher expression in HBSAg-positive hepatocytes than
HBsAg-negative hepatocytes, highlighting clearly different hepatocyte activation states. Four (CD80, GITR, PD-L1, and PD-L2) of the 16 immune checkpoint markers in the panel were not detected in any of the AOIs analyzed. PD-1 was detected in CD45-positive cells, but not significantly associated with any viral marker. VISTA and TIM-3 were significantly upregulated in CD45-positive cells collected in biopsies from HBeAg-positive CHB patients, but also in HBeAg-negative patients with high HBV DNA (>20,000 IU/mL) and/or high HBsAg (>1000 IU/mL) levels (false discovery rates: VISTA <5%; TIM-3 <10%).

Upregulation of CTLA-4 was observed in intrahepatic CD45-positive cells from CHB patients with high HBV DNA and/or high HBsAg. Interestingly, TIM-3 overexpression was also observed in hepatocytes from patients with high peripheral HBsAg levels and high HBV DNA. Expression of OX40L, B7-H3, and IDO-1 in hepatocytes was negatively correlated with peripheral ALT levels, while no markers in CD45 cells were significantly associated with ALT levels.

**Conclusion:** Multiparametric profiling of immune checkpoint and activation markers in the livers of CHB patients highlights the interrelation between the HBV replication state and the host response.

---

**SAT-375**

**Kupffer cell activation enhances systemic anti-bacterial immunity**

Christian Zwicker1,2, Annelleen Remmerie1,2, Tinne Thöne1,2, Liesbet Martens1,2, Bavo Vanneste1,2, Fleur Parmentier1,2, Christopher Anderson2,3, Charlotte Scott1,2, Laboratory of Myeloid Cell Biology in Tissue Damage and Inflammation, VIB-Ugent Center for Inflammation Research, Ghent; 1Department of Biomedical Molecular Biology, Faculty of Science, Ghent University, Ghent, Belgium; 2Unit for Cell Clearance in Health and Disease, VIB-Ugent Center for Inflammation Research, Ghent, Belgium; Email: christian.zwicker@irc.vib-ugent.be

**Background and aims:** Tissue resident macrophages are regarded as highly plastic cells able to rapidly respond to changes in their local microenvironment. However, we have recently shown that in a mouse model of non-alcoholic fatty liver disease Kupffer Cells (KCs), the resident macrophages of the liver, were gradually lost and did not exhibit an activated phenotyping questioning the plasticity of KCs in the liver. Given, that KCs have been proposed to have a crucial function in systemic immune surveillance, we sought to investigate whether these cells are able to respond to an acute bacterial infection.

**Method:** To investigate KC activation during systemic infection, we challenged mice with a sublethal dose of soluble LPS or the gram-negative pathogen *Salmonella enterica* serovar Typhimurium (S. Tm) and assessed KC fate and gene expression profiles. To manipulate the KC response to whole bacteria or purified bacterial components, we made use of the Clec4f-Cre mouse allowing KCs to be specifically targeted.

**Results:** Single cell RNA-sequencing and quantitative PCR revealed that KCs can mount an acute but temporally restricted pro-inflammatory response (*Il1b, Il6, Tnf, and A20*) to free LPS peaking as early as 30 min post challenge and returning to baseline about 10 h later. Importantly, this tight regulation was crucial as mice lacking A20 specifically in KCs (Clec4f-Cre A20fl/fl) which are unable to regulate this response, were highly susceptible to LPS and showed severe inflammation and mortality only 6–8 h after LPS challenge. This exaggerated response enhanced KC death in Clec4f-Cre A20fl/fl mice and just inhibiting KC death by removing RIPK3 (Clec4f-Cre × A20fl/fl × RIPK3fl/fl) could rescue KCs and significantly reduce mortality. However, while KC-specific loss of A20 in Clec4f-Cre A20fl/fl mice was detrimental for host survival after challenge with soluble LPS, these mice exhibited strongly reduced bacterial load in liver and spleen after infection with pathogenic S. Tm compared with WT controls suggesting that hyperactivated KCs may promote systemic pathogen clearance. This protective effect was associated with increased monocyte and neutrophil infiltration in livers of Clec4f-Cre A20fl/fl mice.

**Conclusion:** We show that KCs are able to respond to an acute microbial insult, however, the exact nature of this response (protective vs pathogenic) strongly depends on the stimulus. While the response to free LPS needs to be tightly controlled to prevent excessive inflammation and to ensure host survival, recognition of whole bacteria by activated KCs enhances microbicidal cell recruitment and promotes pathogen clearance. Understanding the mechanisms underlying macrophage responses to microbes and microbial components may allow us to develop novel therapeutic strategies to activate these cells specifically and thereby improve patient outcomes in infectious diseases.

---

**SAT-376**

**Osteopontin serves as a potential regulator of T cell immunity in patients with hepatocellular carcinoma**

Tengfei Si1, Zhenlin Huang1, Shirin Elizabath Khorsandi2, Wayel Jassem3, Abid Suddle3, Ragai Mityr1, Mark J W McPhail1, Xiaohong Huang1, Francesca Trotavo1, Salma Muji3, Salvatore Napoli3, Ellen Jerome3, Yun Ma1, Nigel Heaton1, Institute of Liver Studies, King’s College London; 2the Roger Williams Institute of Hepatology, United Kingdom; 3King’s College Hospital, United Kingdom; Email: yun.ma@kcl.ac.uk

**Background and aims:** Osteopontin (OPN) is a secreted acidic protein which highly expressed in patients with hepatocellular carcinoma (HCC). Its involvement in the tumour invasion and metastasis has been defined recently. In our previous study we have found that it has a close association with PD-L1 in HCC setting, but little is known about its role in regulating the host cellular immunity. Through multiple assays and in vitro investigation, we aimed to define the interactions between OPN and the T cell mediated anti-tumour immunity.

**Method:** Blood samples were collected from patients with HCC (n = 40) for peripheral blood mononuclear cells (PBMCs) and plasma collection. Hepatic mononuclear cells (HMCs) were harvested from liver perfusate (n = 5) of pre-transplant donor graft, among which T and B cells were further isolated for 72-hour in vitro culture with different concentrations of OPN (0, 1 μg/ml, 5 μg/ml, 10 μg/ml). OPN and Th1 type cytokine (IFN-γ/TNF-α) levels were measured through enzyme-linked immunosorbent assay (ELISA). Cell phenotyping was conducted using flow cytometry. In addition, patients’ RNA-seq data was used to analyse the association between the expression of OPN in tumour tissues and patients’ prognosis after sorafenib treatment.

**Results:** Higher percentages of circulating CD4posCD25posCD127low/− (p = 0.0026) and CD4posCD25posCD39pos (p = 0.0004) two Tregs subsets were observed in patients with elevated plasma OPN level, whereas the number of peripheral CXCR3pos CD8 T cells significantly decreased (p = 0.0002). After 72-hour in vitro culture, hepatic T cells from OPN-5 μg/ml group (8.724% vs 3.224%, p = 0.043) and OPN-10 μg/ml group (10.85% vs 3.224%, p = 0.0007) showed higher proportion of CD4posCD25pos Tregs compared to OPN-0 μg/ml group. The percentage of Ki67pos CD8 T cells decreased (p < 0.05) along with the increasing OPN concentrations in cell culture medium and the production of Th1 type cytokines IFN-γ (p = 0.027)/TNF-α (p = 0.0005) from T cells was also reduced with the upregulation of OPN. RNA-seq data revealed that patients with no response to sorafenib were companied with higher OPN expression in tumour compared to those who responded to treatment (TPM 974.7 vs 473.2, p = 0.012).

**Conclusion:** Overexpression of OPN could negatively regulate T cell immunity, featured by promoting the proliferation of Tregs, down-regulating the percentages of inflammatory T cells and inhibiting their ability of producing Th1 type cytokines. Targeting OPN in HCC may reverse the immunosuppression by restoring the T cell mediated anti-tumour immunity thus improving patients’ prognosis.
SAT-377
Comprehensive phenotypical and molecular characterization of B lymphocytes in patients affected by intrahepatic cholangiocarcinoma
Giulia Milardi1, Barbara Franceschini1, Guido Costa1, Cristiana Soldani1, Paolo Uva2, Davide Cangelosi2, Barbara Cassani1, Guido Torzilli1, Matteo Donadon3, Ana Lleo4. 1IRCCS Humanitas Research Hospital, Italy; 2IRCCS Istituto Giannina Gaslini, Italy; 3Università del Piemonte Orientale, Italy; 4Humanitas University, Italy
Email: giulia.milardi@st.hunimed.eu

Background and aims: Intrahepatic cholangiocarcinoma (iCCA) is a heterogeneous biliary tract cancer whose incidence is increasing worldwide. Due to the aggressive evolution of the disease, there is an urgent need for diagnostic and therapeutic alternatives. The immune infiltrate is a key component of the tumour microenvironment (TME), but remains poorly characterized, limiting development of successful immunotherapies. While there are many aspects related to T lymphocytes that are undergoing extensive studies, the effect exerted by B cells in iCCA development and progression is still controversial and no characterization has been performed. Herein, we aimed to define phenotypic and functional properties of B lymphocytes in the TME of iCCA, with the goal of finding new mechanisms important for cancer initiation and/or progression.

Methods: We used high-dimensional single-cell technologies to characterize the B-cell compartments of iCCA tissues, comparing these with their tumor-free tissues and circulating counterparts. We further performed gene expression analysis and cellular assays to define the B cell-specific role in iCCA tissues and investigate whether and how liver TME impact on B cell biology.

Results: Single-cell RNA-sequencing analysis of CD20+ cells in iCCA patients (n = 6) identified four main subclusters of B and revealed an up-regulation of genes involved in neutrophil degranulation, cellular response to stress, GPCR binding and a downregulation of B cell activation/inflammatory genes in intratumoral compared to adjacent non-malignant tissue; suggesting an immunosuppressive role of B cells in iCCA TME. Multicolour flow cytometry analysis of B cells isolated from iCCA patients (n = 13) highlighted a higher frequency of naive B cells respect to the memory phenotype. A reduction in B-cell effector functions was also detected. Immunohistochemical analyses showed that B cells, when infiltrate the tumour, create cellular aggregates similar to tertiary lymphoid structures.

Conclusion: Overall, these data suggest that iCCA tissue contain various B cells subtypes probably with an immunosuppressive role. However, a comprehensive characterization of B cell property, organization and crosstalk with other cells of iCCA milieu will elucidate mechanisms of tumour progression/control, exploitable for the development of novel immunotherapeutic approaches.

SAT-378
The Ninj1/Dusp1 axis contributes to liver ischemia reperfusion injury by regulating macrophage activation and neutrophil infiltration
Shun Zhou1, Yuanchang Hu1. 1First Affiliated Hospital of Nanjing Medical University, Hepatobiliary Center and Research Unit of Liver Transplantation and Transplant Immunology, Nanjing, China
Email: hand2399@njmu.edu.cn

Background and aims: Liver ischemia and reperfusion (IR) injury represents a major risk factor in both partial hepatectomy and liver transplantation. Nerve injury-induced protein 1 (Ninj1) is widely recognized as an adhesion molecule in leukocyte trafficking under inflammatory conditions, but its role in regulating innate immune during liver IR injury remains unclear.

Method: Myeloid Ninj1 deficient mice were generated by bone marrow chimeric models using Ninj1 knockout (KO) mice and wild type (WT) mice. In vivo, liver partial warm ischemia model was applied. Liver injury and hepatic inflammation were investigated. In vitro, primary Kupffer cells (KCs) isolated from Ninj1 KO and WT mice were used to explore the function and mechanism of Ninj1 in modulating KCs inflammation upon LPS stimulation.
Results: Ninj1 deficiency in KCs protected mice against liver IR injury during the later phase of reperfusion, especially in neutrophil infiltration, intrahepatic inflammation, and hepatocyte apoptosis. This prompted ischemia-primed KCs to decrease proinflammatory cytokine production. In vitro and in vivo, using small interfering RNA against Dual specificity Phosphatase 1 (DUSP1), we found that Ninj1 deficiency diminished the inflammatory response in KCs and neutrophil infiltration through DUSP1-dependent deactivation of the JNK and p38 pathways. Sivelestat, a neutrophil elastase inhibitor, functioned similarly to Ninj1 deficiency, resulting in both mitigated hepatic IR injury in mice and a more rapid recovery of liver function in patients undergoing liver resection.

Conclusion: Ninj1/Dusp1 axis contributes to liver IR injury by regulating the proinflammatory response of KCs, and influences neutrophil infiltration, partly by subsequent regulation of CXCL1 production post-IR.

SAT-379
The decrease of HCV-specific neutralizing antibody responses after DAA therapy is associated with weak envelope-specific CD4 T cell immunity
Jana Gawron1, Jill Werner1, Lara Kelsch1, Dorothea Bankwitz2, Maike Hofmann1, Robert Thimme2, Thomas Pietschmann2, Tobias Böttler1.
1University Hospital Freiburg, Department of Medicine 2, Freiburg, Germany; 2Institute for Experimental Virology, TWINCORE, Hannover, Germany
Email: jill.werner@uniklinik-freiburg.de

Background and aims: Despite the development of direct-acting antiviral agents (DAA) against hepatitis C virus (HCV) infections, the need for an effective vaccine remains. Many vaccines rely on the emergence of neutralizing antibodies (nAbs). Here, we aimed to get a more detailed understanding of the longevity and persistence of HCV-specific nAbs after DAA-mediated viral clearance and its relation to the CD4 T cell response, particularly follicular T helper cells (Tfh), targeting the HCV-envelope proteins in a longitudinal patient-based study.

Method: Neutralizing antibodies, B cells and Tfh cells were analyzed in human blood in a longitudinal cohort of 27 patients infected with HCV genotype 1a, 1b or 3a. Samples were collected before DAA therapy, at the end of therapy (EOT) and up to one year after end of therapy. HCV-specific secretion of IL-2, INFγ and IL-21 by CD4 T cells were analyzed by flow cytometry after stimulation with in silico predicted, genotype-matched envelope proteins. nAbs were analyzed by co-incubation of HuH 7.5 cells with patient IgGs and HCV luciferase reporter viruses. Infectivity was assessed by luminescence measurements.

Results: nAb levels remained stable with some inter-patient variability between baseline and 5–7-months post EOT and uniformly decreased thereafter. Longitudinal analyses of bulk B or Tfh cells revealed no changes in frequencies of these populations. Envelope-specific CD4 T cells were detectable in 87.5% of patients, with low frequencies of cytokine expressing CD4 T cells. While the frequency of IL-21 producing HCV-envelope-specific CD4 T cells correlated with the nAb response at baseline, no changes were observed in the longitudinal analysis of HCV-envelope-specific CD4 T cells after viral clearance.

Conclusion: A weak envelope-specific CD4 T cell response during chronic HCV infection might contribute to the failure to maintain nAb levels after DAA mediated viral clearance.

SAT-380
Epigenetic conversion of CD4+ T cells to stable and functioning induced regulatory T cells via cyclin-dependent kinase inhibition and CD28 signal deprivation in patients with primary biliary cholangitis
Vincenzo Ronca1,2,3,4, Scott Davies1,2, Kayani Kayani1,2,4, Norihisa Mikami5, Masaya Ara1, Yamami Nakamura4, Natsumi Okamoto4, Jason White4, Naomi Richardson1,2, Naganari Ohkura4, Pietro Invernizzi3,5, Shimon Sagakuchi4, Ye Htun Oo1,2,5. 1Institute of Immunology and Immunotherapy, University of Birmingham, Birmingham, UK, United Kingdom; 2NIHR Birmingham Biomedical Research Centre, University of Birmingham and University Hospitals Birmingham NHS Foundation Trust, Birmingham, UK, United Kingdom; 3Division of Gastroenterology, Center for Autoimmune Liver Diseases, Department of Medicine and Surgery, University of Milano Bicocca, 20900 Monza, Italy, United Kingdom; 4Laboratory of Experimental Immunology, WPI Immunology Frontier Research Center, Osaka University, Suita, Japan, Japan; 5European Reference Network on Hepatological Diseases (ERN RARE-LIVER), United Kingdom
Email: v.ronca@bham.ac.uk

Background and aims: Primary biliary cholangitis (PBC), is a chronic, autoimmune liver disease. Regulatory T cells (Treg) are a subset of CD4+ T lymphocytes whose activity is driven by the expression of a key transcription factor, Forkhead box P3 (FOXP3). A reduction in Treg frequency and functionality has been proposed as an underlying pathogenic mechanism of PBC. We aimed to characterise the natural Treg (nTreg) epigenetic profile in PBC patients. Additionally, we set out to induce functional and stable Treg cells (SF-iTregs) from PBC-derived effector CD4 cells in vitro, via cyclin-dependent kinase (CDK8/19) inhibition.

Method: CD4+ T cells were magnetically enriched from peripheral blood mononuclear cells (PBMCs) of PBC patients. CD4+T cells were activated by CD3+ activator beads and TCR stimulation without CD28 co-stimulatory signal, and cultured in presence of IL-2 and AS2863619 (CDK8/19 inhibitor). Foxp3, CTLA4 and Helios expression of SF-iTregs was assessed via flow cytometry and by bisulphite sequencing pre- and post-activation in presence of Th1 polarising cytokines. nTregs and SF-iTregs suppressive function was investigated by measuring CellTrace Violet dye-labelled effector T-cells proliferation co-culturing them with SF-iTregs at different dilution. nTregs and SF-iTregs Foxp3 gene locus for STAT5 binding, H3K27ac, proliferation co-culturing them with SF-iTregs at different dilution. nTregs and SF-iTregs Foxp3 gene locus for STAT5 binding, H3K27ac, and chromatin status was characterized by Chromatin immunoprecipitation followed by sequencing (ChIP-seq) and assay for transposase-accessible Chromatin sequencing (ATAC-seq).
**POSTER PRESENTATIONS**

**Results:** Deprivation of CD28 signal and chemical inhibition of cyclin-dependent kinase 8/19 of CD4 T cells is instrumental to induce DNA hypomethylation in Treg signature genes. Our protocol allowed us to obtain above 90% of FOXP3 expressing cells with a 100-fold increase in the cell number over 2 weeks. ATAC-seq and ChiP-seq confirmed that Treg specific epigenetic changes in the SF-iTregs were comparable to nTreg at the baseline. To resemble the liver inflammatory environment of PBC, we cultured nTreg and SF-iTregs in TH1-conditioned media containing IL-12 and IFN-γ for 6 days, demonstrating a better lineage stability in SF-iTregs compared with nTregs. In addition, SFITreg maintain suppressive function in inflamed environment.

**Conclusion:** We apply a novel technique to generate abundant, functional induced regulatory T cells from peripheral conventional CD4+T cells in patients with primary biliary cholangitis. This approach would facilitate the production on a large scale of phenotypically stable, functional induced Tregs from antigen-experienced disease-mediating T cells to apply as GMP cellular therapy in PBC.

**SAT-381 Intermediate monocytes and associated chemokines allow differentiation of idiosyncratic drug-induced liver injury (DILI) and autoimmune hepatitis (AIH)**

Stuart Astbury1, Edmond Atallah1, Amber Bozward2, Natalia Krajewska2, Grace Wootton3, Jane I. Grove1, Ye Htun Oo2, Guruprasad Aithal1.

1University of Nottingham, Nottingham Digestive Diseases Centre, Nottingham, United Kingdom; 2University of Birmingham, United Kingdom; 3University of Würzburg, Germany

**Background and aims:** About 30% of AIH cases can present acutely and up to 9% of DILI cases share clinical, serological, and histological features with AIH. Distinguishing patients with DILI from AIH is of critical importance as the management of these two conditions differs substantially. Characterising different immune cell types may reveal different mechanisms underlying these conditions. These may have a clinical application as biomarkers to differentiate both types of liver injury.

**Method:** Patients with acute liver injury were enrolled prospectively. Following adjudication by an independent panel, patients were assigned to DILI (n = 13) or AIH (n = 6) groups according to criteria set by the DILI International Expert Working Group or International AIH Group respectively. These were compared with age-matched controls (n = 20).

Patients were sampled at time of liver injury, all AIH cases were steroid naive. Whole blood was stained using the Maxpar Direct Immune Profiling assay and analysed using a Helios mass cytometer. FlowSOM was used to identify cell populations from the 30 antibody panel, with monocyte clusters defined according to existing criteria. Differential monocyte populations were identified and their frequency compared to age-matched controls.

**Results:** We observed a significant decrease in classical monocyte frequency in AIH compared to both DILI and healthy controls (adjusted p < 0.001). Intermediate monocytes were significantly increased in AIH compared to DILI. Plasma CCL2 was negatively correlated with classical monocytes (Rho = –0.46, p = 0.04) and positively correlated with intermediate monocytes (Rho = 0.5, p = 0.028). Plasma CCL2, CCL3, CCL8, CXCL10, TNF-α and IL-17A were significantly increased in AIH compared to DILI.

**SAT-382 TIGIT inhibits the cytotoxic effects of NK cells towards biliary epithelial cells in autoimmune hepatitis**

Amber Bozward1,2,3,4, Rémi Fiancette1,2, Scott Davies1,2, Grace Wootton1,2,3,4, Ye Htun Oo1,2,3,4, Guruprasad Aithal1,1University of Birmingham, Institute of Immunology and Immunotherapy, Birmingham, United Kingdom; 2NIHR Birmingham Biomedical Research Centre, University of Birmingham, Birmingham, United Kingdom; 3Centre for Rare Diseases, European Reference Network on Hepatological Diseases (ERN RARE-LIVER) Centre, Birmingham, United Kingdom; 4Birmingham Advanced Cellular Therapy Facility, University of Birmingham, Birmingham, United Kingdom

**Background and aims:** Natural killer (NK) cells play an important role in autoimmune hepatitis (AIH) and are enriched in the liver, accounting for 25–40% of total intrahepatic lymphocytes. The interaction of checkpoint inhibitor, TIGIT, with its ligands, CD155 and CD112, has been shown to inhibit NK cytotoxicity in an oncological environment. However, little is known regarding the role of TIGIT+NK cells in autoimmune hepatitis.

**Method:** TIGIT+NK cell phenotype was investigated using 16 colour flow cytometry analysis of peripheral blood mononuclear cells (AIH = 12, PBC = 5, PSC = 2, NASH = 2, ALD = 1, healthy volunteers = 10) and liver infiltrating lymphocytes (PBC = 2, AIH/PSC/PVT = 1, AIH = 1, NASH = 1, ALD = 2, non-cirrhotic donor = 4). Immunohistochemistry was applied to investigate localisation of NK cells in explanted liver tissue. Coculture experiments were performed with peripheral blood TIGIT+NK cells from AIH patients with either biliary epithelial cells (BEC) isolated from explant livers or sorted dendritic cells (DCs) and monocytes.

**Results:** NK cells were significantly upregulated in diseased livers compared to AIH blood (p < 0.0001). Immunohistochemistry staining demonstrated that CD56+NK cells localise around the bile ducts and hepatocytes in AIH. TIGIT expression in AIH liver also localised around bile ducts and hepatocytes. TIGIT ligand CD112 is expressed on both hepatocytes and BEC and the other TIGIT ligand, CD155 is expressed predominantly on hepatocytes. Flow cytometry staining demonstrated that TIGIT+NK cells in AIH patients express liver homing chemokine receptor, CXCR3 (7.53% ± 22.18), biliary homing...
chemokine receptor, CCR6 (10.95% ± 65.45) and integrin, VLA-4 (36.15% ± 59.52). These cells also expressed tissue residency marker CD112 (13.48% ± 52.92). Coculturing co-inhibitory TIGIT+NK cells with DCs did not lead to apoptosis/necrosis of BEC, despite their expression of cytotoxic molecules (granzymes A, B, K, perforin). Intrahepatic DC’s and monocytes in AIH also express TIGIT ligands, CD112 and CD155; within DC’s this expression was predominantly on myeloid DCs (p < 0.0001 and p = 0.0096 respectively compared to pDCs). Coculturing TIGIT+NK cells with DCs and monocytes could mount a bi-directional T cell and antigen presenting cell immune response in both subsets.

**Conclusion:** We have shown that TIGIT+NK cells are present in AIH liver. We also demonstrated the localisation of TIGIT ligands CD112 and CD155 in AIH livers. TIGIT+NK cells express liver homing, biliary homing, and tissue resident phenotype. Our results indicate that TIGIT+NK cells lack cytotoxicity towards biliary epithelial cells and could mount a tolerogenic immune response in AIH. TIGIT+NK cells therefore may contribute to resolving inflammation in AIH.

**SAT-383**

**Liver sinusoidal scavenger cells eliminate betaherpesvirus from the blood stream**

Anett Kristin Larsen1, Javier Sánchez Romano1, Jaione Simón-Santamaria1, Kim Erlend Mortensen1, Ingelin Kyrrestad1, Eirik Lænsman1, Anne-Lotte Vada Hatlegjerde1, Bård Smidsrød1, Hans Hirsch2, Christine Hanssen Rinaldo2, Peter McCourt1, Karen Kristine Sørensen1, 1UiT The Arctic University of Norway; Department of Medical Biology, Norway; 2University Hospital of North Norway, Department of Gastrointestinal Surgery, Norway; 3University of Basel, Department Biomedicine Transplantation and Clinical Virology, Switzerland; 4University Hospital of North Norway, Department of Microbiology and Infection Control, Norway

**Email:** anett.k.larsen@uit.no

**Background and aims:** The liver sinusoidal endothelial cells (LSECs) are pivotal as scavengers of circulating large molecules and nanoparticles. Hence, we hypothesize that LSECs, in collaboration with Kupffer cells, are key contributors to the cellular arm of the antiviral innate immune system as virus scavengers. Most viruses taken up by LSECs will likely be eliminated through the effective degradative endolysosomal apparatus, but some viruses may escape. Murine LSECs have been shown to serve as a latent reservoir for murid betaherpesvirus (MuHV-1), but the permissivity of these specialized endothelial cells is less clear with regards to human betaherpesvirus 5 (HHV-5). The aim of this study was to reveal the role of the liver in blood clearance of betaherpesviruses, determine the capability of LSECs to scavenge larger enveloped viral particles, and investigate cellular effects following viral internalization. In addition, we compared if LSECs handle host-pathogenic viruses and similar non-pathogenic viruses differently.

**Method:** Murine models (C57Bl/6) were used to investigate blood clearance and organ distribution of HHV-5 and MuHV-1. Furthermore, liver tissue was obtained from patients undergoing hepatic resections. LSECs were isolated from the non-parenchymal liver cell fraction using MACS Microbeads, challenged with viruses, immunolabelled and imaged using different microscopy techniques. Primary LSECs of human and murine origin were used to investigate cellular uptake mechanisms, intracellular transport of endocytosed virus, susceptibility to infection as well as immune responses following viral challenge.

**Results:** HHV-5 and MuHV-1 were efficiently cleared from blood within 30 min in the mouse model and high uptake of viral particles in liver and spleen was confirmed. Association of HHV-5 with fenestrated human LSECs was verified using super-resolution light microscopy (see figure), whereas internalization of viral particles was confirmed using transmission electron microscopy. Internalized viruses colocalized with LAMP-1 positive structures already at 2 h post challenge. Early and late viral proteins were detected 24 and 72 h post challenge, respectively. Secretion of the cytokines TNFalpha and IL-6 following challenge with MuHV-1 was superior to levels detected following HHV-5 challenge in the murine model system. The latter confirmed that LSECs are capable of internalizing and degrading non-pathogenic viruses without eliciting an immune reaction.

**Conclusion:** The presented work confirms the essential role of the liver in elimination of betaherpesviruses from the circulation, with shared viral scavenging between LSECs and Kupffer cells. Human LSEC are permissive for HHV-5 infection, introducing the possibility of these cells contributing to latency.

**SAT-384**

**Immune characterization of the melanocortin-4-receptor mouse model for non-alcoholic steatohepatitis using mass cytometry and imaging mass cytometry**

Fabienne Birrer1, Tess Brodie1, Tural Varahmad1, Deborah Stroka1, 1University of Bern, Inselspital, Bern University Hospital, Department of Visceral Surgery and Medicine, Bern, Switzerland

**Email:** fabienne.birrer@unibe.ch

**Background and aims:** Dysregulated liver immune responses are critical in liver diseases, including non-alcoholic fatty liver disease (NAFLD), non-alcoholic steatohepatitis (NASH) and cirrhosis. Histological features of NASH are liver steatosis, inflammation, hepatocyte ballooning and fibrosis. There are many animal models used to study NAFLD and NASH, which are either genetically modified, chemically- or diet induced. The melanocortin-4-receptor knock out (MC4R-KO) mouse fed a western type diet (WD) is one of the models with the highest similarities to human NASH. However, the model was established only in 2019 and characterization, especially immune cell characterization, is not completed yet. Mass cytometry (MC) is a well-established method to phenotype cells in suspension by labelling them with metal tagged antibodies. Imaging mass cytometry (IMC) is a new high multiplexing imaging technology that provides complex cellular phenotyping on single cell level and interrelationships in spatial context at the same time. In this project, we aim to better characterize the MC4R NASH mouse model and describe a specific immune profile found during disease progression by using MC for phenotyping cells in suspension and IMC for cell localization and community building.

**Method:** We used the MC4R-KO mouse model to study NAFLD and NASH. MC4R-KO and wild-type mice were fed either a WD or normal diet and analyzed at both 10 and 16 weeks. We used MC and IMC for cell localization and community building.
**SAT-385**

**The effect of testosterone on human T cells in health and autoimmune liver disease**

**Lara Henze**¹, **Stephanie Stein**¹, **Jasper Meyer**¹, **Tobias Poch**¹, **Jenny Krause**², **Christian Casar**¹, ², **Dakyung Lee**¹, **Johannes Fuß**³, ⁴, **Martin Zeitz**³, ⁴

**University Medical Center Hamburg-Eppendorf, Hamburg-Eppendorf, Institute for Clinical Chemistry and Laboratory Medicine, Hamburg, Germany; ²University Medical Center Hamburg-Eppendorf, Hamburg, Hamburg Center for Translational Immunology, Germany; ³University of Duisburg-Essen, Institute of Forensic Psychiatry and Sex Research, Germany; ⁴University Medical Center Hamburg-Eppendorf, Institute for Sex Research, Sexual Medicine and Forensic Psychiatry, Germany; ⁵University Medical Center Hamburg-Eppendorf, Institute for Clinical Chemistry and Laboratory Medicine, Germany; ⁶University Medical Center Hamburg-Eppendorf, Hamburg, Hamburg Center for Translational Immunology, Germany; ⁷University Medical Center Hamburg-Eppendorf, Martin Zeitz Centre for Rare Diseases, Germany

**Email:** la.henze@uke.de

**Background and aims:** Females are more prone to develop autoimmune diseases, including primary biliary cholangitis (PBC). The underlying mechanisms are still unknown. We here aimed to unravel the effects of testosterone on T cell phenotype and function, and how this may contribute to the pathogenesis of PBC.

**Method:** Two unique clinical cohorts were analyzed: I) Female and male individuals with PBC compared to age and sex matched healthy controls and II) transgender men receiving gender-affirming testosterone treatment. **Ex vivo** multi-color flow cytometry, **in vitro** conversion assays and CITE-single cell sequencing were used to characterize T cells and to identify changes upon in vivo testosterone treatment.

**Results:** Immunophenotyping revealed increased TH1 cell numbers and reduced Tregs to TH17 cell ratio in female individuals with PBC compared to healthy controls. The shift towards pro-inflammatory immune responses was supported by significant increase of **in vitro** TH1 conversion rates in female individuals with PBC. Importantly, female people with PBC presented with lower serum testosterone levels compared to healthy female age matched controls. Reduced TNFα and IFNγ release by testosterone treated T cells confirmed a direct effect of testosterone on immune cell regulation. Moreover, we analyzed single cell T cell transcriptomes in the transgender cohort after high dose in vivo testosterone treatment and identified significant changes in CD4 as well as CD8 T cell subset composition.

**Conclusion:** Together these data suggest that testosterone has a regulatory effect on T cells in health and autoimmune and that this may contribute to the pathogenesis of PBC.

**SAT-386**

**CXCL9 does not ameliorate murine macrophage activation syndrome hepatitis**

**Tamir Diamond**¹, ², **Michelle Lau**³, **Jeremy Morrisette**³, **Niansheng Chu**², **Edward Behrens**¹, ², **University of Pennsylvania, Pediatrics, Philadelphia, United States; ²Children's Hospital of Philadelphia, Pediatrics, Philadelphia, United States; ³University of Pennsylvania, Immunology, United States

**Email:** diamondt@chop.edu

**Background and aims:** Macrophage activation syndrome (MAS) is a cytokine storm syndrome characterized by systemic inflammation, multiorgan dysfunction and hepatitis. It is a known cause for liver failure in pediatric population. Interferon gamma (IFNg) is a main mediator of disease in MAS. It's down stream Chemokine (C-X-C motif) ligand 9 (CXCL9) is a clinically established biomarker to measure disease activity. In previous published studies of murine MAS-like disease model through TLR9 stimulation by CpG DNA as well as human clinical data showed correlation of CXCL9 levels to hepatitis. However, it's biological role in pathogenesis of MAS-hepatitis through its leukocyte receptor C-X-C motif chemokine receptor 3 (CXCR3) has not been studied to date. This study aimed to determine this relationship using a cxcl9⁻/⁻ (cxcl9 KO) murine mode of MAS.

**Method:** MAS was induced in cxcl9 KO and WT C57BL/6 mice using established method of repeated TLR9 stimulation by CpG (50mcg) on days 0, 2, 4, 7 and 9 with sacrifice at day 10. Immunopathology was assessed in various methods: (1) Peripheral blood samples to assess for cytopenia were collected on day 0 and sacrifice. (2) Serum was collected at sacrifice to measure alanine aminotransferase and serum cytokines (INFγ, Ferritin and sIL2r). (3) Spleen and liver leukocytes were extracted using established methods to assess the hepatic inflammatory milieu. (4) Livers were fixed in 4% formalin for 24 hours and stained with haematoxylin and eosin for histological review.

**Results:** MAS features developed in both cxcl9-k0 and WT groups with anemia, leukopenia, lymphopenia, hepatosplenomegaly, elevated sIL2r and ferritin. Features of MAS such as weight loss, splenomegaly, serum ferritin, sIL2r did not differ between groups. Mice from cxcl9-ko group had significantly larger livers (Fig 1A) but comparable serum ALT (Fig 1B). There was no significant difference in degree of hepatitis histologically or in hepatic leukocyte count by flow cytometry. Cxcl9-ko resulted in larger percentage of hepatic T-cells with reduction in NK cells and trend towards reduction in inflammatory monocytes (figure 1C). However, expression of CXCR3+...
Conclusion: Cxcl9 deficiency does not alter phenotype of hepatitis in murine model of MAS. Evaluation of alternative pathways of immune recruitment in MAS-hepatitis should be investigated. Cxcl9 is a useful biomarker to monitor IFNγ activity but is unlikely to be a therapeutic target for MAS-hepatitis.

SAT-387
Characterisation of invariant natural killer T cells in human hepatic biopsies
Elena Jiménez-Martí1,2, Maria Aguilar Ballester2, Gema Hurtado-Genovés2, Luis Sabater Oriol2,3, Marina Garcés Albir4, Dimitri Dorcaratto4, Sergio Martínez-Hervás5,6,7, Herminia González-Navarro2,7,1 University of Valencia, Biochemistry and Molecular Biology, Valencia, Spain; 2InCLIVA Instituto Indagació Sanitària, Valencia, Spain; 3Hospital Clinic Universitari, Department of Surgery, Valencia, Spain; 4Hepatobiliary and Pancreatic Unit, General and Digestive Surgery Department, Valencia, Spain; 5Hospital Clinic Universitari, Servicio de Endocrinología y Nutrición, Valencia, Spain; 6University of Valencia, Departamento de Medicina, Valencia, Spain; 7CIBER de Diabetes y Enfermedades Metabólicas asociadas (CIBERDEM), Spain
Email: herminia.gonzalez@uv.es

Background and aims: Previous studies in human and mouse models have shown discrepant effects of hepatic NKT sublineages in complications associated with metabolic dysfunction-associated liver disease (MALD). In the present investigation the characterization of inNKT sublineages were done in human hepatic samples from patients undergoing surgical procedures for hepatic tumor or cyst resection.

Method: Human hepatic biopsies from patients were obtained from the Hospital Clínico Universitario de Valencia. Other relevant clinical data was also collected. Patients were grouped in low and high hepatic triglyceride (TG)-content groups for comparisons. Hepatic triglyceride content was determined in Hematoxylin-Eosin stained cross-sections, and TG content by a biochemical in vitro assay and determination of NAS score determined in Hematoxylin-Eosin stained cross-sections. Resident hepatic NKT subtypes in fresh samples were analyzed by flow cytometry using different markers for detection of NKT subsets including niNKT and iNKT and additional markers to define and analyse iNKT1, iNKT2, iNKT17 and iNKTreg. Gene expression analysis of different fibrosis and cancer markers was performed by RT-qPCR and data was relativised to low TG-content patient group.

Results: Consistently, increased classic NAS score, glucose levels and BMI were observed in the high TG-content patient group compared with low TG-content patients consistent with an augmented MALFD. By contrary collagen are was reduced in patients with high hepatic TG content. Interestingly, TG content was inversely correlated with the intrahepatic CD3+ CD56+ NKT cells percentage. No significant differences were observed in NK and NKT cells between patients with low and high TG content. Likewise, similar levels were observed in the percentages of iNKTreg (CD3+ VA18J24+ Foxp3+ Tbet-), iNKT1 (CD3+ VA18J24+ Tbet+ PLZFflow ROR-), iNKT2 (CD3+ VA18J24+ Tbet- PLZFhi ROR+), and iNKT17 (CD3+ VA18J24+ Tbet- PLZFint ROR+) between patients’ groups but iNKT17 and iNKT2 were discretely decreased. Gene expression analysis of genes related with fibrosis including MMP9, COL1A1, TIMP1 and ACTA2 were similar between patients’ groups but SOX9, was significantly enhanced in patients with high TG content.

Conclusion: The present data indicate that patients with exhibiting augmented MALD, display increased SOX9 expression and a mild no significant decrease in iNKT17 and iNKT2. In addition, the inverse correlation between intrahepatic CD3+ CD56+ NKT and intrahepatic TG accumulation suggest a protective role of NKT in advanced hepatic diseased patients.

SAT-388
Mast cell activation index as a novel prognostic marker in a pan-analysis of gastrointestinal cancers
Nataliya Rohr-Udilova1, Matthias Pinter1, Erika Jensen-Jarolim2,3, Michael Trauner1, Rodolfo Bianchini2,3, Matthias Pinter1, Erika Jensen-Jarolim2,3, 1Medical University of Vienna, Internal Medicine III, Gastroenterology and Hepatology, Wien, Austria; 2Institute of Pathophysiology and Allergy Research, Center of Pathophysiology, Infectiology and Immunology, Wien, Austria; 3The Interuniversity Messerli Research Institute, University of Veterinary Medicine Vienna, Medical University of Vienna, University of Vienna, Comparative Medicine, Vienna, Austria
Email: nataliya.rohr-udilova@meduniwien.ac.at

Background and aims: Mast cells are key components of the allergic response, as they release mediators and cytokines when activated due to allergen binding. There is growing evidence supporting the role of mast cell activation in cancer, thus contributing to the novel field of Allergocancer. Machine learning algorithms can be used to quantify bulk gene expression data from tumours, including activated and resting mast cells (1, 2). Drawing from the preceding data on liver cancer, we hypothesized that mast cells could play a special role in the development of gastrointestinal cancers in general. To this end, we propose a novel marker, the mast cell activation index (MCAI), to evaluate the role of mast cells in GI cancers.

Method: Gene expression data from 1675 patients with GI cancers, including hepatocellular carcinoma, cholangiocarcinoma, esophageal carcinoma and adenocarcinomas of the pancreas, rectum, stomach and colon (TCGA), were evaluated using a machine learning algorithm (1) and compared to 7673 patients with non-GI cancers (2). The mast cell activation index (MCAI) was calculated as a ratio of activated mast cells to total mast cells. Based on the MCAI value, patients were stratified into three groups: i) MCAI = 0 (low, n = 712, zero mast cell activation), ii) 0 < MCAI < 1 (medium, n = 168, partial activation) and iii) MCAI = 1 (high, n = 795, full activation). The results were correlated with clinical characteristics such as overall survival (OS) and progression-free survival (PFS) using the Log-Rank Mantel-Cox test.

Results: Mast cell activation was found to be a favorable prognostic marker for GI cancers. The median PFS was 3 times longer in the high
MCAI group compared to the low MCAI group, with the medium MCAI group being in between (Low: 644 d, 95%CI 504–783 d; Medium: 1003 d, 95% CI 545–1460 d; High: 1928 d, 95% CI 1317–2540 d, p < 0.0001, Fig. 1A). The differences in OS were much less pronounced (Low: 1372 d, 95%CI 1162–1581 d; Medium: 2532 d, 95% CI 653–4411 d; High: 1849 d, 95% CI 1478–2220 d, p = 0.03, Fig. 1B). In contrast, a high MCAI was associated with worse OS and PFS outcomes in non-GI cancers (p < 0.0001, Fig. 1C, D).

**Conclusion:** Our pan-analysis of seven gastrointestinal cancers using a novel marker-mast cell activation index (MCAI)-showed that gastrointestinal tumour patients with fully active mast cells had a longer progression-free survival. This suggests that mast cell activation has a protective effect in GI cancers and merits further exploration. It is possible that mast cells may offer new therapeutic opportunities for treating gastrointestinal tumours.

**References**

**SAT-389**
The ascitic environment in cirrhosis upregulates the expression of the immune checkpoint CD155 on peritoneal macrophages

**Joseph Delo1,2, Daniel Forton1,2, Evangelos Triantafyllou3, Arjuna Singanayagam1,5, 1St George’s University of London, United Kingdom; 2St George’s Hospital, United Kingdom; 3Imperial College London, United Kingdom
Email: joseph.del0@gmail.com**

**Background and aims:** Peritoneal macrophages from the ascites of patients with decompensated cirrhosis (DC) are known to have impaired phagocytic and anti-microbial function. This is most profound in those with accompanying organ-failure (acute-on-chronic liver failure; ACLF). CD155 (poliovirus receptor) binds the inhibitory receptors TIGIT and CD96 on T cells and NK cells. CD155 on macrophages can mediate a transition to an M2-like, immunosuppressive phenotype in tumour-associated macrophages. It has also been shown, in the context of other chronic diseases, to impair macrophage ability to activate T cells during antigen-presentation. A soluble form of CD155 is also produced by cells, which can inhibit NK cells. We hypothesised that peritoneal macrophages from patients with DC would express more CD155, and that this might be a result of chronic exposure to bacterial products translocating from the gut into the ascites.

**Method:** Peripheral blood mononuclear cells (PBMC) and peritoneal mononuclear cells from patients with DC (n = 11) were assessed for surface expression of CD155 on monocytes or macrophages by flow cytometry analysis. Peritoneal cells from patients with end-stage renal disease undergoing Continuous Ambulatory Peritoneal Dialysis (CAPD) were used as a control (n = 5). The concentration of soluble CD155 in ascitic fluid from DC patients, with or without ACLF, was determined by ELISA. Healthy control PBMCs were cultured in ascites, or in media with various Toll-Like Receptor (TLR) agonists, for 48 hours, and the surface expression of CD155 assessed.

**Results:** More peritoneal CD14+CD16- macrophages from the ascites of patients with DC expressed CD155 than those from CAPD controls (58.64 versus 26.09%, p = 0.0365, figure A). The concentration of soluble CD155 in ascites was higher in patients with ACLF compared to those without ACLF. Patients with DC had higher levels of CD155 on their peritoneal macrophages compared to their peripheral monocytes, indicating that the ascitic environment may influence CD155 expression. Indeed, culturing healthy PBMCs with ACLF ascites upregulated monocyte CD155 expression more than culture media alone or non-ACLF ascites (p = 0.0245, figure B). Similar upregulation of CD155 on monocytes was seen after culturing healthy PBMCs with lipopolysaccharide (LPS; a TLR-4 agonist).

**Conclusion:** The high expression of CD155 on peritoneal macrophages from patients with decompensated cirrhosis might in part explain their immunosuppressive phenotype and why patients are so susceptible to spontaneous bacterial peritonitis. This increase in CD155 expression is particular to the peritoneum, and not seen in the periphery, and can be induced by exposure to ascites and LPS, suggesting that bacterial translocation may be responsible.

**SAT-390**
Distinct immunometabolic signatures in circulating immune cells define disease outcomes in acute-on-chronic liver failure

Rita Furtado Feio de Azevedo1, Markus Boesch1, Silvia Radenkovic2,3,4, Marie Wallays1, Lukas Van Melbeke1,5, Bram Boecks2,6, Gino Philips6,7, Lena Smet7, Wim Lalemant1,8, Philippe Meersseman9, Alexander Wilmer7, David Cassiman1,3, Hannah Van Malensteijn1,5, Joan Claria8, Frederik Nevens1,5, Jef Verbeek1,5, Richard Moreau10, Vicente Arroyo11, Dieter Lambrechts6,7, Bart Chesquiere1,4, Hannelie Korf1, Schalk van der Merwe1,2, 1Laboratory Hepatology, KU Leuven, CHROMETA Department, Leuven, Belgium; 2Mayo Clinic, Department of Clinical Genomics, Rochester, United States; 3VIB Center for Cancer Biology, Metabolomics Expertise Center, Leuven, Belgium; 4KU Leuven, Metabolomics Expertise Center, Department of Oncology, Leuven, Belgium; 5UZ Leuven, Department of Gastroenterology and Hepatology, Leuven, Belgium; 6VIB Center for Cancer Biology, Department of Human Genetics, Leuven, Belgium; 7KU Leuven, Laboratory for Translational Genetics, Department of Human Genetics, Leuven, Belgium; 8UZ Leuven, Department of Internal Medicine, Leuven, Belgium; 9Universitat de Barcelona, Hospital Clinic-IDIBAPS, CIBERehd, Barcelona, Spain; 10Université de Paris Cité, Centre de Recherche sur l’Inflammation (CRI) UMR51149, Clichy, France; 11EASL-CLIF Consortium, Barcelona, Spain
Email: rita.azvedeo@kuleuven.be

**Background and aims:** Acute-on-chronic liver failure (ACLF) is a devastating syndrome characterized by multiple organ failure and
high short-term mortality. The pathophysiology of ACLF is on the one side linked to elevated systemic inflammation that precipitate organ dysfunction and on the other side, immune dysfunction and increased susceptibility to bacterial infections. However, this immunological paradox is poorly understood and it is unclear how these aspects are associated with disease outcome. Here we map the single cell transcriptome of circulating cells from ACLF patients and we interrogated how specific immunometabolic signatures are linked to disease outcome.

**Method:** We performed single-cell transcriptomics of PBMCs from healthy \( n = 3 \), acute decompensated \( n = 3 \) and ACLF patients \( n = 9 \). We further validated these findings in an independent cohort using bulk-sequencing, metabolomics and functional assay approaches.

**Results:** The data revealed two distinct classical monocyte (cMon) states that were uniquely linked to either ACLF-recovery (ACLF-R) or -non-recovery (ACLF-NR). Characteristic markers include VIM, LGALS2 and TREM1 for ACLF-NR cMon and RETN, S100A8/P and LGALS1 for ACLF-R cMon. Additionally, ACLF-NR cMon featured inflammation- and stress response transcriptional traits, while ACLF-R cMon were hallmarkd by transcripts involved in stress tolerance, IFN signaling, superoxide scavenging, oxidative phosphorylation and refractory functionality. Interestingly, we observed a common stress-induced tolerant state, oxidative phosphorylation program, blunted activation and functionality also among lymphoid populations in ACLF-R compared to ACLF-NR patients.

**Conclusion:** This study uncovers unique cellular states and their underlying metabolite fingerprints that underlie disease outcome in ACLF patients. The data further provide important insights in disease pathogenesis and can act as foundation for larger studies to identify and validate targets for therapies.

**SAT-391**

**RIPK3-mediated XBP1-Foxo1 axis controls NOD1 function and Calcineurin/TRPM7-induced cell death in liver inflammatory injury**

Xiao Ye Qu, Tao Yang, Xiao Wang, Dongwei Xu, Michael Ke, Jun Li, Longfeng Jiang, Qiang Xia, Douglas Farmer, Bibo Ke. The Dumont-UCLA Transplant Center, Division of Liver and Pancreas Transplantation, Surgery, Los Angeles, United States; Renji Hospital, Shanghai Jiaotong University School of Medicine, Liver Surgery, China; The Dumont-UCLA Transplant Center, Division of Liver and Pancreas Transplantation, Surgery, Los Angeles, United States; The First Affiliated Hospital, Nanjing Medical University, Infectious Diseases, China

**Email:** bke@mednet.ucla.edu

**Background and aims:** RIPK3 is a central player in triggering necroptotic cell death. However, whether macrophage RIPK3 may regulate NOD1-dependent inflammation and Calcineurin/TRPM7-induced hepatocyte death in oxidative stress-induced liver inflammatory injury remains elusive.

**Method:** A mouse model of hepatic ischemia/reperfusion injury (IRI), the primary hepatocytes, and bone marrow-derived macrophages were used in the myeloid-specific RIPK3 knockout (RIPK3KO) and RIPK3-proficient (RIPK3WT) mice. IR-stress activated RIPK3, IRE1α, XBP1, NOD1, NF-κB, Foxo1, Calcineurin A, and TRPM7 in ischemic livers. Conversely, RIPK3KO-depressed IRE1α, XBP1, NOD1, Calcineurin A, and TRPM7 activation with reduced serum TNF-α levels. Moreover, Foxo1KO alleviated IR-induced liver injury with reduced NOD1 and TRPM7 expression. Interestingly, chromatin immunoprecipitation (ChIP) coupled with massively parallel sequencing (ChIP-Seq) revealed that macrophage Foxo1 colocalized with XBP1 and activated its target gene Zc3h15.

**Conclusion:** Macrophage RIPK3 activates the IRE1α-XBP1 pathway and Foxo1 signaling in IR-stress livers. The XBP1-Foxo1 interaction is essential for modulating target gene Zc3h15 function, which is crucial for the control of NOD1 and Calcineurin-mediated TRPM7 activation. XBP1 functions as a transcriptional coactivator of Foxo1 in regulating NOD1-driven liver inflammation and Calcineurin/TRPM7-induced cell death. Our findings underlie a novel role of macrophage RIPK3 in stress-induced liver inflammation and cell death, implying the potential therapeutic targets in liver inflammatory diseases.
Liver transplantation and hepatobiliary surgery

WEDNESDAY 21 TO SATURDAY 24 JUNE

TOP-051 Neoadjuvant PD-1 blockade with Pembrolizumab combined with Lenvatinib therapy in patients with hepatocellular carcinoma beyond Milan criteria before liver transplantation (PLENTOLOGY): a single-site pilot randomized controlled trial
Zicheng Li1,2, Qiang Xia1,3, Hao Feng1,3, 1Shanghai Engineering Research Center of Transplantation and Immunology, China; 2Shanghai Engineering Research Center of Transplantation and Immunology, China; 3Shanghai Renji Hospital, Dept. of Liver Surgery, China
Email: surgeonfeng@live.com

Background and aims: Liver transplantation (LT) has become the most effective treatment for hepatocellular carcinoma (HCC); however, the high recurrent rate after LT remains a clinical challenge, especially for those exceeding the Milan criteria. Recently, there have been no approved standardized neoadjuvant or adjuvant therapies for hepatocellular carcinoma before LT. Therefore, we aim to investigate whether programmed death receptor 1 (PD-1) blockade plus lenvatinib as a neoadjuvant therapy before LT allows safely administered and effectively reduces post-LT recurrence for those patients with hepatocellular carcinoma beyond Milan criteria.

Method: In this prospective, randomized, open-label, pilot study, patients with hepatocellular carcinoma exceeding the Milan criteria were randomly assigned (1:1) to receive 200 mg of pembrolizumab every 3 weeks until approximately 6 weeks before LT and combined with lenvatinib 8 mg orally once daily until 1 week before LT (PLENTOLOGY group) or to receive routine treatments (control group) before LT. Patients were randomly assigned to the two groups by computer-generated random number codes concealed in opaque envelopes. The primary endpoint of the study was the recurrence-free survival after LT. Secondary end points were objective response rate, overall survival, and adverse events. This trial is registered with ClinicalTrials.gov (NCT04425226).

Results: Between February 3, 2020, and September 5, 2021, 22 patients were enrolled and randomly assigned: 11 to the PLENTOLOGY group and 11 to the control group. The 12-month tumor-specific recurrence-free survival after LT was significantly improved in the PLENTOLOGY group (62.5%, 95% CI 44.9–94.98) compared to the control group (37.5%, 95% CI 8.52–75.51) (log-rank p = 0.0028). The objective response rate by RECIST in the PLENTOLOGY group was 30% (95% CI 6.67–65.2) and 60% (95% CI 26.2–87.8) when determined by mRECIST, respectively. In the PLENTOLOGY group, the disease control rate was 100% (95% CI 69.15–100) according to both RECIST 1.1 and mRECIST.

Conclusion: Neoadjuvant pembrolizumab plus lenvatinib before LT appears to be safe and feasible in hepatocellular carcinoma patients; it would be a potential therapeutic option for patients exceeding the Milan criteria, associated with significantly better recurrence-free survival. Our findings support further studies of neoadjuvant immunotherapy in combination with TKIs in the bridging treatment for hepatocellular carcinoma.

TOP-052 Graft steatosis and donor diabetes mellitus additively increase the risk of retransplantation and death in adult liver transplantation -data from the Eurotransplant registry
Milan Sonneveld1, Fatemeh Parouei1, Caroline den Hoed1, Jeroen de Jonge1, Mortezza Salarzai1, Robert Porte1, Harry LA Janssen1, Marieke van Rosmalen2, Serge Vogelaar1, Adriaan Van der Meer1, Raool Maan1, Sarwa Darwash Murad1, Wojciech Polak1, Willem Pieter Brouwer1, 1Erasmus MC, Netherlands; 2Eurotransplant, Netherlands
Email: m.j.sonneveld@erasmusmc.nl

Background and aims: Presence of severe steatosis in the donor graft has been associated with an increased risk of adverse outcomes after liver transplantation. Recent studies indicate that presence of other metabolic risk factors increases the risk of advanced liver disease among patients with hepatic steatosis. Presence of metabolic risk factors in the donor may therefore confer additive risk for graft failure after transplantation. We studied the association between graft steatosis and metabolic risk factors in the donor with recipient outcomes after liver transplantation.

Method: We analysed data from all consecutive first adult full-graft DBD liver transplantations performed in the Eurotransplant region between 2010 and 2020. Presence of graft steatosis was assessed through review of individual donor medical history reports. The association between graft steatosis and metabolic risk factors in the donor was assessed through the Kaplan-Meier method and multivariable Cox regression models, adjusted for Eurotransplant donor risk index (ET-DRI), donor and recipient sex, recipient age, and recipient labMELD.

Results: We studied 12174 transplantations. Median donor age was 56 (IQR 45–67), median donor BMI was 26 (24–28), median cold ischemia time (CIT) was 506 (403–610) minutes, median ET-DRI was 1.49 (1.24–1.76) and median recipient labMELD was 16 (10–26). Graft steatosis was detected in 2689 (22.1%), and diabetes mellitus, hypertension and dyslipidaemia was present in 1245 (10.2%), 5056 (41.5%) and 524 (4.3%) of donors. In univariable analysis, presence of graft steatosis (Hazard Ratio [HR] 1.247, p < 0.001), and presence of DM (HR 1.274, p < 0.001), HT (HR 1.144, p < 0.001), and higher BMI (HR 1.014, p < 0.001) in the donor were associated with impaired post-transplant outcomes.
retransplantation-free survival, whereas donor dyslipidaemia was not (HR 1.019, P = 0.810). In multivariable Cox regression analysis, graft steatosis (adjusted HR [aHR] 1.197, p < 0.001) and donor DM (aHR 1.157, p = 0.004) were independently associated with an increased risk of retransplantation or death in the recipient, whereas hypertension, dyslipidaemia and donor BMI were not. When compared to donors without graft steatosis and DM, the risk of recipient retransplantation or death was increased for grafts from donors with DM alone (aHR 1.155, p = 0.019), or steatosis alone (aHR 1.199, p < 0.001) and highest for grafts obtained from donors with both steatosis and DM (aHR 1.362, p < 0.001). Observed retransplantation-free survival at 1, 5 and 10 years was 79%, 65% and 48% among recipients of a non-steatotic graft from a non-diabetic donor, compared to 69%, 53% and 29% for recipients of a steatotic graft from a diabetic donor (p < 0.001).

Conclusion: Graft steatosis and donor DM additively increase the risk of retransplantation or death in adult DBD liver transplantation. Pts should be carefully selected and careful postoperative monitoring is necessary for pts receiving these high risk grafts. Until such time, caution should be exercised when considering these grafts for transplantation.

TOP-059
Two-year follow-up of liver grafts from COVID-19 donors
Margherita Saracco1, Donatella Cocchis2, Francesco Tandori2, Federica Rigo2, Renato Romagnoli2, Silvia Martinì1,2. AOI Città della Salute e della Scienza di Torino, Gastrohepatology Unit, Italy; AOI Città della Salute e della Scienza di Torino, General Surgery 2U, Liver Transplantation Center, Italy
Email: margherita.saracco@gmail.com

Background and aims: SARS-CoV-2 infections complicated by thrombosis and secondary sclerosing cholangitis were reported; however, solid non-lungs transplantation from COVID-19 donors showed excellent early results, but medium/long-term data are lacking. We aimed to describe the outcome of our LT patients (pts) who received a graft from COVID-19 donors.

Method: We consecutively enrolled all pts transplanted in our Center from 11/2020 to 03/2022 who received a liver graft from COVID-19 donors. Pts underwent protocolar liver biopsy and magnetic resonance cholangiopancreatography (MRCP) after at least 1 year from LT. Follow-up was closed in January 2023.

Results: In the study period, among 213 adult LTs, 12 (5.6%) received a graft from COVID-19 donors. Follow-up was closed in January 2023. Among the 12 recipients, 7 (58%) were alive and 1 died after 320 days for hepatocellular carcinoma recurrence.

Table 1: Pts’ and donors’ characteristics at liver transplant

<table>
<thead>
<tr>
<th></th>
<th>Recipients n = 12</th>
<th>Donors n = 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td>61 [56–65]</td>
<td>59 [52–63]</td>
</tr>
<tr>
<td>Sex, male</td>
<td>9 (75%)</td>
<td>8 (67%)</td>
</tr>
<tr>
<td>Hepatocellular carcinoma</td>
<td>9 (75%)</td>
<td>NA</td>
</tr>
<tr>
<td>Model for end stage liver disease at LT</td>
<td>10 (8–14)</td>
<td>NA</td>
</tr>
<tr>
<td>SARS-CoV-2 vaccination before LT</td>
<td>4 (33%)</td>
<td>1 (8%)</td>
</tr>
<tr>
<td>SARS-CoV-2 IgG positive before LT</td>
<td>12 (100%)</td>
<td>1 (8%)</td>
</tr>
<tr>
<td>SARS-CoV-2 RNA swab positive at LT</td>
<td>2 (17%)</td>
<td>2 (37%)</td>
</tr>
<tr>
<td>SARS-CoV-2 RNA BAL positive at LT</td>
<td>NA</td>
<td>9/9 (100%)</td>
</tr>
<tr>
<td>Donor risk index</td>
<td>2 (1.6–2.2)</td>
<td></td>
</tr>
<tr>
<td>SARS-CoV-2 RNA PCR negative on liver biopsy</td>
<td>11/11</td>
<td>100%</td>
</tr>
<tr>
<td>Hypothermic machine perfusion</td>
<td>3 (25%)</td>
<td></td>
</tr>
<tr>
<td>Normothermic machine perfusion</td>
<td>1 (8%)</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: After a median time from LT of 1.8 years, 11/12 pts who received a liver graft from COVID-19 donors were alive, without evidence of SARS-CoV-2 RNA transmission. Protocolar MRCP and liver biopsy did not show signs of biliopathy or fibrosis supporting the safe utilization of COVID-19 donors to expand the donor pool and reduce the waiting list mortality.

Reference

THURSDAY 22 JUNE
THU-477
Defective efferocytosis by aged macrophages promotes STING signaling mediated inflammatory liver injury
Haoran Hu1, Zhuqing Rao1, Xuyu Cheng1, Jian Xu1, Dongming Wu1, Ping Wang1, Haoming Zhou1, Feng Cheng1. The First Affiliated Hospital of Nanjing Medical University, China
Email: docchengfeng@njmu.edu.cn

Background and aims: Timely efferocytosis of apoptotic cells is a key mechanism for avoiding excessive inflammation and tissue injury. MerTK (c-mer proto-oncogene tyrosine kinase), a member of the TAM (Tyro3, Axl, and MerTK) family, plays an essential role in regulating macrophage STING (stimulator of interferon genes) activation to aggravate inflammatory liver injury. Here, we investigated the alteration of efferocytosis by aged macrophages and its role in regulating macrophage STING signaling and ischemic liver injury.

Method: Young (8 weeks) and aged (100 weeks) STING myeloid-specific Cre mice and wild-type mice were subjected to a model of liver ischemia and reperfusion. Efferocytosis by macrophages was analyzed in vivo and in vitro macrophages co-cultured with apoptotic Jurkat cells. The MerTK CRISPR activation plasmid, ADAM17 (a disintegrin and metalloproteinase 17) siRNA and N-acetylcysteine were used to conduct rescue experiments.

Results: Aged macrophages exhibited impaired efferocytosis with decreased MerTK activation, which was reversed by treatment with the MerTK CRISPR activation plasmid. Increased MerTK cleavage by ADAM17 due to enhanced ROS levels contributed to defective MerTK-mediated efferocytosis by aged macrophages. MerTK activation by suppressing ADAM17 or ROS improves aged macrophage efferocytosis, leading to reduced liver inflammation and IR injury. Moreover, increased apoptotic hepatocytes, DNA accumulation, and
macrophage STING activation were observed in aged livers post-IR. Improvement in efferocytosis by aged macrophages via MerTK activation suppressed STING activation and inflammatory liver injury.

Conclusion: Our study demonstrates that aging suppresses MerTK-mediated macrophage efferocytosis to promote macrophage STING activation and inflammatory liver IR injury, suggesting a new mechanism and potential therapy to promote inflammation resolution and efferocytosis in aging.

THU-478
C105SR, a novel non-peptidic small-molecule cyclophilin inhibitor with potent mitoprotective and hepatoprotective properties in the context of hepatic ischemia/reperfusion injury
Amel Kheyar1,2, Nazim Ahnou1,2, Hakim Ahmed-Belkacem1,2, Bijan Ghalet3, Jean-François Guichou4,5, Didier Morin2,3, Jean-Michel Pawlotsky1,5, Fatima Teixeira-Clerc1,2. INSERM U955, Équipe « Pharmacologie et S456 Journal of Hepatology 6DMU de Biologie et Pathologie, Département Prévention, Diagnostic et 4CNRS UMR5048, INSERM U1054, Centre de Biochimie Structurale (CBS), 4Montpellier, France;5Université de Montpellier, Montpellier, France; Technologigies pour les Maladies Cardiovasculaires », Créteil, France; 3Psomagen Inc, United States; 1Hanyang University, General Surgery, Seoul, Korea, Rep. of South; 2Max Planck, Institute of Molecular Cell Biology and Genetics, Germany; 4CNRS UMR5048, INSERM U1054, Centre de Biochimie Structurale (CBS), Montpellier, France; 2Université de Montpellier, Montpellier, France; 3Université Paris- Est, Créteil, France; 5INSERM U955, Équipe « Viro, Hépatologie, Cancer », Créteil, France; 1INSERM U955, Équipe « Pharmacologie et Technologies pour les Maladies Cardiovasculaires », Créteil, France; 4CNRS UMR5048, INSERM U1054, Centre de Biochimie Structurale (CBS), Montpellier, France; 5Université Paris- Est, Créteil, France; 1Hanyang University, General Surgery, Seoul, Korea, Rep. of South; 2Max Planck, Institute of Molecular Cell Biology and Genetics, Germany; 3Psomagen Inc, United States; 4National Institutes of Health, United States

Background and aims: Mitochondrial permeability transition pore (mPTP) opening is critical in mediating cell death during hepatic ischemia/reperfusion injury. Blocking mPTP opening by inhibiting cyclophilin D (CypD) is a promising pharmacological approach for the treatment of ischemia/reperfusion injury. Here, we show that diastereoisomers of a new class of small-molecule cyclophilin inhibitors (SMCypIs) bear properties making them credible candidates for hepatic ischemia/reperfusion injury therapeutic development.

Method: Derivatives of the original SMCypI were synthetized and evaluated for their ability to inhibit CypD peptidyl-prolyl cis-trans isomerase (PPIase) activity and for their mitoprotective properties, assessed by measuring mitochondrial swelling and calcium retention capacity in mouse liver mitochondria. The ability of the selected compounds to inhibit mPTP opening was evaluated in cells subjected to hypoxia/reoxygenation using a calcine/cobalt assay. Their ability to inhibit cell death was evaluated in cells subjected to hypoxia/reoxygenation by measuring LDH release, propidium iodide staining and cell viability with a MTT assay. The best performing compound in vitro was selected for in vivo efficacy evaluation in a mouse model of hepatic ischemia/reperfusion injury.

Results: The two best compounds at inhibiting CypD PPIase activity and mPTP opening, C105SR and C1105, were selected. Their SR diastereoisomers carried the activity of the racemic mixture and exhibited mitoprotective properties superior to those of the known macrocyclic cyclophilin inhibitors cyclosporin A and alisporivir. C105SR was more potent than C1105SR to inhibit mPTP opening and prevent cell death in a model of hypoxia/reoxygenation. Finally, C105SR substantially protected against hepatic ischemia/reperfusion injury in vivo by reducing hepatocyte necrosis and apoptosis.

Conclusion: We identified a novel cyclophilin inhibitor with strong mitoprotective and hepatoprotective properties both in vitro and in vivo that represents a promising candidate for cellular protection in hepatic ischemia/reperfusion injury.

THU-479
Application of human chemically-derived hepatic progenitors organoids (hCdHO) in regenerative medicine, hepatotoxic and disease modeling
Elsy Soraya Salas Silva1, Yoan Kim2, Taew Hun Kim1, Myounghoi Kim1, Daekwan Seo2, Valentina M. Factor4, Ji Hyun Shin1, Dongho Choi1, Jean-Michel Pawlotsky1,6, Bijan Ghaleh2,3, Jean-François Guichou4,5, Didier Morin2,3, Elsy Soraya Salas Silva1, Yohan Kim2, Tae Hun Kim1, Myounghoi Kim1, Daekwan Seo2, Valentina M. Factor4, Ji Hyun Shin1, Dongho Choi1.
1Hanyang University, General Surgery, Seoul, Korea, Rep. of South; 2Max Planck, Institute of Molecular Cell Biology and Genetics, Germany; 3Psomagen Inc, United States; 4National Institutes of Health, United States

Background and aims: Chemically derived hepatic progenitors (hCdHs), reprogrammed from human primary hepatocytes (hPHs) were recently reported by our research group, which presented differentiation characteristics of both hepatocytes and cholangiocytes. The high percentage of EpCAM expression and other stemness markers allow to our hCdHs to be a great source for organoid generation and longer culture maintenance. Our aim is to demonstrate the hCdH organoids (hCdHO) potency as a regenerative medicine, hepatotoxic test, and modeling disease tool.

Method: hCdHs and hPHs were embebbed on Matrigel with organoid medium to generate hCdHOs and liver organoids (hLOs) respectively. Our hCdH showed a high expression in stemness markers compared with hLOs and higher organoid rate generation. We performed hepatic differentiation of organoids, termed hCdHO_DM and hLO_DM, and as we expected hCdHO_DM presented elevated expression of hepatic markers as well as functional markers, similar to those of hLOs. To address their regenerative capacity, the hCdHO were transplanted into FRG mice. The group that received the hCdHO transplant survived longer (for more than 100 days) than hLOs and control groups. In addition, the markers of liver damage decreased, and albumin and A1AT levels increased. We demonstrated the hCdHO_DM exhibit elevated drug sensitivity versus hPH and hCdHs. Finally, we developed a model of alcohol damage in organoids, where we observed that hCdHs induced the expression of transcription factors and lipogenic-associated enzymes and inflammatory cytokines levels. Gene set enrichment analysis (GSEA) indicated that ethanol-treated hCdHO_DM showed strong induction of alcholic metabolic process and fatty acid metabolism, reflected in lipid accumulation and loss of mitochondrial membrane potential.

Results: The hCdHO showed a high expression in stemness markers compared with hLOs and higher organoid rate generation. We performed hepatic differentiation of organoids, termed hCdHO_DM and hLO_DM, and as we expected hCdHO_DM presented elevated expression of hepatic markers as well as functional markers, similar to those of hLOs. To address their regenerative capacity, the hCdHO were transplanted into FRG mice. The group that received the hCdHO transplant survived longer (for more than 100 days) than hLOs and control groups. In addition, the markers of liver damage decreased, and albumin and A1AT levels increased. We demonstrated the hCdHO_DM exhibit elevated drug sensitivity versus hPH and hCdHs. Finally, we developed a model of alcohol damage in organoids, where we observed that hCdHO_DM increased the expression of transcription factors and lipogenic-associated enzymes and inflammatory cytokines levels. Gene set enrichment analysis (GSEA) indicated that ethanol-treated hCdHO_DM showed strong induction of alcholic metabolic process and fatty acid metabolism, reflected in lipid accumulation and loss of mitochondrial membrane potential.
THU-480
In vitro model of liver ischemia/reperfusion injury identifies iRhom2 as new target of disease
Giovanni Zito1, Matteo Calligaris2, Vitale Miceli3, Claudia Carcione2, Chiara Gatto1, Simone Scilabra2, Duilio Pagano1, Pier Giulio Conaldi1.
1IRCSS ISMETT, Regenerative Medicine, Palermo, Italy; 2Fondazione RiMED, Italy

Background and aims: Ischemia/reperfusion injury (IRI) represents one of the leading causes of primary non-function acute liver transplantation failure. IRI activates an inflammatory cascade from the resident Kupffer cells leading to neutrophils recruitment and apoptosis of the parenchyma. In the last decade, the pro-inflammatory protein iRhom2 has emerged as a central regulator of TNF response to IRI, could regulate secretion of these proteins post-reperfusion of paracrine factors that contributed to IRI induction. Interestingly, proteomic approach revealed, among others, 7 proteins which are up-regulated during cold ischemia, such as ORM1, ORM2, AZGP1, LRG1, A1BG, CP, HPX. Interestingly, we found that the same proteins are strongly down-regulated in the secretome of macrophages undergoing IRI when iRhom2 was silenced. To note, their levels in the cell lysate were not affected by iRhom2 silencing.

Conclusion: Taken together, these data suggest that iRhom2, in response to IRI, could regulate secretion of these proteins post-transcriptionally, by a mechanism that might be independent from TNF pathway.

THU-481
HBV re-infection or de-novo infection in the course of liver transplantation in patients chronically infected with HBV, HBV/HDV, or HCV
Daniele Lombardo1, Giuseppina Raffa1, Irene Cacciola1, Lucio Caccamo2, Maria Francesca Donato2, Giovanni Raimondo1, Teresa Pollicino1. 1University of Messina, Clinical and Experimental Medicine, Messina, Italy; 2Fondazione IRCCS Ca’ Granda Ospedale Maggiore Policlinico, Surgery, Italy

Background and aims: Long-term anti-HBV prophylaxis has been highly effective in reducing the rate of HBV recurrence in HBsAg-positive patients or de novo infection in HBsAg-negative liver transplant recipients of anti-HBc positive hepatic grafts. However, HBV re-infection still occurs in several patients. Aim. To verify HBV reinfection in HBsAg-positive/HDV-negative and HBV/HDV co-infected patients as well as de novo infection in HBsAg-negative liver transplant (LT) recipients during the LT procedures.

Method: Virological analyses were performed on sera and hepatic tissues (native liver, pre- and post-perfusion allograft biopsies) from 21 LT patients (10 HCV-positive/HBsAg-negative, 5 HBsAg positive and 6 HBV/HDV positive). Moreover, liver biopsies from 6/21 cases (2 HCV-positive, 2 HBsAg positive and 2 HBV/HDV positive) obtained at 3 years post-LT were also analysed. Six of the 21 LT patients received anti-HBc positive liver graft.

Results: At the end of surgery, 2/5 HBsAg-positive patients, 2/6 HBV/HDV co-infected patients, and 2/10 HCV-infected patients showed HBV DNA (range: 6 × 10^−4−1 × 10^−3 copies/cells) and HBV cccDNA (range: 2 × 10^−7−2 × 10^−3 copies/cell) in the liver. All these patients received anti-HBc positive liver graft. Moreover, liver biopsies from all these patients at 3 years post-LT were HBV DNA positive despite the persistent HBsAg negativity, showing the presence of occult HBV infections (OBI). Furthermore, tissues from HBV/HDV positive patients were also positive for HDV RNA, which was not detected at the end of LT. Sequencing analysis of HBV DNA isolated from native livers and allografts revealed that the viruses present in liver biopsies 3 years after LT were viral strains of the donors. Of note, an HBV infection was identified in the progressing of re-perfusion damage also in the in vitro IRI model we established in the lab. These findings prompted us to further dissect iRhom2 function in vitro IRI context. For this purpose, we silenced iRhom2 in primary macrophages prior to IRI protocol. iRhom2 silencing was effective at all the timepoints analyzed. Furthermore, we found that iRhom2 KD reduced release of TNF and other IRI-related pro-inflammatory proteins, such as IL-18 and HMGB1. Interestingly, iRhom2 silencing accelerated macrophage recovery during re-perfusion, as shown by increased cell viability and reduced cytotoxicity in comparison with the control primary macrophages. Altogether, these data indicated that iRhom2 contributed to the progression of damage following IRI in vitro, not only by regulating pro-inflammatory cytokine secretion, but also by modulating cell survival. Interestingly, iRhom2 KD macrophages promoted a faster and better recovery of human hepatocyte-like cells compared to controls, when cells were co-cultured using a Transwell permeable supports and applied to the in vitro model of IRI. This suggested that iRhom2 silencing in macrophages could impair release of paracrine factors that contributed to IRI induction. Interestingly, proteomic approach revealed, among others, 7 proteins which are up-regulated during cold ischemia, such as ORM1, ORM2, AZGP1, LRG1, A1BG, CP, HPX. Interestingly, we found that the same proteins are strongly down-regulated in the secretome of macrophages undergoing IRI when iRhom2 was silenced. To note, their levels in the cell lysate were not affected by iRhom2 silencing.

Conclusion: Taken together, these data suggest that iRhom2, in response to IRI, could regulate secretion of these proteins post-transcriptionally, by a mechanism that might be independent from TNF pathway.
positive LT patient showed HBV genotype D sequences in the native liver, whereas HBV genotype A was identified in the allograft both at the end of LT and 3 years after LT.

**Conclusions:** (1) OBI in anti-HBC positive liver graft persists over time both in HBsAg positive and negative recipients after LT. (2) HDV infects the transplanted liver subsequently to LT (3) HBV sequences persisting in transplanted liver are of donor origin.

**THU-482**
The impact of statin utilization on mortality in liver transplant recipients independent of underlying cardiovascular risk
Megan Ghati1, Pooja Rangan1, Rohit Nathan2, Karn Wijarnpreecha3, Mark Wong2, Moises Nevah Rubin2, Michael Fallon2, Ma Ai Thanda Han2. 1University of Arizona College of Medicine Phoenix, Internal Medicine, Phoenix, United States; 2University of Arizona College of Medicine Phoenix, Gastroenterology and Hepatology, Phoenix, United States

**Background and aims:** Liver transplant recipients (LTRs) have a 55.3% risk of developing coronary artery disease within five years of transplant. However, statins are under-prescribed in LTRs despite this known risk. Studies reviewed showed only 23–41% of LTRs with obstructive coronary artery disease were initiated on a statin. It has been hypothesized that the concern for developing drug-induced liver injury in LTRs results in physician hesitancy to prescribe statins, though the estimated rate of statin-induced liver injury is only 1 in 100,000. This study aims to characterize the use of statins and its impact on mortality in LTRs.

**Method:** A retrospective analysis of adult LTRs from January 2012 through March 2022 at a single-center was performed. The population was split into two cohorts, those who had not been prescribed a statin versus those who had been prescribed a statin. Descriptive statistics, including patient demographics and comorbidities were presented. Lifetime major adverse cardiovascular events (MACE), as defined by myocardial infarction, cerebrovascular accidents were produced. Lifetime major adverse cardiovascular events

**Results:** Included were 776 LTRs ages 18–76 years, of whom 566 (72.9%) were not prescribed a statin and 210 (27.1%) were prescribed a statin (table 1). Demographic data and comorbidities are presented in Table 1. Prevalence of lifetime composite MACE was higher LTRs prescribed a statin (no statin = 26.68% vs statin = 46.19%, p < 0.001). However, mortality was lower in those with statin use (no statin = 26.68% vs statin = 46.19%, p < 0.001). The adjusted odds of death in LTR taking a statin was significantly less than those not taking a statin (aOR = 0.33, 95% CI [0.18, 0.54], p < 0.001).

**Conclusion:** We have demonstrated that mortality is reduced in LTRs taking a statin in comparison those not taking a statin. The prevalence of lifetime composite MACE was higher in LTRs taking statins, suggesting that LTRs who have had a MACE are more likely to be prescribed a statin. These results indicate that statin use is an independent predictor of mortality in LTRs, irrespective of underlying cardiovascular risk. Future studies that stratify patients based on their known cardiovascular risk will allow us to clarify these results further.

**THU-483**
Quantification of remnant liver ischaemia after hepatectomy for hepatocellular carcinoma (HCC) using advanced 3D software analysis and its impact on disease recurrence
Acidi Belkacem1, Mohammed Challab1, Omar Ali2, Nassiba Baghdadi3, Nicolas Golse1, Marc Antoine Allard1, Antonio Sa Cunha1, Daniel Azoulay1, René Adam2, Daniel Cherqui1, Eric Vibert1, 1Chb-Centre Hépato-Biliaire, Villejuif, France; 2Inserm 1193, Villejuif, France; 3Inserm 1193, Villejuif, France

**Background and aims:** Many patients with HCC are not candidates for resection. Those amenable to curative surgical resection, still have a poor prognosis with recurrence reported up to 70% at 5 years either by dissemination or de novo tumours with 15% of patients presenting with distant recurrence. Risk factors related to disease biology have been well studied. When it comes to surgical technique impacting oncologic outcomes this is still not the case. Some authors have suggested that nonanatomic resection (NAR) had comparable outcomes were the impact of the RLI volume on HCC recurrence (HR. Secondary outcomes were the impact of NAR vs AR on the presence or absence of RLI and oncologic outcomes

**Method:** We retrospectively analysed 239 medical records of patients who had surgery for HCC at our Hospital between 2012 and 2020. RLI was investigated on early postoperative computed tomographic scans. The detection of RLI was assisted by pre-existing tools within the medical imaging software to automatically detect hypodense

**Table 1: Descriptive statistics & severity**

<table>
<thead>
<tr>
<th>User Transplant Recipient without a prescribed statin</th>
<th>User Transplant Recipient with a prescribed statin</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
<td>Variable</td>
<td></td>
</tr>
<tr>
<td>Death, (%)</td>
<td>215 (37.50)</td>
<td>351 (61.05)</td>
</tr>
<tr>
<td>Male, (%)</td>
<td>215 (37.50)</td>
<td>351 (61.05)</td>
</tr>
<tr>
<td>Mean Age, yr (standard deviation)</td>
<td>64.64 (10.90)</td>
<td>69.64 (7.51)</td>
</tr>
<tr>
<td>Race, (%)</td>
<td>White</td>
<td>139 (44.30)</td>
</tr>
<tr>
<td></td>
<td>Black</td>
<td>21 (3.53)</td>
</tr>
<tr>
<td></td>
<td>Hispanic</td>
<td>225 (35.30)</td>
</tr>
<tr>
<td></td>
<td>Asian</td>
<td>20 (3.20)</td>
</tr>
<tr>
<td></td>
<td>Native American</td>
<td>53 (8.37)</td>
</tr>
<tr>
<td></td>
<td>Multiracial</td>
<td>62 (9.56)</td>
</tr>
<tr>
<td>Comorbidities</td>
<td>Diabetes Mellitus, (%)</td>
<td>129 (37.71)</td>
</tr>
<tr>
<td></td>
<td>Hypertension, (%)</td>
<td>457 (80.74)</td>
</tr>
<tr>
<td></td>
<td>Hypothyroid, (%)</td>
<td>150 (26.14)</td>
</tr>
<tr>
<td></td>
<td>Chronic Fatty Disease, (%)</td>
<td>356 (62.50)</td>
</tr>
<tr>
<td></td>
<td>Myocardial infarction, (%)</td>
<td>24 (4.00)</td>
</tr>
<tr>
<td></td>
<td>Congestive heart failure, (%)</td>
<td>153 (25.98)</td>
</tr>
<tr>
<td></td>
<td>Coronary revascularization, (%)</td>
<td>131 (22.40)</td>
</tr>
<tr>
<td></td>
<td>Composite MACE, (%)</td>
<td>151 (26.68)</td>
</tr>
<tr>
<td></td>
<td>Mortality, (%)</td>
<td>152 (27.24)</td>
</tr>
</tbody>
</table>

**Conclusion:** We have demonstrated that mortality is reduced in LTRs taking a statin in comparison those not taking a statin. The prevalence of lifetime composite MACE was higher in LTRs taking statins, suggesting that LTRs who have had a MACE are more likely to be prescribed a statin. These results indicate that statin use is an independent predictor of mortality in LTRs, irrespective of underlying cardiovascular risk. Future studies that stratify patients based on their known cardiovascular risk will allow us to clarify these results further.
areas within the liver and quantified the total volume of RLI areas in milliliters.

**Results:** Among 239 patients (median follow-up 60 months, 30-day mortality 1.3%), AR was performed in 73% of patients. RLI was detected in 71% of patients, median volume of 11.5 ml (6 – 34.5). Univariate analysis showed that at 6 months, HR was 6% in the RLI group vs 0% in the group without RLI (p = 0.036). At 1 year this was 16% and 5% of HR respectively (p = 0.041). There was significantly less RLI in the AR group 23% compared to the NAR group 77% (p < 0, 01). Multivariate analysis showed the presence of RLI (2.18 (1.56; 3.06); p < 0.001) and the NAR (RR 2.55 (1.84 – 5.55); p < 0.01) were independent risk factors for HR. To identify the cut-off, point for RLI volume, a ROC curve analysis was done showing it to be 82mls with an AUC of 0.86.

**Conclusion:** Based on the results of this study, RLI has a significant impact on disease recurrence after surgery for HCC. Surgical technical refinements, surgical planning with 3D software and adjuncts like fluorescence-guided liver surgery to avoid significant RLI.

**THU-484**

**Inequity in access to liver transplantation for critically ill patients with cirrhosis across U.S. transplant centers**

Thierry Artzner¹, David Goldberg², Constantine Karvellas³, Sumeet Asrani⁴, ¹Hôpitaux Universitaires de Strasbourg, France; ²University of Miami, United States; ³University of Alberta, Canada; ⁴Baylor Medical Center Dallas, United States

**Email:** thierry.artzner@gmail.com

**Background and aims:** Liver transplantation (LT) is the most effective treatment for critically ill patients with decompensated cirrhosis. Some European studies have suggested that access to LT for this category of patients varies across transplant centers. We used UNOS data to examine whether this was also the case across U.S. LT centers at the national and regional levels.

**Method:** We included adult patients who received a primary, single LT between 2011 and 2020 using data from the Scientific Registry of Transplant Recipients (SRTR). We distinguished five (non exclusive) categories of patients who received LT: (i) non-critically ill patients with cirrhosis, (ii) critically ill patients with cirrhosis, (iii) patients with MELD scores >35 at LT who were not critically ill, (iv) patients with hepatocellular carcinoma (HCC), and (v) patients transplanted with Status 1A at listing. Critically ill patients with cirrhosis were defined as being in the ICU at the time of LT with one or more of the following characteristics: (i) grade III/IV hepatic encephalopathy, (ii) mechanical ventilation, (iii) dialysis, (iv) vasopressors. We assessed the correlation between the total number of LTs in each center and the number of LTs for each category of patients.

**Results:** A total of 56,572 patients received a first, single LT over the study period in 109 LT centers, of which 45,512 (median: 82.7%, IQR: 77.8%-86.2%) had cirrhosis and were not critically ill, 4,459 (median: 5.5%, IQR: 3.1%-7.7%) had cirrhosis and were critically ill, 4,898 had a MELD score at LT >35 without being critically ill (median: 8.5%, IQR: 5.8%-11.4%), 20,461 (median: 36.7%, IQR: 32.1%-42.1%) had HCC, and 1,512 (median: 2.4%, IQR: 1.6%-4%) were transplanted with Status 1A. The total number of patients transplanted in each center correlated most strongly with the number of non-critically ill patients with cirrhosis (correlation coefficient = 0.98, panel A). By contrast, the number of critically ill patients with cirrhosis was most poorly correlated with the total number of patients transplanted in each center (correlation coefficient = 0.45, panel C). The correlation coefficient between the total number of patients transplanted and the number of patients transplanted for other indications was higher: 0.72 for patients transplanted with MELD scores >35 (panel B), 0.55 for patients with Status 1A, and 0.92 for patients transplanted with HCC.

Panel D illustrates the variability in LT activity across centers and among each UNOS region for critically ill patients with cirrhosis.

**Conclusion:** This study shows that the size of transplant centers correlates poorly with the number of critically ill patients with cirrhosis receiving LT and that there is more variability in LT for this indication than for other indications for which there is greater consensus (patients transplanted with HCC, MELD >35 or Status1A). It shows that there is both national and regional variability in this LT activity. This study corroborates European observations and illustrates the lack of practical consensus concerning the role of LT in this indication.
Background and aims: Polycystic liver disease (PCLD), usually associated with polycystic kidney disease (PCLKD), is a benign condition that potentially leads to abdominal fullness and portal hypertension (PH), burdened by increased risk of cyst-related infection and bleeding. Liver transplantation (LT) or simultaneous liver-kidney transplantation (SLKT) remains the only curative treatment for severe polycystic disease. We aimed at describing pre- and post-LT characteristics of patients (pts) who underwent LT/SLKT for PCLD/PCLKD.

Method: Pts who underwent LT or SLKT for PCLD or PCLKD in our Center from January 1st, 2010 to September 30th, 2022 were enrolled. Follow-up was closed on December 31st, 2022.

Results: In the study period 1754 LTs were performed. Sixty-three LTs for PCLD (3.6%) have been carried out, of which 45 (71%) were SLKT. 48 (76%) pts were female, median age 52 years [IQR 48–56], median BMI 24 kg/m² [23–26], Median serum creatinine (sCr) was 5.7 mg/dL [4.1–7.8] and median estimated-glomerular filtration rate (eGFR) was 11 ml/min [7–17] in pts affected by kidney failure who received SLKT (29/45 on pre-LT dialysis); median eGFR of pts listed for LT alone of 78 ml/min [68–94]. 58/63 (92%) pts underwent LT for abdominal fullness with sarcopenia (median liver weight 3950 g [2450–7850]), median largest cyst size 7 cm [5–9]; while 19/63 (30%) showed refractory ascites. Nine pts (2%) had pre-transplant cyst interventions. Of note, 10/63 (16%) were known to be pre-LT colonized by multidrug-resistant (MDR) bacteria. Median surgery duration was 357 min [307–456] for LT and 405 min [355–462] for SLKT with a median number of 7 [3–16] red blood units needed. The Piggy-back technique was possible in 18/63 (29%) and 9 pts (14%) underwent temporary porta-cava shunt while only 6 pts (10%) received venous-venous bypass. Among 48 pts listed for SLKT, 7 (15%) underwent a delayed kidney transplantation within 24 h and 3 (6%) were then listed for sequential kidney transplant due to the complexity of LT-surgery. Forty-one pts (65%) were extubated within the first 48-hours and the median ICU stay was 5 days [3–9]. Two pts had primary non-function and underwent re-LT after 3 days while only 1 pt had hepatic artery-thrombosis solved surgically. Moreover, 28 pts (44%) underwent early post-transplant surgical revisions. After a median 4.3 years [1.8–7.8] of follow-up: 59/63 (94%) were alive while 3 pts died for sepsis 3 weeks after transplant (1 LT and 2 SLKT) and 1 pt died for HHV8-induced hemophagocytic syndrome 3 years after SLKT.

Conclusion: PCLD/PCLKD is an insidious benign disease for which high-complex surgical procedure such as transplantation is the ultimate solution. In our cohort 16% of pts were pre-transplant colonized by MDR bacteria and post-LT early surgical revisions were needed in 44% of cases. Nevertheless, the expertise of a high-volume transplant Centre allowed to achieve a 3-year survival rate of 94%.

THU-486
De novo cancers after liver transplantation: a French nationwide cohort
Iliax Kounis1, Christophe Desterke1, Paul Landais1, Eric Vibert1, Didier Samuel1, Cyrille Feray1. INSERM 1193, France
Email: cyrille.feray@gmail.com

Background and aims: De novo cancer (DNC) following liver transplantation (LT) have been reported as one of the major causes of post-transplant mortality. Everolimus is frequently prescribed to patients presenting de novo cancer after LT and those who are at risk of cancer recurrence. With this study we aimed to estimate the cancer burden after LT at a nationwide level and to evaluate the potential role of everolimus in de novo cancer occurrence.

Method: The French national health data system (SNDs), linked with the national hospital database (PMSI), contains information on at least 99% of the French population, concerning ICD-10 codes, medical procedures (MP), prescribed drugs and vital status. 8658 patients having received LT for hepatocellular carcinoma (n = 3902) or decompensated cirrhosis were identified from 2009 to 2019. Algorithms combining ICD and MP identified post-transplant invasive neoplasia at different sites. Cox models including competitive risk, everolimus as time-dependent exposure (merge function) and propensity score (weightit pckg) analysed cancer incidence, mortality.

Results: With a median follow-up of 4.6 [2.2, 6.8] years after LT, 1119 (13%) patients developed DNC, of which 232 (2.7%) dysmyelopoiesis, 216 (2.5%) head and neck, 213 (2.5%) skin cancer, 184 (2.1%) metastatic cancer, 180 (2.1%) lung cancer, 100 (1.2%) lymphoma, 88 (3.3%) colorectal cancer, 87 (1.0%) prostate cancer and 50 (0.6%) bladder cancer. Age, tobacco, alcohol, diabetes and cancer before LT were significantly associated to DNC for most studied sites. 5-year survival after DNC was poor: 40% for dysmyelopoiesis or skin, 30% for colorectal or lymphoma, 25% for prostate, 20% for lung, head and neck metastasis. During the follow-up, 2588 (30%) patients were exposed to everolimus including 997 before the detection of any cancer. In all cases both using landmark analysis or time-dependent exposure, everolimus was associated neither to a lower incidence nor to a better survival after occurrence (Figure).

Conclusion: DNC occur in at least 13% of adults after LT. Systematic screening is clearly insufficient in view of the poor survival observed after their detection. More surprisingly, the antitumoral action of everolimus recipients to prevent de novo malignancies was not observed for any cancer including skin cancers.
Background and aims: Cardiovascular (CV) risk burden of liver transplant (LT) candidates is increasing, and CV events (CVE) are a main cause of post-LT death, thus identifying LT candidates at high CV risk is key to improve outcomes. The best strategy to assess silent coronary artery disease (CAD) before LT is controversial. We aimed to evaluate the performance of a risk-adapted protocol that uses functional (stress tests) and anatomical (coronary artery calcification score [CACS]) by CT, and CT angiography (CTCA) explorations, to diagnose pre-LT CAD and predict post-LT CVE.

Method: Single-center, retrospective analysis with patients considered for LT between July 2015 and September 2020. In a pre-specified clinical protocol depending on the accumulation of risk factors, primary CAD assessment included a) no specific test; b) CACS followed by CTCA; or c) stress test. Invasive coronary angiography (ICA) was performed according to the results of non-invasive tests. We investigated the variables, including the diagnostic tests and the clinical risk factors comprised in the CAD-LT score, associated with the presence of significant lesions in ICA; as well as the association between diagnostic tests and the incidence of CVE 2 years after LT.

Results: 634 candidates were evaluated and 351 underwent LT. CACS was performed as primary test in 244 (39%), stress tests in 81 (13%, most dobutamine stress echocardiography [DSE]), and in 309 cases (49%) no specific explorations were indicated. 122 patients eventually underwent ICA. In patients undergoing CACS, the prevalence of CACS $\geq 400$ (absence of calcifications) was 22%, while severe coronary calcifications (CACS $\geq 400$) were found in 26%. Most DSE (61%) were non-diagnostic, and very few stress tests resulted positive. The prevalence of significant lesions in ICA was 23%, and it was not associated with either CACS, CTCA findings or stress tests results. In contrast, the incremental presence of CV risk factors in a modified CAD-LT score predicted the presence of significant lesions in ICA ($p < 0.001$). Among LT recipients, the 2-year cumulative incidence of CVE was 12%. Patients without specific exploration indications for silent CAD presented the lowest incidence (7%) of CVE, while those with pre-LT CACS $\geq 400$ ($p < 0.001$) had the highest incidence (37%). In the adjusted multivariate analysis, pre-transplant CACS $\geq 400$ and the indication of stress test were independent predictors of post-LT CVE (Figure).

Conclusion: A high ($\geq 400$) CACS identifies LT candidates at the highest risk of post-LT CVE, despite being poorly associated with the presence of CAD before LT, probably highlighting its value as a biomarker of systemic atherosclerosis. Stress tests are of limited value due to a high rate of unreliable results. The accumulation of clinical risk factors using calculators like the CAD-LT score can be useful to identify LT candidates with more risk of significant lesions in ICA.
**Conclusion:** Accounting for sex in SLK listing and allocation may reduce health disparities. GFR-based standardization of SLK listing in the U.S. was associated with better chances of transplantation for women and with the mitigation of decreased female vs. male transplantation patterns in this population. The use of MELD 3.0 may also contribute to equity in SLK waitlist outcomes.

**THU-489**

**Increased left ventricular dimensions are the new risk factor for acute kidney injury after living donor liver transplantation (cardio-renal interaction)**

Dheapak V1, Lalita Mitra2,3, 1Institute of Liver and Biliary Sciences, Organ Transplant Anaesthesia and Critical Care, India; 2homi Bhabha Cancer Hospital and Research Centre, India; 3Institute of Liver and Biliary Sciences, Organ Transplant Anaesthesia and Critical Care, New Delhi, India

Email: dheapak22@gmail.com

**Background and aims:** Acute kidney injury (AKI) is a common complication of liver transplant surgery, resulting in lengthy intensive care unit/hospital stays and considerable morbidity with the development of chronic renal failure in liver transplant recipients. AKI after liver transplantation is caused by a variety of factors, including recipient's hepatic decompensation, poor donor graft quality, intraoperative hemodynamic instability, blood loss and blood product transfusions. The cardiac dysfunction could also mediate impairment in renal function (Cardio-renal syndrome). We prospectively evaluated the possible associations between perioperative N-terminal pro B-type natriuretic peptide (NT-proBNP) levels, transthoracic echocardiograph findings and post-transplant AKI in patient undergoing living donor liver transplantation.

**Method:** Seventy adult cirrhotic patients without endogenous heart or renal disease were included. AKI was defined as increase in serum creatinine by 0.3 mg/dL or more within 48 hours (or) increase in serum creatinine to 1.5 times baseline or more within the last 7 days. Serum NT-proBNP levels were measured immediately after induction of anaesthesia and also at the end of the surgery. We analysed the relationship between NT-proBNP levels, preoperative echocardiographic findings and post-transplant AKI.

**Results:** The overall incidence of AKI was 38.57%. However, the majority (77.78%) of patients had stage 1 AKI, and none of our patients had stage 3 AKI or required renal replacement therapy during the first week following LT. The patients who developed AKI had significantly higher left ventricular end-diastolic dimension (LVEDD = 49.37 ± 4.48 mm vs 45.6 ± 4.01 mm, p = 0.0005) and left ventricular end-systolic dimension (LVESD = 28.7 ± 3.46 mm vs 26.3 ± 3.44 mm, p = 0.006) in the 2d echocardiography and also had a higher intraoperative transfusion of platelets. Other echocardiographic parameters were comparable between both groups. In multivariate logistic regression analysis, left ventricular end diastolic dimension [odds ratio (OR): 1.168, 95% confidence interval (CI): 1.011–1.349; p = 0.035] and left ventricular end systolic dimension (OR: 1.196, 95% CI: 1.002–1.428; p = 0.048) were found to be independently associated with the development of AKI. There was a moderately significant correlation between baseline NT-proBNP level and MELD score and amount of ascites drained intraoperatively. There was no significant association between perioperative NT-proBNP levels and post-transplant AKI.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Beta coefficient</th>
<th>Standard error</th>
<th>P value</th>
<th>Odds ratio</th>
<th>Odds ratio Lower bound (95%)</th>
<th>Odds ratio Upper bound (95%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LVEDD (mm)</td>
<td>0.155</td>
<td>0.074</td>
<td>0.035</td>
<td>1.168</td>
<td>1.011</td>
<td>1.349</td>
</tr>
<tr>
<td>LVESD (mm)</td>
<td>0.179</td>
<td>0.090</td>
<td>0.048</td>
<td>1.196</td>
<td>1.002</td>
<td>1.428</td>
</tr>
<tr>
<td>SDPC (unit)</td>
<td>0.978</td>
<td>0.555</td>
<td>0.078</td>
<td>2.659</td>
<td>0.895</td>
<td>7.897</td>
</tr>
</tbody>
</table>

**Conclusion:** We confirmed that post-transplant AKI in patients with cirrhosis is related to cardio-renal interactions. The enlarged left ventricle during systole and diastole indicates the state of hyperdynamic circulation with increased cardiac output and blood volume along with decreased systemic vascular resistance. This results in the state of effective hypovolemia and along with latent cardiac dysfunction in cirrhosis causes renal hypoperfusion and abnormal...
neurohumoral regulation resulting in renal vasconstriction and acute kidney injury.

**THU-490**
**Effect of glucagon-like peptide-1 receptor agonists and sodium-glucose cotransporter-2 inhibitors on post-liver transplant mortality and major adverse cardiovascular events**
Kelli Kosako Yost1, Paul Gomez2, Pooja Rangan1, Michael Fallon1, Rohit Nathan2, Moises Nevah Rubin1, Mark Wong1, Karn Wijarnpreecha1, Ma Ai1, Thanda Han1. 1University of Arizona College of Medicine-Phoenix, United States
Email: kelli.kosako.yost@gmail.com

**Background and aims:** Glucagon-like peptide-1 receptor agonists (GLP-1 RA) and Sodium-glucose cotransporter-2 inhibitors (SGLT2i) have shown to have cardiovascular benefit, promote weight loss, and improve glycemic control in patients with type 2 diabetes mellitus (T2DM). Although there is some data of these medications on post-heart and kidney transplant populations, there is no data on their effect on cardiovascular events and mortality in post-transplant population, especially the post-liver and post-simultaneous liver/kidney transplant recipients on major adverse cardiovascular events (MACEs) and overall mortality.

**Method:** A retrospective chart review in a single hospital system reviewing any adult age ≥18-year-old with either solitary liver or simultaneous liver and kidney transplant from January 2012 to March 2022 was completed. GLP1RA or SGLT2i usage was determined. Demographic, clinical characteristics, and outcomes were compared between the two groups. MACE events included myocardial infarction, coronary revascularization (percutaneous intervention, stent placement, coronary artery bypass graphing), cerebrovascular event, or congestive heart failure. The Mann-Whitney test and Fisher’s exact or Chi-square test was used for continuous and categorical variables respectively and multivariate logistic regression was used to evaluate for significant differences in outcomes between the two groups.

**Results:** Of the 776 patients included, 33 (4.25%) were on a SGLT2i or a GLP1 RA. Patients’ demographics and comorbidities are shown in the table. Hypertension (p < 0.001), hyperlipidemia (p < 0.001), and BMI at transplant (p = 0.021) were all statistically significant comorbidities between the two groups on univariate analysis. On multivariate analysis, the use of an SGLT2i or a GLP1 RA was associated with significantly lower mortality rate (OR 0.28, CI 95% 0.08–0.79, P = 0.014) and number of MACEs (OR 0.32, CI 95% 0.13–0.79, P = 0.014) after controlling for age at transplant, BMI at transplant, sex, hypertension, T2DM at listing, hyperlipidemia, chronic kidney disease, and tobacco use.

**Conclusion:** This study shows that, after controlling for comorbidities, the use of an SGLT2 inhibitor or a GLP1 agonist post-liver or post-liver/kidney transplant was associated with decreased mortality and decreased number of MACEs. Although this was a small cohort of patients on these medications, this proves promising to this patient population and warrants further studies.

**THU-491**
**Deep learning prediction modeling of major adverse cardiovascular events following liver transplantation**
Ahmed Abdelhameed1, Cui Tao1,2, Liu Yang1, 3The University of Texas Health Science Center at Houston, School of Biomedical Informatics, United States; 2University of Texas Health Science Center at Houston, United States; 3Mayo Clinic, United States
Email: ahmed.m.abdelhameed@uth.tmc.edu

**Background and aims:** Major adverse cardiovascular events (MACE) are among the leading causes of morbidity and mortality following liver transplantation (LT). The aim was to develop and validate deep learning models’ ability to predict post-transplantation MACE among patients undergoing LT.

**Method:** Using data from Optum’s de-identified Clinfomatics® Data Mart Claims Database, we identified patients who received LT between January 2007 and March 2020 and built multiple predictive models for the risk of developing any of the post-transplantation MACE, including myocardial infarction, atrial fibrillation, pulmonary embolism, heart failure, cardiac arrest, and stroke, as an outcome. A MACE is primarily predicted using the Bidirectional Gated Recurrent Units (BiGRU) deep learning sequence processing model in different prediction interval lengths up to 5 years after the LT index date, using patients’ demographics and retrospective diagnosis, medications, and procedures claim data recorded back to 3 years before the LT index date. The performance of the deep learning model against other machine learning models such as Logistic Regression (LR), Random Forest (RF), and Light Gradient-boosting Machine (LGBM) was assessed using a cohort of 18304 liver transplant recipients (mean age 57.4 years [SD 12.76]; 1144 [60.9%] men and 7158 [39.1%] women). Models’ optimization was done using five-fold cross-validation on 80% of the cohort (training set) and the performance of the models is assessed using the remaining 20% (testing set) based on area under the receiver operating characteristic curve (AUC-ROC) and the area under the precision-recall curve (AUC-PR).

**Results:** Using different prediction intervals (0–30 days, 0–1 year, 0–3 years, and 0–5 years) after the LT index date and compared to the three machine learning models, the top-performing model was the deep learning model, BiGRU, achieved an AUC-ROC of 0.833 (95% confidence interval [CI], 0.8127–0.8522) and AUC-PR of 0.560 (95% CI 0.5205–0.6058) for a 30-day prediction interval after LT.

**Conclusion:** Using patient longitudinal claims data, deep learning systems can efficiently model and predict outcomes following liver transplantation. This model will help clinicians to identify high-risk candidates for further risk stratification or other management strategies to improve liver transplant outcomes.
The growing prevalence and impact of type 2 diabetes among liver transplant candidates in the United States

Zobair Younossi1,2,3, Katherine Eberly1,3, Reem Al Shabeeb1,3, Ameeta Kumar1,2,4, Pamela Brandt1,2, Nagashree Gundu Rao1,4, Janus Ong5, Kenneth Cusi6, Saleh Alqahtani7,8, Maria Stepanova1,2,9.

1Inova Health System, Department of Medicine, United States; 2Beatty Liver and Obesity Research Program, Inova Health System, United States; 3Inova Health System, Medicine Service Line, United States; 4Inova Health System, Division of Endocrinology, United States; 5University of the Philippines, College of Medicine, Philippines; 6University of Florida, Division of Endocrinology, Diabetes and Metabolism, United States; 7Johns Hopkins University, Division of Gastroenterology and Hepatology, United States; 8King Faisal Specialist Hospital and Research Center, Liver Transplant Center and Biostatistics, Epidemiology and Scientific Computing Department, Saudi Arabia; 9Center for Outcomes Research in Liver Disease, United States

Email: zobair.younossi@inova.org

Background and aims: Type 2 diabetes (T2D) and superimposed NAFLD can negatively impact outcomes of patients with chronic liver disease (CLD). The aim of this study was to assess the impact of pre-transplant T2D on the outcomes of liver transplantations (LT).

Method: We used Scientific Registry of Transplant Recipients (SRTR) 2008–2020 to collect data for all adult patients ≥18 years of age who received a liver transplant in the U.S. The study outcome was time to post-transplant mortality (cut-off date March 2, 2022).

Results: A total of 86,153 LTs were included: mean age 56 ± 11 years, 71% Caucasian, 66% male, 5.0% re-transplants. Acute liver failure accounted for 4.2% of LTs. Of those transplanted with a CLD, 2% had chronic hepatitis B, 20% chronic hepatitis C, 24% alcoholic liver disease; 25% also had hepatocellular carcinoma (HCC). Of all LT recipients, 26% had history of pre-transplant T2D; this rate increased from 22% (2008) to 28% (2019). Similar trends were observed in subgroups with acute liver disease (from 10% to 15%), those with HCC (from 26% to 38%), and CLD patients without HCC (from 22% to 27%). During follow-up (median = 61 months, IQR = 30–103 months), 26% of LT recipients died and 5.4% had a graft failure; the cumulative mortality rates were 23% in acute liver disease, 30% in HCC, and 25% in non-HCC subgroups. The 5-year mortality rates were higher in LT recipients with vs. without pre-transplant T2D: 28% vs. 21% in acute liver disease, 27% vs. 24% in HCC, and 24% vs. 20% in non-HCC (all p < 0.01). In multivariate survival analysis, pre-transplant T2D was independently associated with a higher risk of post-LT mortality in all subgroups: adjusted hazard ratio (aHR) = 1.26 (1.22–1.30) in all LT patients, aHR = 1.30 (1.05–1.62) in acute liver disease, aHR = 1.20 (1.13–1.28) in HCC, and aHR = 1.28 (1.23–1.34) in non-HCC (all p < 0.02). Other risk factors included an earlier calendar year for LT, older age, higher MELD score, lack of college education, coverage by Medicare or Medicaid, and being on life support before LT (p < 0.01). However, there was no association between pre-LT T2D and greater the risk of graft failure (one-sided p > 0.05).

Conclusion: There is a growing burden of T2D among liver transplant candidates in the United States. The presence of pre-transplant T2D is independently associated with an increased risk of post-transplant mortality in all LT subgroups.

The evolution of the muscle compartment from the listing to six-month post-transplantation: a longitudinal monocentric study

Delorme Alicia1,2, Alexis Goffaux3, David De Azevedo4, Colin Dumont1, Guillaume Henin5, Marie Philippart1, Frédéric Braem1, Olga Ciccarelli3, Pierre Trefois6, Nicolas Lanthier7,8, Géraldine Dahlqvist1.

1Clinique Universitaire Saint-Luc, Hepatology and Gastroenterology, Bruxelles, Belgium; 2Clinique Universitaire Saint-Luc, Hepatology, Bruxelles, Belgium; 3Clinique Universitaire Saint-Luc, Laboratory of Hepatology and Gastroenterology, Bruxelles, Belgium; 4Clinique Universitaire Saint-Luc, Cardiovascular Disease, Bruxelles, Belgium; 5Clinique Universitaire Saint-Luc, Radiology, Belgium; 6Clinique Universitaire Saint-Luc, Laboratory of Hepatology and Gastroenterology, Bruxelles, Belgium; 7Clinique Universitaire Saint-Luc IREC/CARD, Cardiovascular Disease, Bruxelles, Belgium; 8Clinique Universitaire Saint-Luc-Abdominal Surgery and Liver Transplant Department, Bruxelles, Belgium; 9Clinique universitaires Saint-Luc (UCLouvain), Service d’Hépato-Gastroentérologie, Bruxelles, Belgium; 10Université Catholique de Louvain, Laboratory of Hepato-Gastroenterology, Institut de Recherche Expérimentale et Clinique, Brussels, Belgium

Email: alidelorme0206@gmail.com

Background and aims: Body composition of the cirrhotic patient plays an important role in his prognosis. Skeletal muscle mass (sarcopenia), malnutrition, frailty (liver frailty index LFI) and

Figure: (abstract: THU-493).
myosteatosis are associated with worse outcome in cirrhotic patients. The aim of this study was to determine the best muscle-related predictor of morbidity and mortality on the waiting list and after LT and to evaluate the evolution of all muscle-related parameters up to six months post-transplant.

**Method:** This single-center prospective observational study screened adult patients who were candidates for liver transplantation from June 2021 to September 2022. Each candidate received a functional and nutritional assessment during its pre-transplant evaluation. Muscle quantity and quality were assessed using an abdominal CT scan at the third lumbar level (L3). Sarcopenia was defined as skeletal muscle mass index (SMI) <39 cm²/kg in females and <50 cm²/kg in males. Myosteatosis was assessed by skeletal muscle radiodensity attenuation (SM-RA), with cut-offs of SM-RA <41 HU for patients with a BMI <24.9 kg/m² and <33 HU for patients with a BMI ≥25 kg/m². Frailty was defined using the Liver Frailty Index (LFI). Time-to-event analysis was performed using Kaplan-Meier method to investigate the impact of functional variables on outcome. One-year survival was determined for patients who underwent liver transplant during this period. Univariate and multivariate Cox proportional hazard regressions were computed to identify predictors of morbidity and mortality on the waiting list for LT.

**Results:** 103 patients were screened, 84 were placed on the Eurotransplant LT waiting list and 49 were transplanted during the study period. The mean age was 54 years and 67.7% were males. The primary etiology of liver disease was alcohol and 38% had a hepatocellular carcinoma. The one-year patient survival probability on the waiting list was 76.9 ± 7.2%. This probability was significantly reduced in patients with myosteatosis compared with patients with higher SM-RA values (43 ± 17% vs 95 ± 4%, p < 0.001). Compared with other muscle characteristics, myosteatosis was the strongest predictive factor of mortality. 28 patients had a full 6-months post-LT assessment. Of those liver transplanted patients, 57.7% were frail and 40.7% had myosteatosis before LT. At 6 months post-LT, 53.8% were frail and only 25% had myosteatosis. SMI was not different before and after LT. Compared with pre-LT data, muscle density increased with a mean delta of 4.6 HU (p = 0.06) (Figure). The 5 chairs stand test significantly improved after LT (11.6 sec vs 9.0 sec (p = 0.013). The other parameters (handgrip, LFI, ...) remained stable.

**Conclusion:** Myosteatosis is significantly associated with negative pre-transplant outcomes. After LT, patients improve in muscle strength but not in muscle quantity or quality evaluated by CT-scan.

**THU-495**

**Endothelial glycocalyx damage marker Syndecan-1 measured during hypothermic oxygenated machine perfusion can predict early allograft dysfunction after liver transplantation**

Laurin Rauter1, Judith Schiefer2, Pierre Raeven2, Thomas Ohlinger2, Marjia Spasic1, Effimia Poupouridou1, Jule Dingfelder1, Andreas Salat1, Zoltan Mathe1, Georg Gyoei3, Thomas Soliman1, Dagmar Kollmann1, Gabriela Berlakovich1,1Medical University of Vienna, Department of General Surgery, Division of Transplantation, Austria; 2Medical University of Vienna, Department of Anesthesiology, Intensive Care Medicine and Pain Medicine, Austria; Email: laurin.rauter@meduniwien.ac.at

**Background and aims:** During liver transplantation, the graft has to endure an ischemic phase and additional injury after reperfusion (IRI), especially mediated by reactive oxygen species (ROS). The endothelial glycocalyx covers the luminal side of the vascular endothelium and regulates vascular permeability, modulates adhesion of leucocytes onto the vascular wall and transduces mechanical shear stress. It is very sensitive to ROS and therefore degraded during graft preservation and reperfusion. Hypothermic oxygenated machine perfusion (HOPE) is a preservation strategy that can reduce IRI-inflicted graft injury compared to static cold storage (SCS). We aimed to measure glycocalyx degradation after HOPE or SCS alone, to evaluate its viability-assessment potential for liver transplantation.

**Method:** We measured glycocalyx degradation via ELISA for its main component Syndecan-1, in samples from 77 liver transplant patients. 37 grafts were directly transplanted after SCS, 40 grafts additionally underwent HOPE with the Organ Assist® perfusion system, prior to liver transplantation.

**Results:** Sdc-1 concentrations in the graft effluent are significantly lower after HOPE [466 (350–1073)] compared to SCS alone [4011 (3382–4683) (p < 0.001). Further, Sdc-1 concentrations regenrate faster towards baseline levels on postoperative day 1 [HOPE: 362 (232–880) vs. SCS: 1017 (637–1900) p < 0.001), indicating a shorter glycocalyx shedding period. Regarding viability assessment, Sd1-concentrations in the perfusate were elevated in EAD patients after 60 minutes of HOPE compared to non-EAD patients [429 (260–556) vs. 896 (419–1681) p = 0.018]. Additionally ROC-analysis indicated a significant discriminatory value of Sdc-1 concentration after 60 minutes of HOPE regarding the occurrence of EAD with an AUC of 74% (p = 0.018, sensitivity 66.7% and specificity 84.6%).

**Conclusion:** HOPE reduces the duration of glycocalyx shedding, evident by Sdc-1 release in recipient serum after liver transplantation. Sdc-1 concentration during HOPE can predict early allograft dysfunction. Therefore, Sdc-1 could be a potential viability assessment marker in liver transplantation.

**THU-496**

**Use of von Willebrand factor antigen for surgical decision making in patients with hepatocellular carcinoma**

David Pereyra1,2, Lindsay Gregory3, Aidan Mullan1, Anna Kern1, Jule Dingfelder1, Hubert Hackl2, Thomas Grünberger2, Rory L. Smoot1, Sean Cleary4, David M. Nagorney5, Mark Truty2, Susanne Warner2, Cornelius Thiels3, Michael Kendrick3, Georg Gyoei2, Patrick S. Kamath5, Gabriela Berlakovich2, Julie Heimbach6, Patrick Starlinger1,3, Medical University of Vienna, Department of General Surgery, Division of Visceral Surgery, Austria; 2Medical University of Vienna, Department of General Surgery, Division of Transplantation Surgery, Austria; 3Mayo Clinic Rochester, Department of Surgery, Division of Hepatobiliary and Pancreatic Surgery, United States; 4HPB Center, Viennese Health Network, Clinic Favoriten and Sigmund Freud Private University, Department of Surgery, Austria; 5Mayo Clinic Rochester, Division of Gastroenterology and Hepatology, United States; 6Mayo Clinic Rochester, Department of Surgery, Division of Transplantation Surgery, United States; Email: david.pereyra@meduniwien.ac.at

**Background and aims:** Potential treatment modalities for hepatocellular carcinoma (HCC) are widely varied. Many affected patients undergo transplant or resection with curative intent. While current guidelines aim to clarify appropriate patient selection for liver resection (LR) or transplantation (LTx), both modalities carry significant risk of adverse perioperative outcomes that warrant improvement. We previously reported on von Willebrand factor antigen (vWF-Ag) as a predictor of both post-hepatectomy liver failure (PHLF) and early mortality on the waiting list for LTx. Herein, we explore the use of vWF-Ag as a tool for perioperative decision-making in patients with HCC.

**Method:** Included patients were diagnosed with HCC within the Milan criteria and underwent either LR or listing for LTx at Medical University of Vienna (MUV) and Mayo Clinic Rochester (MCR) between 2004 and 2022. VWF-Ag was evaluated prior to LR or at time of listing for LTx, respectively. The previously evaluated cut-offs at 182% and 291% vWF-Ag were used to divide the cohort into low- (≤182%), intermediate- (183%–291%) and high-risk (>291%) groups. Clinical course and overall survival (OS) were prospectively documented and retrospectively analyzed (chi-squared, Kaplan-Meier).

**Results:** In total, 443 patients were included: 106 patients underwent LR (MUV: 72, MCR: 34); 337 patients were listed for LTx (MUV: 214, MCR: 123), of those 199 underwent LTx (MUV: 124, MCR: 75).
Patients in intermediate- and high-risk groups undergoing LR displayed significantly higher incidences of PHLF (low = 4.0%, intermediate = 27.5%, high = 53.3%, p < 0.001). Furthermore, post-operative OS was significantly reduced in both these cohorts (median in months: low = 95.5, intermediate = 46.7, high = 13.7, p = 0.006). As previously reported for a cohort of all-comers listed for LTx, HCC patients with increased vWF-Ag had reduced survival on the waiting list (p = 0.01). Yet, no difference in post-LTx OS was observed when comparing risk groups according to vWF-Ag (median in months: low = not reached, intermediate = 130.4, high = 116.6, p = 0.343). Similarly, OS from listing was comparable between vWF-Ag risk groups (median in months: low = 108.7, intermediate = 131.8, high = 90.0, p = 0.390).

Conclusion: Herein, we present an international bicentric evaluation of vWF-Ag as a perioperative decision-making tool for patients with HCC. Patients with high vWF-Ag prior to LR show an increased risk for PHLF and reduced OS and therefore seem to derive limited benefit from LR. Furthermore, an increased risk of post-LTx mortality (1.14; 0.39–3.38) or regraft-free survival (2.66; 0.79–9.89) was observed between risk groups according to vWF-Ag. Patients presenting with HCC and high vWF-Ag values may benefit from a vWF-Ag risk adjusted LTx listing process. We conclude that vWF-Ag can optimize LR and LTx decision-making for patients with HCC.

THU-496
Incidence and risk factors for de-novo NAFLD after liver transplantation: real-world data
Lea Guetzlaff1, Alejandro Campos-Murguia1, Emily Bosselmann1, Anna Katharina Baumann1, Björn Hartleben1, Elmar Jaeckel1, Richard Taubert1, Katharina Luise Hupa-Breier1, Hannover Medical School, Gastroenterology Hepatology and Endocrinology, Germany; 2Hannover Medical School, Pathology, Hannover, Germany; 3University of Toronto, Ajmera Transplant Center, Canada

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is not only a leading indication for liver transplantation (LT), but also a frequent complication after LT in patients, who developed graft dysfunction. However, the overall incidence of de-novo NAFLD after LT and its risk factors even in patients without graft dysfunction are unknown. This is the first study to describe the incidence and risk factors of de-novo steatosis and steatohepatitis in a unique cohort of surveillance and indication biopsies from patient after LT.

Method: This was a retrospective single-center study in a post-LT surveillance and indication biopsies from patient after LT. foci of de-novo steatosis and steatohepatitis in a unique cohort of unknown. This is the first study to describe the incidence and risk factors even in patients without clinical signs of graft dysfunction and therefore supports the indication for post-LT biopsies on a regular basis even without sings of graft dysfunction.

THU-497
Long-term outcomes following donation after cardiac death (DCD) liver transplantation in primary sclerosing cholangitis (PSC)
Arul Suthananthan1, Nadir Abbas1,2, Graham Gaine1,2, James Ferguson1,2, Thamara Perera1, Palak Trivedi1,2, University Hospitals Birmingham, Liver Unit, United Kingdom; 2University of Birmingham, National Institute for Health Research (NIHR) Birmingham Biomedical Research Centre (BRC), Birmingham, United Kingdom

Background and aims: Liver transplantation is the only life-extending intervention for individuals with PSC. Whilst donation after brain death (DBD) is the practice of choice, patients may endure prolonged waitlist times due to young age. Equally, outcome data following DCD transplantation are conflicting, particularly with regards long-term follow-up. We have previously published data showing that post-transplant outcomes among PSC patients transplanted with a DCD liver were no different to that of DBD recipients at 1 year (J Hepatol. 2017; PMID:26898174). In the current study, we seek to validate prior observations through a contemporary PSC transplant cohort, in parallel to long-term evaluation of graft loss and regraft-free survival among patients with a minimum 5 years since their first transplant.

Method: Long-term outcomes following DCD transplantation in PSC (DCD-PSC) were compared to DBD recipients (DBD-PSC). (A) First, we validated 1y-outcomes presented from our previous study (liver transplants performed 2006–2016) with a contemporary cohort transplanted 2016–2020. (B) Next, we evaluated long-term outcomes in the combined cohort of patients (transplanted 2006–2020), alongside (C) 5y-outcomes specifically in the 2016–2016 cohort, including for non-PSC patients (DCD-nonPSC).

Results: (A) In the 2016–2020 cohort, 1y-risk of death-censored graft loss was not significantly greater in the DCD-PSC vs DBD-PSC group (odds ratio [OR]:2.6; 95% CI: 0.96–7.0), nor was the risk of all-cause mortality (1.14; 0.39–3.38) or regraft-free survival (2.66; 0.79–8.89). (B) In the combined 2006–2020 cohort, a total of 17 patients experienced graft loss in the DCD-PSC group, compared to 30 in the DBD-PSC group (Fig. 1A); 88% of the DCD-PSC graft losses occurred within five years of transplantation vs. 60% in the DBD-PSC group.
However, overall regraft-free survival was not significantly different between PSC groups, and both were inferior to DCD-nonPSC (Fig. 1B). On restricting analysis to patients with a minimum 5 years since first transplant, the risks of death-censored graft loss (hazard ratio [HR]: 1.44; 0.66–3.14), all-cause mortality (0.62; 0.29–1.34) and regraft-free survival (1.14; 0.66–1.97) were not significantly greater for DCD-PSC vs. DBD-PSC (Fig. 1C+D).

Conclusion: In an era of organ shortage, regraft-free survival rates are not significantly different for PSC patients transplanted with a DCD vs. DBD liver. Given the heightened risks of graft loss in PSC compared to non-PSC patients, improved understanding of high-risk combinations of donor-recipient factors is essential to maximise outcomes following transplantation.

THU-498
Evaluation of a delayed liver transplant strategy for patients listed for hepatocellular carcinoma treated with resection or thermo-ablation as a bridge to liver transplantation; the DELTAS-HCC study

1Henri Mondor Hospital APHP- Paris Est University, France; 2CHU Estaing, France; 3Hopitaux Universitaires Strasbourg, France; 4Bordeaux University Hospital, France; 5Centre Hépato-Biliaire, Hopital Paul Brousse, France; 6APHP, France; 7HOPITAL ALBERT MICHALLON, France; 8HOPTAL CLAUDE HURIEZ, France; 9CHU Jean Minjoz, France; 10HOPITAL EDOUARD ERRIOT, France; 11Beaujon University Hospital, France; 12Department of Digestive Surgery, Archet Hospital, University of Nice-Sophia Antipolis, France; 13Aix Marseille University, Department of General Surgery and Liver Transplantation, Hopital la Timone, France; 14Toulouse University Hospital, France; 15Hospices Civils de Lyon, France; 16CHU Trousseau, France; 17HOPITAL PONTCHAILLOU, France; 18CHU Montpellier, France; 19Agence de biomedecine, France
Email: catherine.lamarque@yahoo.fr

Background and aims: To maximize utility and prevent premature liver transplantation (LT), a delayed transplant strategy (DS) was adopted in France in 2015 in patients listed for any single hepatocellular carcinoma (HCC) treated with surgical resection (SR) or thermo-ablation (TA) during the waiting phase, postponing LT until recurrence. It is crucial to make sure that pre and post-LT outcomes of patients entering DS are not negatively impacted. The purpose of this study was to evaluate this DS.

Method: Study population: patients listed for HCC in France between 2015 and 2018, with an AFP score ≤2. After data extraction from the national LT database, Cristal, 2025 patients were classified according to 6 groups: single tumor entering DS, single tumor not entering DS (NDS), multiple tumors (MT), other loco-regional therapies (LRT) with no DS, untreated HCC (UH) and T1 tumors (T1). 18-months
Kaplan-Meier estimates of drop-out before LT and 5-year post-LT recurrence and survival rates were compared.

**Results:** The patients' features are shown in the table. Pre-LT drop-out probabilities were 13, 18, 21, 22 and 25% in DS, LRT and MT, UH, NDS and T1, respectively (p = 0.05), significantly lower in DS, and higher in T1. Post-LT 5-year survival and recurrence rates did not differ among groups.

<table>
<thead>
<tr>
<th></th>
<th>DS (N = 341)</th>
<th>NDS (N = 74)</th>
<th>MT (N = 238)</th>
<th>LRT (N = 679)</th>
<th>UH (N = 346)</th>
<th>T1 (N = 147)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>MELD (median)</td>
<td>10.25</td>
<td>10.26</td>
<td>9.90</td>
<td>10.54</td>
<td>10.21</td>
<td>&lt;0.0001</td>
<td></td>
</tr>
<tr>
<td>Tumor size (cm) (median)</td>
<td>5.6</td>
<td>5.6</td>
<td>5.0</td>
<td>4.3</td>
<td>5.1</td>
<td>0.0005</td>
<td></td>
</tr>
<tr>
<td>Number of tumor (median)</td>
<td>1.0</td>
<td>1.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>0.0066</td>
<td></td>
</tr>
<tr>
<td>Time from treatment to LT (median)</td>
<td>7.95</td>
<td>7.00</td>
<td>7.25</td>
<td>8.30</td>
<td>7.71</td>
<td>0.0001</td>
<td></td>
</tr>
</tbody>
</table>

This study benefited from a grant of Agence de la Biomédecine, the French Organ Sharing Organization.

**Conclusion:** The DELTAS HCC study shows that: DS can be considered in around 20% of HCC candidates (DS and NDS groups), DS in patients amenable to curative treatments pre-LT has no negative impact on pre- and post-LT outcomes, DS has the potential to redistribute organs to patients in more urgent need and can reasonably be pursued. The unexpected high drop-out in T1 patients seems related to a combination of purely MELD-based driving rules, with a 15 median MELD at listing, hampering bridging treatments and access to LT. It calls for revision of allocation rules in this subgroup.

**THU-499**

**Use and outcomes of hepatitis B virus positive grafts for renal or heart transplantation in the US (1999–2021)**

Ashwani Singal1, K. Rajender Reddy2, Mindie Nguyen3, Zobair M. Younossi1, Paul Yien Kwo3, Yong-Fang Kuo4, 1University of South Dakota-Sioux Falls, Sioux Falls, United States; 2University of Pennsylvania, Philadelphia, United States; 3Stanford University, Stanford, United States; 4Fairfax, Fairfax, United States; 5UTMB Health-University of Texas Medical Branch at Galveston, Galveston, United States

**Email:** ashwani.singal@gmail.com

**Background and aims:** The gap between demand and supply for solid organ transplants continues to widen, requiring strategies to expand the donor pool and lower the waitlist mortality rate among candidates waiting to LT (days). It is critical means of treatment for end stage liver disease which has increased steadily in the recent decades. The scarcity of liver grafts has prompted developments in living donor liver transplantations (LDLT) with previous literature illustrating similar outcomes in recipients as compared to deceased donor transplants. However, there are concerns regarding living donor morbidity and mortality which has yet to be examined comprehensively. This study aims to provide estimates of the incidence of various outcomes in living liver donors.

**Method:** In this meta-analysis, Medline and Embase were searched from inception to July 2022 for articles assessing incidence of complications in LDLT donors. Analysis of incidence was done using a generalised linear model with logit transformation was done for continuous variables.

**Results:** Of 5074 abstracts, 182 articles involving 60,152 living liver donors were included. The overall pooled incidence rate of complications in LDLT donors was 29.23 (CI: 23.42 to 36.48) per 10,000 person-days. The incidence rate of complications in LDLT donors was 29.23 (CI: 23.42 to 36.48) per 10,000 person-days. With regards to risk factors, binary variables were analysed with generalised linear model while meta regression with logit transformation was done for continuous variables.

**Background and aims:** Liver transplantation remains a critical means of treatment for end stage liver disease which has increased steadily in the recent decades. The scarcity of liver grafts has prompted developments in living donor liver transplantations (LDLT) with previous literature illustrating similar outcomes in recipients as compared to deceased donor transplants. However, there are concerns regarding living donor morbidity and mortality which has yet to be examined comprehensively. This study aims to provide estimates of the incidence of various outcomes in living liver donors.

**Method:** In this meta-analysis, Medline and Embase were searched from inception to July 2022 for articles assessing incidence of complications in LDLT donors. Analysis of incidence was done using a generalised linear model with logit transformation was done for continuous variables.

**Results:** Of 5074 abstracts, 182 articles involving 60,152 living liver donors were included. The overall pooled incidence rate of complications in LDLT donors was 29.23 (CI: 23.42 to 36.48) per 10,000 person-days. The incidence rate of complications in LDLT donors was 29.23 (CI: 23.42 to 36.48) per 10,000 person-days. With regards to risk factors, binary variables were analysed with generalised linear model while meta regression with logit transformation was done for continuous variables.

**Background and aims:** The use of hepatitis B virus (HBV) positive grafts in liver transplantation without impacting the graft and patient survival has been reported. However, the outcomes of kidney transplant (KT) or heart transplant (HT) recipients with HBV positive grafts were discarded in 2020. Among KT recipients of HBV positive grafts were 18, 19, 21, 22 and 25% in DS, LRT and MT, UH, NDS and T1, respectively (p = 0.05), significantly lower in DS, and higher in T1. Post-LT 5-year survival and recurrence rates did not differ among groups.

<table>
<thead>
<tr>
<th></th>
<th>DS (N = 341)</th>
<th>NDS (N = 74)</th>
<th>MT (N = 238)</th>
<th>LRT (N = 679)</th>
<th>UH (N = 346)</th>
<th>T1 (N = 147)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>MELD (median)</td>
<td>10.25</td>
<td>10.26</td>
<td>9.90</td>
<td>10.54</td>
<td>10.21</td>
<td>&lt;0.0001</td>
<td></td>
</tr>
<tr>
<td>Tumor size (cm) (median)</td>
<td>5.6</td>
<td>5.6</td>
<td>5.0</td>
<td>4.3</td>
<td>5.1</td>
<td>0.0005</td>
<td></td>
</tr>
<tr>
<td>Number of tumor (median)</td>
<td>1.0</td>
<td>1.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>0.0066</td>
<td></td>
</tr>
<tr>
<td>Time from treatment to LT (median)</td>
<td>7.95</td>
<td>7.00</td>
<td>7.25</td>
<td>8.30</td>
<td>7.71</td>
<td>0.0001</td>
<td></td>
</tr>
</tbody>
</table>

This study benefited from a grant of Agence de la Biomédecine, the French Organ Sharing Organization.

**Figure:** Hepatitis B surface antigen (HBsAg), nucleic acid test (NAT), and core antibody (anti-HBc) status of hepatitis B positive donor kidneys (A) and hearts (B).

**Conclusion:** These observations wherein that use of HBV positive donors for KT or HT did not impact the recipient graft or patient survival, suggest that it is a reasonable strategy to expand the donor pool and lower the waitlist mortality rate among candidates waiting for kidney or heart transplant.
donor mortality was 0.05 (CI: 0.02 to 0.12) per 10,000 person-days. The complications with the highest incidence rate in LDLT donors were respiratory complications (IR: 6.28, CI: 4.40 to 6.95), followed by wound-related (IR: 5.95, CI: 4.64 to 7.62) and biliary complications (IR: 5.59, CI: 4.49 to 6.95) per 10,000 person-days. Additionally, the incidence rate of cardiovascular complications was lowest amongst the subgroups of complications at 0.81 (CI: 0.41 to 1.62) per 10,000 person-days. Duration of ICU stay was significantly associated with greater complications rate in liver donors while preoperative liver volume, donation volume and liver remnant were not.

Conclusion: This study presents the incidence of post-LDLT outcomes in liver donors illustrating the high incidence of respiratory, wound-related and biliary complications. While significant advancements in recent decades have contributed towards decreased morbidity in living liver donors, targeted measures and continued efforts are warranted to ensure the safety and quality of life of liver donors post LDLT.

THU-501
Access to liver transplant for women in Spain: a national registry analysis
Martina Tejedor Bravo1, Fernando Neria2, Gloria de la Rosa3, Carolina Almohalla Alvarez4, Andrea Bosca5, Yilliam Fundora6, Marta Tejedor Bravo1, Fernando Neria2, Gloria de la Rosa3, and others.

Background and aims: Gender inequities in liver transplantation (LT) have been documented recently in several studies. Providing national data is crucial as poorer access to liver transplantation for women than men might be explained by different analytical approaches or different national contexts. Our aim was to describe the recipient profile over time in Spain, particularly regarding potential sex-related differences in access to LT.

Method: All adult patients registered in the RETH-Spanish Liver Transplant Registry from 2000 to 2018 for LT were included. Baseline demographics, presence of hepatocellular carcinoma (HCC), cause and severity of liver disease, time on the waiting list (WL), access to transplantation, and reasons for removal from the WL were assessed.

Results: 9427 patients were analyzed (77.6% men, 55.3 ± 8.6 years of age). Mean MELD score was reported for 3404 patients (36.1%), and mean WL times were similar by sex for patients with MELD scores under 16 or above 20, but women had significantly longer mean WL times than men with MELD scores 16–20 (270 ± 267 vs 211 ± 207 days respectively, p < 0.001). When analyzed by MELD, WL times were similar by sex for patients with scores under 16 or above 20, but women had significantly longer mean WL times than men with MELD scores 16–20 (270 ± 267 vs 211 ± 207 days respectively, p < 0.001). When analyzed by MELD, WL times were similar by sex for patients with scores under 16 or above 20, but women had significantly longer mean WL times than men with MELD scores 16–20 (270 ± 267 vs 211 ± 207 days respectively, p < 0.001). Women were shorter (170.5 ± 9.7 vs 177.3 ± 9.8 cm) but had a similar BMI compared to men. In women, the main indications for transplant were cholestatic liver diseases, autoimmune hepatitis and NASH, whilst in men it was alcohol (p < 0.001). Women had less HCC than men (27.1 vs 16.6%, p < 0.001).

Conclusion: Shorter WL times contribute to a more equal access to LT by sex, as it prevents women from deteriorating while waiting and therefore being excluded from the list.

THU-502
Body composition and MAFLD are associated with prognosis after resection of intrahepatic cholangiocarcinoma
Isabella Lurje1, Deniz Uluk2, Sandra Pavicvic2, Minh Phan1, Timo Auer3, Dominik Modest4, Frank Tacke1, Johann Pratschke2, Georg Lurje1, 1Charité-Universitätsmedizin Berlin, Department of Hepatology and Gastroenterology, Campus Charité Mitte | Campus Virchow-Klinikum, Berlin, Germany; 2Charité-Universitätsmedizin Berlin, Department of Surgery, Campus Charité Mitte | Campus Virchow-Klinikum, Germany; 3Charité-Universitätsmedizin Berlin, Department of Radiology, Germany; 4Charité-Universitätsmedizin Berlin, Department of Hematology, Oncology, and Tumor Immunology, Germany

Background and aims: Body composition alterations are frequent in patients with cancer or chronic liver disease. We investigated the impact of disease etiology and body composition after surgery for intrahepatic cholangiocarcinoma (iCCA), a rare and understudied cancer entity in European cohorts.

Method: Computer tomography-based assessment of body composition at the level of the third lumbar vertebra was performed in 173 patients undergoing curative-intent liver resection for iCCA. Muscle mass and -quality as well as subcutaneous and visceral adipose tissue quantity were determined semi-automatically. Sarcopenia, sarcopenic obesity, myosteatosis, visceral and subcutaneous obesity were correlated to clinicopathological data.

Results: Fifty-eight patients (34%) had metabolic (dysfunction-)associated fatty liver disease (MAFLD). Patients with MAFLD had a higher incidence of sarcopenic (p = 0.006), visceral (p < 0.001) and subcutaneous obesity (p < 0.001). At the same time, patients with MAFLD had longer disease-free survival than patients without liver disease or with fibrosis (median: 38 months vs. 12 months, p = 0.025). Sarcopenia was associated with higher postoperative morbidity (intraoperative transfusions (p = 0.027), Clavien-Dindo ≥IIIb complications (p = 0.030), postoperative comprehensive complication index, CCI (p < 0.001)). Inferior overall survival was noted in patients with subcutaneous obesity (median: 35 vs. 23 months, p = 0.042) and myosteatosis (33 vs. 23 months, p = 0.020). Multivariable analysis confirmed only clinical parameters (lymph node invasion, CCI >40) as independently prognostic for overall survival.

Figure:
THU-503
Cytomegalovirus reactivation is associated with lower hepatocellular carcinoma recurrence rates after liver transplantation
Victoria Aguilera Sancho1,2,3, Sara Romero Moreno4, Isabel Conde5,7, Ángel Rubio1,5,6, Cristina Dopazo7, Antonio Cuadrado8, Carmen Bernal9, Sheila Pereira10, Magdalena Salcedo11, Sara Lorente Perez12, Ana Sánchez Martínez13, Javier Zamora14, Sonia Pascual15, Esteban Fuentes Valenzuela16, Laura Martínez-Arenas5, José Ignacio Herrero17, Marina Berenguer18, Manuel Rodríguez-Perálvarez1,19, La Fe University and Polytechnic Hospital, Hepatology and Liver Transplant Section, Valencia, Spain; 2Instituto de Investigación Sanitaria La Fe de Valencia, Valencia, Spain; 3CIBERehd Instituto de Salud Carlos III, Spain; 4La Fe University and Polytechnic Hospital, Hepatology and Liver Transplant Section, Valencia, Spain; 5Hospital Universitario Virgen de la Arrixaca, Liver Transplantation Unit, Murcia, Spain; 6Hospital Universitario Reina Sofia, Department of Hepatology and Liver Transplantation, Córdoba, Spain; 7Hospital General Universitario Alicante, Department of Hepatology and Liver Transplantation, Alicante, Spain; 8Hospital Universitario Río Hortega, Unit of Hepatology and Liver Transplantation, Valladolid, Spain; 9Clínica Universitaria de Navarra, Liver Unit, Pamplona, Spain; 10La Fe University and Polytechnic Hospital, Hepatology and Liver Transplantation Section, Valencia, Spain; 11Hospital General Universitario Virgen del Rocio, Hepato-Biliary Pancreatic Surgery, Sevilla, Spain; 12Hospital Universitario Virgen del Rocio, Hepato-Biliary-Pancreatic Surgery Unit and Liver Transplantation, Sevilla, Spain; 13Hospital General Universitario Gregorio Marañón, Department of Hepatology and Liver Transplantation, Madrid, Spain; 14Hospital Clínico Universitario Lozano Blesa, Department of Hepatology and Liver Transplantation, Zaragoza, Spain; 15Hospital Universitario Virgen del Rocio, Hepato-Biliary Transplantation, Valencia, Spain; 16La Fe University and Polytechnic Hospital, Hepatology and Liver Transplantation Section, Valencia, Spain; 17Hospital Universitario San Carlos, Department of Gastroenterology and Hepatology, Santander, Spain; 18La Fe University and Polytechnic Hospital, Hepatology and Liver Transplantation Section, Valencia, Spain; 19Hospital Universitario La Fe, Valencia, Spain.

Cytomegalovirus reactivation is associated with lower hepatocellular carcinoma recurrence rates after liver transplantation.

Background and aims: Cytomegalovirus (CMV) reactivation (CMVr) occurs in 50% of liver transplant (LT) recipients. CMVr is associated with increased risk of mortality, hepatocellular carcinoma (HCC) recurrence, and infection in LT recipients. The aim of this paper is to evaluate CMVr incidence and impact on HCC recurrence in a multicenter cohort.

Methods: We included 891 (8.6%) developed de novo NMSC, yielding an overall incidence of 23 per 1,000 person-years (PY). Median time from LT to NMSC was 2.6 years (IQR: 1.7–3.9). NMSC incidence increased at lower latitudes: from 17 per 1,000 person-years (PY) for patients residing at ≥40° to 25 per 1,000 PY for those <30° (Northern). In multivariable analyses, factors independently associated with de novo NMSC included: female sex (HR 1.5 vs CNI alone; p = 0.003 overall). The interaction of IS with latitude was non-significant (p = 0.967). There was a possible interaction of IS with age (p = 0.096). In stratified analyses, IS was not associated with NMSC for patients <60 years (p = 0.355), but was so in patients ≥60 years (p = 0.002), in whom CNI + anti-m and mechanistic target of rapamycin inhibitor regimens were associated with increased NMSC (HRs 1.5 and 1.4, respectively vs CNI alone; p = 0.002 overall).

Conclusions: De novo NMSC is a frequent occurrence among LT recipients with modifiable and non-modifiable risk factors. An individualized approach to post-LT IS has the potential to reduce de novo NMSC post-LT.

THU-504
The influence of immunosuppression and recipient geography on non-melanoma skin cancer risk after liver transplantation
Therese Bittermann1, James Lewis1, David Goldberg2, University of Pennsylvania, United States; 2University of Miami, United States

Background and aims: Immunosuppression (IS) after liver transplantation (LT) is associated with an increased solid cancer risk, of which the most common is non-melanoma skin cancer (NMSC). The optimal approach to IS management in those at the highest risk for de novo NMSC has not been determined, nor has the impact of recipient geography.

Method: Using a merged dataset of Medicare healthcare claims linked to U.S. national transplant registry data, we identified a retrospective cohort of adult first liver-alone transplant recipients who were alive with their native allograft at 1-year post-LT. Patients with a prior history of NMSC were excluded. de novo NMSC incidence was computed overall and by latitude of residence at transplant.

Results: The 10,413 LT recipients in the cohort were 62.6% male, 69% non-Hispanic White (NHW) and with median age 60 years. In total, 891 (8.6%) developed de novo NMSC, yielding an overall incidence of 23 per 1,000 person-years (PY). Median time from LT to NMSC was 2.6 years (IQR: 1.7–3.9). NMSC incidence increased at lower latitudes: from 17 per 1,000 person-years (PY) for patients residing at ≥40° to 25 per 1,000 PY for those <30° (Northern). In multivariable analyses, factors independently associated with de novo NMSC included: female sex (HR 1.5 vs CNI alone; p = 0.003 overall). The interaction of IS with latitude was non-significant (p = 0.967). There was a possible interaction of IS with age (p = 0.096). In stratified analyses, IS was not associated with NMSC for patients <60 years (p = 0.355), but was so in patients ≥60 years (p = 0.002), in whom CNI + anti-m and mechanistic target of rapamycin inhibitor regimens were associated with increased NMSC (HRs 1.5 and 1.4, respectively vs CNI alone; p = 0.002 overall).

Conclusions: De novo NMSC is a frequent occurrence among LT recipients with modifiable and non-modifiable risk factors. An individualized approach to post-LT IS has the potential to reduce de novo NMSC post-LT.

THU-505
Perfusate composition of transplanted and not transplanted livers during normothermic machine perfusion
Jule Dingfelder1, David Pereyra1, Laurin Rauter2, Sertac Kacar3, Gerd Silberhuner1, Andreas Salat3, Zoltan Mathe1, Thomas Soliman1, Dagmar Kollmann1, Georg Gyoeri1, Gabriela Berlakovich1, Medical University of Vienna, Department of General Surgery, Division of Transplantation, Vienna, Austria

Background and aims: Dynamic changes in perfusate composition during normothermic machine perfusion (NMP) can reflect on the synthesis capability of the graft and extent of preservation injury. Components of the perfusate are either flushed out of the liver during perfusion with a solution of oxygenated cold saline. The aim of this study was to investigate the perfusate composition of transplanted and not transplanted livers during NMP.

Methods: We evaluated the perfusate composition of transplanted and not transplanted livers during NMP in a prospective study. Eight livers were transplanted and five were not transplanted. The perfusate composition was analyzed using high-performance liquid chromatography (HPLC). The main components of the perfusate were measured, including glucose, lactate, pyruvate, and ammonia.

Results: The perfusate composition during NMP showed a significant difference between transplanted and not transplanted livers. The glucose levels were significantly higher in transplanted livers compared to not transplanted livers (p < 0.05). Lactate and pyruvate levels were also higher in transplanted livers, but the difference was not statistically significant. Ammonia levels were similar in both groups.

Conclusion: The perfusate composition during NMP can be a useful tool for assessing the preservation status of the graft. Higher glucose levels in transplanted livers suggest better preservation compared to not transplanted livers.
perfusion or produced by the liver or endothelial cells. Our aim was to compare perfusate composition during NMP of transplanted livers (tx) with non-transplanted livers (non-tx).

Method: During NMP of 27 livers, blood gas analysis (BGA) of perfusate and bile was performed, as well as perfusate analysis for thrombocytes, leukocytes, van Willebrand factor activity (VWF), factor XIII activity (FXIII), fibrinogen, bilirubin, sodium, alkaline phosphatase (AP), alanine-aminotransferase (ALT), aspartate-aminotransferase (AST) gamma-glutamate transferase (gGT) and lactate dehydrogenase (LDH). Liver and bile duct biopsies were taken before and after perfusion. Viability assessment was performed between hours 2 and 4 and included lactate clearing, decreasing perfusate glucose, perfusate and bile pH, bile glucose and bile production.

Results: In total 31 livers underwent NMP, 20 were transplanted following viability assessment while 11 livers did not meet the criteria for transplantation. The two groups did not differ in donor age (p = 0.06) and BMI (p = 0.197), but WIT was significantly longer (p = 0.016) and gGT was higher (p = 0.005) in the non-tx group. BGA of perfusate showed lower sodium and bicarbonate (60 minutes, p = 0.011) levels in non-tx livers after 30 (p = 0.001) and 60 (p = 0.05) minutes. The pH was higher in tx livers at 0 (p = 012), 30 (p = 0.001), and 60 (p = 0.024) minutes. Non-tx livers presented with higher FXIII activity at 5 min (p = 0.041), 60 min (p = 0.07), 120 min (p = 0.084), and 240 min (p = 0.069). FXIII act was increasing in non-tx livers but remained mostly stable in tx livers. Bilirubin (5 min, p = 0.02), AP (5 min, p = 0.027; 60 min, p = 0.049), AST (5 min, p = 0.02; 60 min, p = 0.04; 120 min, p = 0.008; 240 min, p = 0.014), ALT (5 min, p = 0.07; 60 min, p = 0.08; 120 min, p = 0.009; 240 min, p = 0.043), gGT (5 min, p = 0.002; 60 min, p = 0.013), LDH (5 min, p = 0.05; 60 min, p = 0.011; 120 min, p = 0.009) was significantly higher in non-tx livers. Fibrinogen levels trended higher in tx livers (not significantly) and were increasing over the course of perfusion in both groups.

Conclusion: Decisions regarding viability assessment were confirmed by damage marker composition in perfusate. Interestingly, FXIII in perfusate was significantly higher in non-tx livers and presented with different dynamics. Fibrinogen was increasing over the course of perfusion in all livers. Transplanted livers presented with higher fibrinogen levels, maybe indicating a higher regenerative capacity.

THU-506 Risk factors associated with surgical morbidities of laparoscopic living liver donors Jinsoo Rhu1, Cyu-Seong Choi1, Jong Man Kim1, Jae-Won Joh1.

Background and aims: This study analyzed incidence and risk factors for surgical morbidities of laparoscopic living donors. Although laparoscopic living donor program has been safely established in leading centers, donor morbidities have not been sufficiently discussed.

Method: Laparoscopic living donors operated during May 2013 to June 2022 were reviewed. Donors’ complications were reviewed, and factors related to bile leakage and biliary stricture were analyzed using multivariable logistic regression method.

Results: A total of 636 donors underwent laparoscopic living donor hepatectomy. Open conversion rate was 1.6%. Thirty-day complication rate was 16.8% (n = 107) Grade IIIa and IIIb complication occurred in 4.4% (n = 28) and 1.9% (n = 12), respectively. The most common complication was bleeding (n = 38, 6.0%). Fourteen donors (2.2%) required reoperation. Portal vein stricture, bile leakage and biliary stricture occurred in 0.6% (n = 4), 3.3% (n = 21), and 1.6% (n = 10) of cases. Readmission rate and reoperation rate was 5.2% (n = 33) and 2.2% (n = 14), respectively. Risk factors related to bile leakage were two hepatic arteries in liver graft (OR = 13.836, CI = 4.092–46.789, P < 0.001), division-free margin <5 mm from main duct (OR = 2.624, CI = 1.030–6.886, P = 0.043) and estimated blood loss during operation (OR = 1.002, CI = 1.001–1.003, P = 0.008) while Pringle maneuver (OR = 0.300, CI = 0.110–0.817, P = 0.018) was protective for leakage. Regarding biliary stricture, only bile leakage was the only significant factor (OR = 11.902, CI = 2.773–51.083, P = 0.001).

THU-507 Clinical impact and treatment of veno-occlusive disease/sinusoidal obstruction syndrome (VOD/SOS) after liver transplantation (LT): the role of transjugular intrahepatic porto-systemic shunt (TIPS) M. Triolo1, Mauro Viganò1, Francesca Poggi2, Luisa Pasulo1, Leonardi Filippo1, Maria Grazia Luca1, Massimo De Giorgio1, Claudia Iegri1, Michele Colledan2, Aurelio Sonzogni3, Paolo Marra4,5, Stefania Camagni1, Domenico Pinelli2, Stefano Fagiuoli1.

Background and aims: Veno-occlusive disease/sinusoidal obstruction syndrome (VOD/SOS) after liver transplantation (LT) is a rare complication, and best treatment and long-term outcome is still
undefined. Aim of this monocentric retrospective study is to evaluate the management and outcome of VOD/SOS after LT.

Method: Between November 1997–2022, 1123 adult patients underwent LT. In patients who developed portal hypertension with ascites and/or hydrothorax after LT, the diagnosis of VOD/SOS was established by liver biopsy and measurements of hepatic venous pressure gradient (HVPG).

Results: 35/1123 (3%) patients [74% males, median age 51 (18–70) yrs, all treated with steroids plus tacrolimus (94%), plus tacrolimus and mycophenolic acid (3%) or plus cyclosporin and mycophenolic acid (3%) had histologically proven VOD/SOS diagnosis. All patients presented with ascites, associated with hydrothorax in 4 (11%) cases. In 28/35 (80%) HVPG was measured at diagnosis of VOD/SOS. Median HVPG with ascites, associated with hydrothorax in 4 (11%) cases. In 28/35 had histologically proven VOD/SOS diagnosis. All patients presented 41 days (17–220) days after acute cellular rejection (ACR), whereas 2 (6%) patients had concomitant ACR and VOD/SOS occurrence. Ten (28%) patients showed spontaneous clinical improvement after a median time of 41 days (17–259), 2 (6%) were treated with defibrotide and 23 (66%) underwent TIPS. HVPG and Meld-Na at VOD/SOS diagnosis were significant higher in patients treated with TIPS compared to those which experienced spontaneous clinical improvement (19 vs 12.5, p < 0.001 and 14 vs 10, p = 0.002). After TIPS placement, the median HVPG was reduced to 8 mmHg (2–15), 17 (89%) patients resolved ascites ± hydrothorax after a median time of 3 months, 3 (16%) patients developed porto-systemic encephalopathy which resolved with medical therapy in 2 cases and with TIPS caliber reduction in the other one. Two (10%) patients needed TIPS enlargement within one year due to stent dysfunction and ascites relapse. Overall, during a median follow-up of 62 months, 3 (16%) patients needed re-OLT, 1 (3%) for tipsitis, 1 (3%) for hepatic artery thrombosis and 1 (3%) for delayed dysfunction of graft. The 1, 3, 5 and 10-yr survival of patients having VOD/SOS spontaneous improvement were 100%, 100%, 87% and 73% compared with 95%, 91%, 63% and 29% of those treated with TIPS, respectively (p = 0.016).

Conclusion: VOD/SOS is a rare (3%) post LT complication associated with ACR in nearly 25% of cases. Among patients with high HVPG (median 19 mmHg) and without an early spontaneous clinical improvement, TIPS could be a safe and effective treatment option in our case series.

THU-508
Reassessing BCLC stage at transplant to predict risk of mortality and HCC recurrence in HCC liver transplant recipients
Cameron Goff1, Ronald Samuel1, Nicole Rich1, Jhanne Benhammou2, Pembai Somasundaram2, Abbas Rana1, Hashem El-Sera1, Fasihah Kanwal1, George Cholankeril1, 1Baylor College of Medicine, Houston, United States; 2UT Southwestern Medical Center, Dallas, United States; 3Pete Morton Medical Building-UCLA Medical Center, Los Angeles, United States; 4Boston University School of Medicine, Boston, United States
Email: george.cholankeril@bcm.edu

Background and aims: The Barcelona Clinic Liver Cancer (BCLC) staging system is widely used for prognostication and treatment-decision making for patients with hepatocellular carcinoma (HCC) at time of diagnosis. However, progression in BCLC stage and change in performance status for HCC liver transplant (LT) recipients is not routinely reassessed at LT, and could predict risk of HCC recurrence and post-LT mortality. The aim of this study is to evaluate BCLC stage at LT as an independent predictor for post-LT mortality and HCC recurrence.

Method: Using the United Network for Organ Sharing (UNOS) database, we retrospectively analyzed all adult T2 HCC exception patients who received LT in the United States from January 1, 2012, to July 1, 2022. BCLC stage at LT was determined for all patients using calculated Child Pugh Score, ECOG Performance Status Scale from reported Karnosfsky performance status, and explant pathology at the time of transplant. Due to poor data quality, performance status of 1 was not used for classification. Cox Hazards regression analyses performed to analyze BCLC as a predictor for mortality, and logistic regression was used to analyze BCLC as a predictor for HCC recurrence.

Results: The study population consisted of 18,534 HCC LT recipients, of which 19.5% (3,808) remained at BCLC stage 0–A and 11.8% (2,188) were BCLC stage B at time of LT. 29.8% of HCC recipients progressed to BCLC stage C and 39.3% (n = 7,279) progressed to BCLC stage D at LT. In recipients with BCLC stage D at LT, 59.1% had ECOG 3–4 and 79.1% were Child Pugh C at time of LT. In addition, 45.7% (n = 3,295) recipients with BCLC stage D at LT had ECOG 0–1 at listing, of which 46.6% (n = 1,536) progressed to ECOG 3–4 at LT. On multivariate analyses accounting for recipient characteristics (age, sex, race and ethnicity), hepatic decompensation, laboratory MELD-Na and AFP at listing, wait time, and donor characteristics, BCLC stage C ( Hazard Ratio (HR): 1.48, p < 0.001) and stage D (HR: 1.39, p < 0.001) at LT were significant predictors for post-LT mortality. For post-LT HCC recurrence, on multivariate analyses, BCLC stage B (Odds Ratio (OR): 1.40, p = 0.004), stage C (OR: 1.86, p < 0.001), and stage D (OR: 1.42, p < 0.001) were also significant predictors of recurrence.

Conclusion: These results suggest that BCLC stage B should be reassessed at LT to prognosticate risk of post-LT mortality and HCC recurrence. This can aid clinicians in determining optimal surveillance strategies for disease monitoring and recurrence.

THU-509
Outcomes in patients with new-onset atrial fibrillation after liver transplantation using the national readmission database
Induja Nimma1, Anand Maligireddy2, Denise Harmois1, Rohan Goswami3, 1Mayo Clinic Florida, Gastroenterology and Hepatology, Jacksonville, United States; 2Mayo Clinic Arizona, Cardiovascular Medicine, Scottsdale, United States; 3Mayo Clinic Florida, Cardiology and Heart Transplant, Jacksonville, United States
Email: nimma.induja@mayo.edu

Background and aims: Atrial fibrillation (AF) increases morbidity and mortality in patients undergoing liver transplantation (LT). Outcomes data is limited on readmission in patients with new-onset AF (NOAF) after LT. We reviewed 90-day outcomes in patients utilizing the National Readmission Database (NRD).

Method: Retrospectively reviewed all adults undergoing LT between 2016 and 2019 using the NRD. Patients readmitted within 90 days were selected based on ICD-10 procedure code for LT (0FY00Z0). Patient data were abstracted from NRD, and descriptive statistics were used to determine significance with a p value of <0.05. All statistical analysis was performed using the stata version 17.0 (StataCorp LLC, College Station, TX, USA).

Results: 31,557 patients underwent LT during our review period, with 8,449 patients (28%) readmitted within 90 days of the index transplantation hospitalization. 222 patients (2.6%) were found to have AF (NOAF) after LT. We reviewed 90-day outcomes in patients with new-onset atrial fibrillation after liver transplantation using the national readmission database.

Figure: Kaplan–Meier survival estimates by BCLC stage
have NOAF, with 67 (43.2%) being female. The median age of NOAF LT patients was 63 (58–67) compared to those without NOAF, which was 58 (50–64) p < 0.01. Comparing NOAF to those without NOAF, we found an increased average hospital length of stay (12 days vs. 6 days), p < 0.01 (95% CI 6.2–7.1). Similarly, the average cost of care was greater in NOAF; 87,010.23 vs. 44,033.59 (US Dollars), p = 0.02 (95% CI 11,932–138,860). NOAF was also associated with increased inpatient mortality 13 deceased (6%) vs. 52 deceased (0.7%) using a multivariate mixed effect logistic regression analysis, p < 0.01 (OR 7.6, 95% CI 3–19).

Conclusion: Based on NDR data, patients in the US who undergo LT have NOAF, with 67 (43.2%) being female. The median age of NOAF LT patients was 63 (58–67) compared to those without NOAF, which was 58 (50–64) p < 0.01. Comparing NOAF to those without NOAF, we found an increased average hospital length of stay (12 days vs. 6 days), p < 0.01 (95% CI 6.2–7.1). Similarly, the average cost of care was greater in NOAF; 87,010.23 vs. 44,033.59 (US Dollars), p = 0.02 (95% CI 11,932–138,860). NOAF was also associated with increased inpatient mortality 13 deceased (6%) vs. 52 deceased (0.7%) using a multivariate mixed effect logistic regression analysis, p < 0.01 (OR 7.6, 95% CI 3–19).

THU-510
Liver Transplantation outcomes in patients following COVID-19 infection
Dinesh Jothimani1, Mullai Ezhi1, Radhika Venugopal1, Hemalatha Ramachandran1, Sathish Srinivasan1, Ramya Paramashivam1, Mohamed Rela1, Dr Rela Institute and Medical Centre, India
Email: dinesh.jothimani@relainstitute.com

Background and aims: COVID-19 can be associated with deleterious effects in patients with underlying chronic liver disease. However, the clinical impact of COVID-19 in patients who undergo LT following recovery from the infection is unclear. This study aimed to compare patients who underwent LT following recovery from COVID-19 to those underwent LT without COVID-19.

Method: A retrospective study of patients who underwent LT following recovery from COVID-19 illness between January 2020 and December 2021 was carried out and compared with MELD matched LT recipients without COVID in a 1:1 ratio. Demographics, clinical presentation, post-operative events, allograft dysfunction and laboratory parameters at week 1, month 1 and 3 compared between the groups. Data analysis done using SPSS v24.

Results: 35 patients underwent LT after COVID illness with a median time of 94 (IQR 58–153) days. Most common etiology was NASH (N = 31.4% vs 37.1%). Mean age 51.23 vs 52.26, p = 0.620), MELD at the time of LT (18.03 ± 18.03, P = 1), Post-operative variables showed ventilator days (mean 3.2 ± 5.346 vs 2.17 ± 0.707 p = 0.95), ICU (11.14 ± 7.826 vs 8.23 ± 7.42 days, P = 0.097) and hospital stay (mean, 18.34 ± 7.82 ± 11.4 ± 6.28, days; P = 0.045) between COVID-LT and non-COVID-LT groups. Post-operative events showed ACR (5.7% vs 8.6% P = 1), AKI (37.1% vs 25.7%, P = 0.44), early allograft dysfunction (17.1% vs 22.6%, P = 0.767), pleural effusion (25.7% vs 5.7%, P = 0.045) between two groups, respectively.

Conclusion: Patients who recovered from COVID-19 illness had comparable outcome following LT akin to those with no COVID in MELD matched recipients.

THU-511
Long-term outcome following liver transplantation for chronic liver disease in intensive care unit: the French nationwide experience
Magdalena Meszaros1, Faouzi Saliba2, Claire Francoz2, Christophe Duvoux3, Filomena Conti4, François Faitot5, Pauline Houssett-Debry5, Jean Hardwigsen8, Marie-Noëlle Hilleret9, Claire Vanlennem9, Ephrem Salamé10, Nassim Kamar11, Jean Gugenheim13, Armand Abergel14, Claire Perignon15, Sebastien Dharancy19, Jérôme Dumortier20, Georges-Philippe Pageaux1, Florent Artru7,22, 1Hospital Center University De Montpellier, Montpellier, France; 2Hôpital Paul-Brousse Ap-Hp, Villejuif, France; 3Hospital Beaunon AP-HP, Clichy, France; 4Henri-Mondor University Hospital, Créteil, France; 5University Hospitals Pitié-Salpêtrière-Charles Foix, Paris, France; 6Hôpital de Hautepierre-Hôpitaux Universitaires de Strasbourg, Strasbourg, France; 7CHU Rennes-Pontchaillou Hospital, Rennes, France; 8Hospital Nord, Marseille, France; 9Chu Grenoble Alpes, La Tronche, France; 10Besançon Regional University Hospital Center, Besançon, France; 11Chru Hospitals of Tours, Tours, France; 12Hospital Center University De Toulouse, Toulouse, France; 13Hospital L'archet, Nice, France; 14Site Estaing Clermont-Ferrand University Hospital, Clermont-Ferrand, France; 15University Hospital Center of Caen, Caen, France; 16Hospital Center University De Bordeaux, Bordeaux, France; 17CHU Dupuytren I, Limoges, France; 18Hôpital de la Croix-Rousse-HCL, Lyon, France; 19Hospital Center University De Lille, Lille, France; 20Edouard Herriot Hospital, Lyon, France; 21Hospital Center University of Montpellier, Montpellier, France; 22King’s College Hospital, United Kingdom
Email: m-meszaros@chu-montpellier.fr

Background and aims: Long-term outcomes of patients with chronic liver disease (CLD) who undergo liver transplantation (LT) in the intensive care unit (ICU) have been poorly reported. We aimed to investigate it and to evaluate the impact on organ utility.

Method: The study was allowed by the French LT organism (Agence de la Biomédecine). All patients with CLD who underwent LT alone between 2008 and 2013 in France were retrospectively included. Data were extracted from the CRISTAL national database. Patients ≤18 years old or who underwent LT in the context of unknown liver disease, secondary malignancy of the liver or primary non-function of the graft were excluded from the analyses. We evaluable organ failure was defined by EASL CLIF-OF criteria.

Results: 5532 patients fulfilled the inclusion criteria including 5236 (94.7%) with CLD and 296 (5.3%) transplanted in the context of fulminant hepatitis (FH). Among them, 708 patients with CLD (12.8%) and 253 (4.6%) with FH were transplanted while in ICU with a median follow-up of 61.7 years. The main causes of LT for CLD-ICU patients were alcohol-related (n = 288, 40.7%) and viral-related cirrhosis (n = 148, 20.9%). Their median age was 54 years old with a median MELD score of 30.8. At the time of LT, 42% were under mechanical ventilation, 31.2% had renal failure (22.0% treated with renal replacement therapy), 63.3% had liver failure and 43.4% had coagulation failure. The 5-year survival was 64.3% in CLD-ICU patients vs. 78.1% in patients with CLD transplanted outside of ICU (CLD-non-ICU, p < 0.0001) and 72.6% in patients with FH (p = 0.09). In CLD-ICU patients, 169/246 deaths (68.7%) occurred within the 1st year following LT. After the 1st year, the annual risk of death was 3.3% vs. 3.1% (p = 0.4) in CLD-ICU and CLD-non-ICU respectively. At the time of LT in CLD-ICU patients, factors independently associated with 5-year survival in multivariable analyses were age (p = 0.04), MELD score (p = 0.05), mechanical ventilation (p = 0.002), and liver failure (p = 0.04). There was a trend toward an independent association of 5-year survival with the timeframe of LT (with better survival observed when LT was performed in the two last years (68% vs. 61.8%, p = 0.06). Causes of death were different between CLD-ICU vs. CLD-non-ICU patients (p < 0.0001) with infection being the leading cause of death (37.2% vs. 20.5%) and cancer being less frequent (9.5% vs. 20.8%).
**CONCLUSION:** CLD-ICU patients had a poorer 5-year survival rate as compared to CLD-non-ICU patients. This was explained by an increased mortality risk at 1 year with infection being the main driver of mortality. After 1-year the annual risk of death was not different. Research should focus on predictors of early mortality as well as on the prevention of infectious events in these patients to improve organ utility.

**THU-512**
**Validation of MELD3.0 in two centres from different continents**

Marta Tejedor Bravo1, José Bellón2, Margarita Fernández-de la Varga2, Peregrina Peralta2, Eva Montalvá2, Nazia Selzner4, Marina Berenguer3.

1Hospital Infanta Elena, Valdemoro, Spain; 2Instituto de Investigación Sanitaria Gregorio Marañón, Madrid, Spain; 3La Fe University and Polyclinic Hospital, Valencia, Spain; 4Toronto General Hospital, Toronto, Canada

Email: marina.berenguer@uv.es

**Background and aims:** A new scoring system, MELD3.0, has been proposed to stratify patients on the liver transplant (LT) waiting list (WL), as it seems to reduce the historical disadvantage of women in accessing LT. Our aim was to validate MELD3.0 in our populations.

**Method:** a 2 centre retrospective review of medical charts of all adult patients included in the LT WL between 2015 and 2019 was conducted. Variables related to patient's demographics, liver function, etiology of liver disease and survival were collected.

**Results:** 619 patients were included, 61% were male, mean age 56 years. Mean MELD at inclusion was 18.00 ± 7.88, MELDNa 19.78 ± 7.00, MELD3.0 20.39 ± 7.25 (MELD3.0 only available for 548 patients). AUC to predict mortality on the WL was 0.8791 (95% CI 0.8196, 0.93850) for MELD, 0.9212 (95% CI 0.87571, 0.96661) for MELDNa and 0.9439 (95% CI 0.91160, 0.97611) for MELD3.0. MELDNa and MELD3.0 were better predictors than MELD (p = 0.06 and p = 0.04 respectively). In women, AUD for MELD was 0.8348 (95% CI 0.74380, 0.92575), for MELDNa 0.8732 (95% CI 0.87544, 0.96014) and for MELD3.0 0.9166 (95% CI 0.86975, 0.96345), differences for the comparison between AUC in women vs men for all 3 scores were non-significant.

**Conclusion:** MELD3.0 has been validated in centers with significant heterogeneity and offers the highest mortality prediction for women on the WL without disadvantaging men.

**THU-513**
**Pre-transplant mycophenolate mofetil may be associated with reduced intrahepatic cholangiopathy in ABO-incompatible liver transplantation**

Jinsoo Rhu1, Gyu-Seong Choi1, Jong Man Kim1, Jae-Won Joh1.

1Samsung Medical Center, Korea, Rep. of South

Email: jrsrules@gmail.com

**Background and aims:** Intrahepatic cholangiopathy is a life-threatening sequela of ABO-incompatible liver transplantation. We analyzed the clinical impact of pre-transplant administration of mycophenolate mofetil in reducing intrahepatic cholangiopathy in ABO-incompatible liver transplantation.

**Method:** Patients who underwent living donor liver transplantation between 2010 and April 2022 were included. Pre-transplant mycophenolate mofetil was started in November 2020. A comparison between patients who experienced intrahepatic cholangiopathy and who did not among ABO-incompatible transplantation was performed. Recipients of ABO-incompatible transplantations were categorized based on donor surgery into open, laparoscopy without pre-transplant mycophenolate mofetil, and laparoscopy with pre-transplant mycophenolate mofetil groups. Cox analysis of intrahepatic cholangiopathy was performed.

**Results:** A total of 234 ABO-incompatible transplantations were included. Intrahepatic cholangiopathy occurred in 1.1% (n = 1/94), 13.3% (n = 12/90) and 2.0% (n = 1/50) of patients who received an ABO-incompatible liver with open surgery, laparoscopic donor surgery without pre-transplant mycophenolate mofetil and laparoscopic donor surgery with pre-transplant mycophenolate mofetil. (p = 0.001) Multivariable analysis showed that transplantations involving a donor who underwent a laparoscopic hepatectomy and a recipient who did not receive pre-transplant mycophenolate mofetil were associated with a higher risk of intrahepatic cholangiopathy (HR = 13.449, CI = 1.710–105.800, P = 0.02) compared to transplantations involving a donor who underwent laparoscopic donor surgery and a recipient who received pre-transplant mycophenolate mofetil were associated with a higher risk of intrahepatic cholangiopathy (HR = 13.449, CI = 1.710–105.800, P = 0.02) compared to transplantations from donors who underwent open surgery. (HR = 5.307, CI = 0.315–89.366, P = 0.25)

**Conclusion:** Laparoscopic donor hepatectomy was a risk factor for intrahepatic cholangiopathy in ABO-incompatible liver transplantation while pre-transplant mycophenolate mofetil was related to risk reduction of intrahepatic cholangiopathy.

---

**Figure:** (abstract: THU-513): Intrahepatic cholangiopathy-free survival according to the case number of ABO-incompatible living donor liver transplantation cases as demonstrated in different groups.
THU-514
Prevalence of renal dysfunction is higher in patients that receive a liver transplant for non-alcoholic steatohepatitis
Rubén Sánchez-Aldehuela1,2,3-4, Margarita Fapatepodori1,2, Agustín Albillos1,2, Emmanuel Toschartzis1,2, 3Royal Free Hospital, London (United Kingdom), United Kingdom; 2Institute for Digestive and Liver Health. University College London (UCL), United Kingdom; 3Hospital Universitario Ramón y Cajal, Madrid (Spain), Instituto Ramón y Cajal de Investigación Sanitaria (IRYCS), Spain; 4Universidad de Alcalá, Spain
Email: ruben.sanchez.aldehuela@gmail.com

Background and aims: Renal dysfunction (RD) is common among liver transplant (LTx) recipients and is associated with worse long-term outcomes. In patients with non-alcoholic steatohepatitis (NASH), additional well-known risk factors for developing RD are present prior to LTx such as diabetes mellitus, hypertension or obesity. We aimed to: i) Investigate the prevalence of pre-LTx RD; ii) Assess the development of RD post-LTx and iii) Identify predictors of RD in such patients.

Method: Retrospective analysis of prospectively collected data of patients that received a LTx at the Royal Free Hospital (London, United Kingdom) between 01/1995 and 04/2022. Patients were considered as NASH cirrhosis if registered as such in the National Database records or if diagnosed with cryptogenic cirrhosis and a BMI ≥30 kg/m² or BMI ≥25 kg/m² and diabetes. Patients who died during LTx or early after were excluded. RD was defined as glomerular filtration rate (GFR) <60 ml/min/1.73 m². Demographic and clinical features were collected from clinical records. A cohort of non-NASH cirrhotic patients transplanted from 01/1995 to 09/2013 was also considered for the aim of the study.

Results: NASH was the primary etiology of cirrhosis in 140/2090 (6.7%) LTx performed. Sixteen patients (11.4%) were excluded because of early post-LTx death and 14 (10%) were lost to follow-up (FU). Finally, 124 patients were included (76.6% males; mean age 59.2 ± 6.8 years; median FU 49.47 months [22.85–102.35]). Diabetes was present in 75% and hypertension in 34.7% pre-LTx. RD was present in 60% and 65.8% at 1 year and at FU respectively. In the multivariate analysis (Figure) we found age, pre-LTx RD, creatinine, presence of varices, ascites and gastrointestinal (GI) bleeding as predictors of RD at 1 year. The NASH group showed a lower GFR compared with other etiologies (SMD 0.17 [0.83 – 0.95], p = 0.001, 95% CI 0.001 – 0.001) at 1 year and FU respectively. In the multivariate analysis, NASH was associated with a higher risk of RD during post-LTx FU (OR 2.511; p < 0.001). After propensity-score matching (PSM) adjustment for age, sex and presence of diabetes and hypertension, no differences for RD at 1 year or at the end of FU were found between NASH and PSM non-NASH LTx recipients (47.5% vs 40.3%; p = 0.24 and 50.8% vs 50.8%; p = 1, respectively).

OR (95% CI) P

| Age | 1.08 (1.02 – 1.15) 0.84 | 1.03 (0.99 – 1.07) 0.75 |
| Sex | 0.64 (0.26 – 1.65) 0.35 | 0.71 (0.46 – 1.11) 0.13 |
| BMI | 0.95 (0.90 – 1.01) 0.06 | 1.01 (0.97 – 1.06) 0.61 |
| Renal dysfunction preLTx | 0.27 (0.13 – 0.56) 0.001 | 0.35 (0.19 – 0.64) 0.001 |
| Hypertension | 0.88 (0.37 – 2.19) 0.73 | 0.84 (0.56 – 1.27) 0.40 |
| Diabetes mellitus | 0.56 (0.24 – 1.28) 0.25 | 1.02 (0.76 – 1.39) 0.44 |
| Varices | 0.54 (0.27 – 1.08) 0.06 | 1.04 (0.83 – 1.31) 0.74 |
| Ascites | 1.04 (0.99 – 1.01) 0.10 | 1.05 (1.00 – 1.10) 0.05 |
| GI bleeding | 1.03 (0.77 – 1.37) 0.01 | 0.11 (0.74 – 1.84) 0.84 |
| Hepatic encephalopathy | 2.13 (0.93 – 4.91) 0.08 | 0.89 (0.60 – 1.29) 0.56 |
| MELD | 1.01 (0.98 – 1.03) 0.83 | 1.00 (0.95 – 1.06) 0.93 |
| ECOG | 1.03 (1.01 – 1.06) 0.001 | 1.02 (1.02 – 1.05) 0.001 |

Conclusion: RD at 1 year and FU is higher in patients transplanted with NASH-cirrhosis compared to other etiologies. Several pre-LTx factors may predict the development of RD in this group of patients.

THU-515
Comparing clinical outcomes of robot-assisted versus open hepatectomy for liver cancer: a systematic review and meta-analysis
Muhammad Elfaituri1, Ala Khaled1, Ahmed BenGhatahni2, Ahmed Elfaituri1, Hazem Faraj1, Ahmed Msherghi1, University of Tripoli, Faculty of Medicine, Tripoli, Libya; 2National Heart Centre, Tajoura, Libya
Email: dr.muhammad.khaled.elfaituri@gmail.com

Background and aims: Liver cancer is a major contributor to cancer-related deaths worldwide. Surgical management of liver tumors remains a challenge, with both open hepatectomy and robot-assisted hepatectomy being commonly used. This systematic review and meta-analysis compare the clinical outcomes of these two surgical techniques.

Method: A comprehensive search of electronic databases, including PubMed, Embase, and the Cochrane Library, was conducted to identify eligible studies comparing robot-assisted and open hepatectomy for liver tumors. The search was conducted up to January 2023. The primary outcome measures were operative time, blood loss, length of hospital stay, and overall complications. The meta-analysis was performed using R version 4.0.3 and the metafor and meta packages.

Results: Seven studies with a total of 368 patients who underwent robot-assisted hepatectomy and 648 patients who underwent open hepatectomy met the inclusion criteria and were included in the meta-analysis. The results showed that robot-assisted hepatectomy was associated with longer operative time (SMD 1.65, 95% CI 0.53 to 2.75, p < 0.01, I² = 98) but lower blood loss (SMD −0.39, 95% CI −0.55 to −0.25, p < 0.01, I² = 0) compared to open hepatectomy. Length of hospital stay was also significantly shorter in the robot-assisted group (SMD −1.7, 95% CI −2.7 to −0.43, p < 0.01, I² = 98). There was no significant difference in the need for blood transfusions between the two groups (RR 1.02, 95% CI 0.38 to 2.71, p = 0.98, I² = 60%). Resection margins and overall complication rates did not show significant differences between the two approaches (SMD −0.08, 95% CI −0.25 to 0.102, p = 0.4, I² = 0 and RR 0.77, 95% CI 0.56 to 1.05, p = 0.1, I² = 6%, respectively).

Conclusion: This systematic review and meta-analysis suggest that robot-assisted hepatectomy is associated with longer operative time, but shorter hospital stays, and lower blood loss compared to open hepatectomy for liver tumors. Further high-quality studies are needed to confirm these findings and assess the long-term outcomes of the two surgical techniques.

THU-516
Association between waiting time and post-transplant survival in recipients with hepatocellular carcinoma outside Milan criteria after downstaging with locoregional therapy
Zoljargal Lkhagvajav1, Elliott Haut2, Uurtalsih Baatarsuren2, Betsy King3, The Johns Hopkins University School of Medicine, Baltimore, United States; 2Onom foundation-Oram Calt, Ulaanbaatar, Mongolia; 3Onom foundation-Oram Calt, Ulaanbaatar, Mongolia[NT1]
Email: zoljargal@onomfoundation.org

Background and aims: Prior studies show conflicting results on the association between waiting time and post-transplant survival among patients with hepatocellular carcinoma (HCC). We aimed to assess the association between waiting time and post-transplant survival in recipients with HCC outside Milan criteria after downstaging with locoregional therapy and identify factors that are associated with higher post-transplant survival.

Method: Using the Scientific Registry of Transplant Recipients (SRTR) database, we retrospectively analyzed 5-years post-transplant survival of all adult patients who had HCC outside Milan criteria and received liver transplantation (LT) between January 1, 2010, and December 31, 2021, after downstaging with LRT and with information about their tumor size and number. According to their waiting time,
recipients were divided into three groups: <6 months, 6–12 months, and >12 months. Kaplan-Meier method and a log-rank test were used to assess survival. Univariable and multivariable Cox regression was used to identify factors associated with post-transplant mortality.

**Results:** A total of 479, 439, and 307 recipients were included in the waiting time group of <6 months, 6–12 months, and >12 months respectively. We conclude that there is no statistically significant difference among the three waiting time groups in terms of post-transplant survival (HR 1.4; 95% CI 1.03–1.91; p = 0.03). Waiting time of <6 months prior to LT put the patients at a significantly higher risk of mortality compared to a waiting time of 6–12 months (HR 1.4; 95% CI 1.03–1.91; p = 0.03). Being in the higher median serum alfa-fetoprotein (AFP) level groups (HR, 1.37; 95% CI 1.02–1.79; p = 0.03) was associated with a higher risk for post-transplant mortality.

**Discussion:** To our knowledge, there hasn’t been any study that has assessed the association between waiting time and post-transplant survival among recipients who presented HCC outside Milan criteria. Our findings show that a higher median serum AFP level is associated with a higher risk for mortality after LT among patients with HCC.

**Conclusion:** Our study indicates that it is important to consider the tumor biology for post-transplant survival and serum AFP level can be used as an indicator for tumor biology and subsequently an indicator for post-transplant survival. The result is consistent with the existing literature that the higher serum AFP level is associated with a higher risk for mortality after LT among patients with HCC. Further research is needed to assess the association with a bigger sample size, possibly in another country where the HCC patients are diagnosed at a more progressed stage and the prevalence of HCC outside Milan criteria is higher.

**THU-517**

CMV reactivation after liver transplantation (LT) in HIV infected is similar to non-HIV patients: a single center comparative study

Sonia García-García1, Isabel Terol Chafé2, Victor Argumánez Tello1, Carmen Vinaixa2,3, Javier Maupoey3, Marino Blanes Julia1, Angela Carvalho Gomez2, Marina Berenguer Haym1,2, Victoria Aguilara Sancho1,2, 1Hospital Universitario y Politécnico La Fe, Valencia, Spain; 2CIBERehd, Instituto Carlos III, Madrid, Spain; 3Universidad de Valencia, Facultad de Medicina, Spain

Email: soniagg1995@hotmail.com

**Background and aims:** Cytomegalovirus (CMV) reactivation after liver transplant (LT) has been associated with poor outcomes. There is no evidence of a higher rate of CMV reactivation or disease in HIV-infected patients. Our aim was to describe the CMV reactivation, primary infection and need of antiviral treatment in HIV-infected LT patients, compared to non-HIV-infected LT patients.

**Method:** We included patients who underwent LT from June 2004 to December 2020 in a single LT center. Each HIV-infected patient was matched to 2 non-HIV infected controls by age, sex, liver disease etiology, and date of LT. Pre-LT baseline features, HIV related variables, and post-LT outcomes related to CMV were recorded. Patients at donor/recipient (D/R) mismatch high risk (D +/R –) were given prophylaxis with valganciclovir. The rest of the patients were followed with a “preemptive” strategy and received early treatment based on clinical criteria.

**Results:** A total of 156 LT recipients were included (52 HIV-infected and 104 non-HIV-infected). Baseline characteristics were similar in both groups (see figure 1), except for age and body mass index, which were lower in HIV-infected patients. Mean follow-up post-LT was 7.5 years in the HIV group vs 8.2 years in the non-HIV group. CMV reactivation occurred in 10 (20%) in HIV vs 24 (24%) in non-HIV and CMV disease occurred in 2 (2%) non-HIV and 1 (2%) HIV patient (p = 0.521 and 0.687). The need for preemptive treatment was 11.5% in the HIV group and 14% in the non HIV group (p = 0.8).

Mean CMV viral load (VL) at reactivation was 2518 in HIV-patients and 14% in the non HIV group (p = 0.8). The need for preemptive treatment was 11.5% in the HIV group vs 8.2 years in the non-HIV group. CMV reactivation after liver transplantation (LT) in HIV infected is

**Table 2. Univariable and multivariable Cox regression analysis for 5-year survival in recipients with HCC outside Milan criteria after downstaging with locoregional therapy**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Univariable HR (95% CI)</th>
<th>p value</th>
<th>Multivariable HR (95% CI)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study groups (ref: &lt;6 months)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;6 months</td>
<td>1.36 (1.05–1.81)</td>
<td>0.04</td>
<td>1.41 (1.15–1.76)</td>
<td>0.03</td>
</tr>
<tr>
<td>6–12 months</td>
<td>1.28 (0.93–1.76)</td>
<td>0.13</td>
<td>1.17 (0.88–1.56)</td>
<td>0.30</td>
</tr>
<tr>
<td>&gt;12 months</td>
<td>1.26 (0.76–2.12)</td>
<td>0.35</td>
<td>1.29 (0.77–2.20)</td>
<td>0.36</td>
</tr>
<tr>
<td>Race (ref: White)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>0.55 (0.30–1.02)</td>
<td>0.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.77 (0.50–1.22)</td>
<td>0.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>0.94 (0.62–1.43)</td>
<td>0.81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>1.46 (0.74–3.03)</td>
<td>0.26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total tumor size (cm2)</td>
<td>1.02 (0.97–1.08)</td>
<td>0.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI (ref: &lt;25)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25–30</td>
<td>0.90 (0.77–1.07)</td>
<td>0.24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;30</td>
<td>1.04 (0.93–1.18)</td>
<td>0.48</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Conclusion:** To our knowledge, there hasn’t been any study that measured the association between waiting time and post-transplant survival among recipients who presented HCC outside Milan criteria and downstaged through LRT before receiving LT. Thus, we aimed to evaluate the association among these patients and find factors that are associated with post-transplant survival. Our findings show that a waiting time of <6 months was associated with 1.4 times increased hazard of mortality compared to a waiting time of 6–12 months. We found that a higher median serum AFP level is associated with a higher risk for post-transplant mortality. Although, the generalizability of this study is affected by the small size of the study population and the selection criteria. As we included patients who were responsive to LRT and successfully downstaged within Milan criteria, it can be implied that these patients had good tumor biology and the result of the current study could not be generalized to all patients who present with HCC outside Milan criteria. Our study indicates that it is important to consider the tumor biology for post-transplant survival and serum AFP level can be used as an indicator for tumor biology and subsequently an indicator for post-transplant survival. The result is consistent with the existing literature that the higher serum AFP level is associated with a higher risk for mortality after LT among patients with HCC.
Conclusion: In the post-LT setting, CMV reactivation in HIV-infected patients was similar to non-HIV patients. Variables associated with reactivation were D/R mismatch and recipient's age. Preemptive strategies seem to be effective in both groups.

THU-519
Development of metabolic disorders in transplant recipients
Gizem Erdemir1, Hale Gökcan2, Ayşegül Gürsoy Çoruh3, Başak Gülpinar2, Zeynep Melekoglu Elik2, Mesut Gümüşsoy3, Serkan Duman1, Emin Bodakçi2, Ramazan Idilman1,1 Ankara University School of Medicine, Internal Medicine, Turkey; 2Ankara University School of Medicine, Gastroenterology and Hepatology, Turkey; 3Ankara University School of Medicine, Radiology, Turkey; 4Karaman Training and Research Hospital, Gastroenterology and Hepatology, Turkey; 5Gaziantep Şehitkamil Public Hospital, Gastroenterology and Hepatology, Turkey; 6Mersin Toros Public Hospital, Gastroenterology and Hepatology, Turkey
Email: halesumer@yahoo.com

Background and aims: Metabolic syndrome (MS) is the most common long-term complication after liver transplantation. The aim of this study was to assess the prevalence and risk factors for metabolic syndrome (MS) and its component after living donor liver transplantation (LDLT).

Method: A total of 114 adult patients listed for liver transplantation (LT) between 2005 and 2021 with a minimum follow-up of one year were included. Demographics, laboratory and computed tomography data were collected pre and post-transplant.

Results: Mean age was 56.0 ± 11.5 and 63% were male. LDLT was performed on 88 (77%) patients. Fourty-six (40%) patients were smokers. HBV infection (36%) was the main indication. The majority of the patients (n = 101, 89%) were on tacrolimus-based treatment. Median follow-up period after LT was 7.5 year (range 1–20 year). In post-transplant period; BMI was 27.8 kg/m², 29.7% of them were obese. Thirty-two (28%) patients developed new-onset DM (NODAT), 60.1% hypertension, 40.7% hyperlipidemia, and 51.3% MS (Table 1). The post-transplant median atherosclerotic cardiovascular disease (ASCVD) risk score was 16.5. Sixteen patients (14%) had a history of a cardiac event post-transplant. The mean post-transplant HbA1C, waist and hip circumference were 6.22 ± 1.57, 104.2 ± 15.3 and 109.4 ± 12.5 respectively. Post-transplant hypertension, diabetes, antihypertensive and antidiabetic drug use, ASCVD score and BMI were higher in post-transplant MS. Posttransplant median visseral adipose tissue (VAT), total fat area (TFA) and VAT/SAT were 146.8 cm² (12.6–340.8), 0.63 (0.1–4.2) and 314.4 cm² (40.9–653.4) respectively, which were higher than in the non-metabolic syndrome group 103.0 cm² (12.6–340.8), 0.63 (0.1–4.2) and 201.6 cm² (32.4–527.5) respectively (p = 0.06).

Conclusion: Metabolic disorders are frequent complications after liver transplantation and a high VAT, SAT/SAT and TFA are at increased risk for developing MS. The high incidence of MS and its components in our sample highlights the importance of closely and carefully monitoring for development of MS and its complications.

THU-519
Tailored immunosuppression with LCPT extended release Tacrolimus based on NFAT-regulated gene expression
Judith Kahn1, Eva Matzhold2, Petra Ofner-Kopeinig3, Peter Schlenke2, Peter Schemmer4. 1General, Visceral and Transplant Surgery, Graz, Austria; 2Department of Blood Group Serology and Transfusion Medicine, Graz, Austria; 3Institute for Medical Informatics, Statistics and Documentation, Graz, Austria; 4General, Visceral, and Transplant Surgery, Graz, Austria[NT2]
Email: judith.kahn@medunigraz.at

Background and aims: There is a narrow therapeutic window for immunosuppression (IS) with calcineurin (CNI) inhibitors. The immunosuppressive effect of CNIIs differs between individuals. Therefore, the drugs’ trough levels do not reflect IS and should be replaced by pharmacodynamic monitoring. Since nuclear factor of activated T-cells (NFAT)-depending gene expression correlates with cyclosporine induced IS, this study was designed to evaluate the effect of LCPT extended release tacrolimus (Tac) on NFAT regulated residual gene expression (RGE). Method: Gene expressions of interleukin-2, interferon-γ and granulocyte-macrophage colony-stimulating factor and three reference genes were measured with droplet digital polymerase chain reaction (ddPCR) in whole blood samples at day 2, 7, 14, month 1 and 6 until 1

Figure: Table 1. Demographics and laboratory data of pre and post transplant period

<table>
<thead>
<tr>
<th></th>
<th>Pre-transplant</th>
<th>Post-transplant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (kg) mean±SD</td>
<td>73.9±14.8</td>
<td>80.2±15.2</td>
</tr>
<tr>
<td>BMI (kg/m²) mean±SD</td>
<td>25.7±4.6</td>
<td>27.8±5.0</td>
</tr>
<tr>
<td>Obesity n, (%)</td>
<td>11(9.7)</td>
<td>28(24.7)</td>
</tr>
<tr>
<td>Hypertension n, (%)</td>
<td>12(10.6)</td>
<td>68 (60.1)</td>
</tr>
<tr>
<td>Diabetes Mellitus n, (%)</td>
<td>28(24.7)</td>
<td>54(47.7)</td>
</tr>
<tr>
<td>Hyperlipidemia n, (%)</td>
<td>13(11.5)</td>
<td>46(40.7)</td>
</tr>
<tr>
<td>Coronary artery disease n, (%)</td>
<td>8(7.07)</td>
<td>16(14.1)</td>
</tr>
<tr>
<td>Metabolic syndrome n, (%)</td>
<td>15(13.2)</td>
<td>58(51.3)</td>
</tr>
<tr>
<td>Glucose (mg/dL) (median-range)</td>
<td>104(69-260)</td>
<td>113(66-289)</td>
</tr>
<tr>
<td>Cholesterol (mg/dL) (median-range)</td>
<td>128(39-246)</td>
<td>172(85-350)</td>
</tr>
<tr>
<td>Triglyceride (mg/dL) (median-range)</td>
<td>97(11-449)</td>
<td>155(46-514)</td>
</tr>
<tr>
<td>ASCVD risk score (median-range)</td>
<td>7(0.2-41.89)</td>
<td>13.6(0.1-63.8)</td>
</tr>
<tr>
<td>Anti-lipidemic drug use n, (%)</td>
<td>3(2.6)</td>
<td>11(9.5)</td>
</tr>
<tr>
<td>Anti-hypertensive drug use n, (%)</td>
<td>10(8.7)</td>
<td>52(46.5)</td>
</tr>
</tbody>
</table>
Table 2. Comparison of post-transplant patients with and without metabolic syndrome in terms of pre-transplant clinicodemographic data

<table>
<thead>
<tr>
<th>Patient characteristics</th>
<th>Metabolic Syndrome Present n=59</th>
<th>Metabolic Syndrome Absent n=55</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex: Male [n (%)]</td>
<td>42 (71.1)</td>
<td>27 (49)</td>
</tr>
<tr>
<td>Age, years means±SD</td>
<td>60 ±7.30</td>
<td>51.9±13.57</td>
</tr>
<tr>
<td>BMI (kg/m²) means±SD</td>
<td>26 ±6.427</td>
<td>24.4±5.63</td>
</tr>
<tr>
<td>Hypertension n, (%)</td>
<td>11 (18.6)</td>
<td>1 (1.81)</td>
</tr>
<tr>
<td>Anti-hypertensive drug use n, (%)</td>
<td>10 (16.9)</td>
<td>1 (1.81)</td>
</tr>
<tr>
<td>Diabetes mellitus n, (%)</td>
<td>21 (35.9)</td>
<td>7 (12.7)</td>
</tr>
<tr>
<td>Anti-diabetic drug use n, (%)</td>
<td>21 (35.9)</td>
<td>5 (9.09)</td>
</tr>
<tr>
<td>Smoking n, (%)</td>
<td>30 (50.8)</td>
<td>16 (29)</td>
</tr>
<tr>
<td>ASCVD risk score [median (range)]</td>
<td>12.5 (0.9-41.8)</td>
<td>5.6 (0.1-22.7)</td>
</tr>
<tr>
<td>VAT (cm²) [median (range)]</td>
<td>171.7 (29.9-484.4)</td>
<td>103.0 (12.6-340.8)</td>
</tr>
<tr>
<td>SAT (cm²) [median (range)]</td>
<td>201.6 (32.4-527.5)</td>
<td>156.1 (22.7-448.8)</td>
</tr>
<tr>
<td>Total Fat Area (cm²) [median (range)]</td>
<td>400.8 (62.3-744.8)</td>
<td>314.4 (40.9-653.4)</td>
</tr>
<tr>
<td>VAT/SAT [median (range)]</td>
<td>0.82 (0.23-4.21)</td>
<td>0.63 (0.1-4.2)</td>
</tr>
</tbody>
</table>

Table: (abstract: THU-518).

Background and aims: A considerable proportion of patients with common variable immunodeficiency (CVID) have inflammatory and autoimmune complications. This can include liver disease with development of nodular regenerative hyperplasia (NRH) leading to portal hypertension and end-stage liver disease. We sought to assess the long-term outcome after liver transplantation (LTX) of patients with CVID.

Method: Information was retrieved from the Nordic liver transplant registry and the patients’ medical records at Oslo University Hospital (OUH) until December 31st 2021.

Results: Between 2009 and 2021, six patients with CVID underwent LTX at OUH. Patient characteristics and indications for LTX are summarized in table 1. All patients had NRH in the explanted liver and none was hepatitis C positive. All patients received our standard initial immunosuppression after LTX which includes prednisolone, tacrolimus and mycophenolate. Table 1 gives an overview of complications and outcome after LTX. Five of the six patients are still alive after an observational time of 4–12 years with median survival 7.5 years. Of the three patients who underwent LTX due to hepatopulmonary syndrome, one is currently well without need for extra oxygen therapy 4 years after LTX, one underwent a lung-transplantation 6 years after LTX due to relapse of pulmonary shunt-related respiratory failure and one is deceased. Patient 2 died suddenly and unexpectedly 6 years after LTX without signs of liver failure, infection or chronic respiratory failure. Two patients (Patient 1 and 4) have developed signs of increased portal vein pressure including one case of severe upper gastrointestinal bleeding, but no other complications of chronic liver disease have been noted. Four patients have had a graft biopsy, all with findings of de-novo NRH. All patients who are still alive have slightly elevated transaminases and/or cholestatic markers. All six patients have had bacterial infections post-LTX, but based on small numbers it’s difficult to conclude if there are more infectious complications in CVID post-LTX compared to other liver recipients. Airway and GI infections may be CVID related, whereas urinary tract infections are not, and none of these infections resulted in severe morbidity or death following LTX. Overall survival rate was 83% after 4–12 years post-transplant observation, which is comparable with overall post LTX survival in the Nordic countries for conventional transplant indications.

Conclusion: Our report shows that CVID patients may obtain overall survival fully comparable to conventional indications for LTX. These patients have a dismal prognosis without transplant. Hence, CVID with severe liver failure should not be considered a contraindication to LTX.
Porto-pulmonary hypertension in patients considered for liver transplantation: a cohort study


1King’s College Hospital, Department of Critical Care, United Kingdom; 2Institute of Liver Studies, King’s College Hospital, Department of Hepatology, United Kingdom; 3Liver Intensive Therapy Unit, King’s College Hospital, Consultant in Critical Care, United Kingdom; 4Institute of Liver Studies, King’s College Hospital, Consultant Transplant Hepatologist, United Kingdom; 5Institute of Liver Studies, King’s College Hospital, Consultant Transplant Surgeon, United Kingdom

Email: declan.lewis@nhs.net

Background and aims: Porto-pulmonary hypertension (PoPH) is a rare cardiovascular complication of portal hypertension and carries significant morbidity and mortality both in the pre- and post-liver transplant (LT) groups. The aim of this study is to assess the efficacy of therapeutic interventions and outcomes in PoPH patients in transplanted and non-transplanted cohorts.

Method: Retrospective review of health records of adult patients with PoPH in a large tertiary centre over an 18-year period.

Results: Records of twenty adult patients diagnosed with PoPH between January 2005 and December 2022 were analysed. Mean age was 48.8 years (SD: ±10.2); male 14 (70%); MELD and UKELD scores were 16.1 (SD ±7.1) and 53.5 (SD ±5.3) respectively; 18 (90%) had cirrhosis; 6 (30%) carried a dual diagnosis of PoPH and hepatopulmonary syndrome. Ten (50%) patients had severe PoPH at diagnosis (mean pulmonary artery pressures (mPAP) >45 mmHg); 7 (35%) moderate (35–44 mmHg); and 2 (10%) mild (25–34 mmHg). MPAP before initiation of monotherapy was 46.1 mmHg (SD ±12.3), decreasing to 39.8 mmHg (SD ±11.7) post-treatment (6.3% reduction; p < 0.05). MPAP prior to dual therapy was 51.8 mmHg (SD ±6.1) decreasing to 35.9 mmHg (SD ±15.5) post-treatment (15.9% reduction; p < 0.05). Normalization of mPAP was achieved in 1 (5%) patient following initiation of pharmacological therapy; 8 (47%) patients improved to mPAP <35 mmHg. Overall, 13 (65%) patients were assessed for LT; five (25%) patients were deemed too unwell for formal transplant assessment; transplantation was not indicated in two (10%) patients due to relative preservation of native liver function. Twelve patients were listed (two were de-listed due to the development of contraindications). One patient was declined for transplant due to prohibitive underlying cardiovascular risk factors. Median transplant free survival was 19 months (IQR 8–28); median survival in transplanted group was 33 months (IQR 19–54), with 1 year survival 69.2% and 71.4%, respectively. No patients died on the waiting list.

Conclusion: Dual therapy strategies appear to be superior to monotherapy for reduction in mean pulmonary artery pressures in patients with PoPH. However, despite improvement in pulmonary haemodynamics post initiation of pharmacological therapy, outcomes in both transplanted and non-transplanted cohorts remain suboptimal. Further studies are required to assess the impact of dual versus monotherapy on post-transplant outcomes.
THU-522
Liver transplantation in patients with cystic fibrosis: 30 years of experience in Australia and New Zealand
Thomas Wilson1, Toni Illhardt1, Michael Fink2,3, Robert Jones3, Anastasia Volovets3, Mandy Byrne2, Mark Oliver1,2, 1The Royal Children’s Hospital Melbourne, Parkville, Australia; 2Austin Hospital, Heidelberg, Australia; 3University of Melbourne, Parkville, Australia; 4Royal Prince Alfred Hospital, Camperdown, Australia
Email: tom.wilson3@rch.org.au
Background and aims: Liver transplantation has emerged as an effective treatment strategy in patients with Cystic Fibrosis-related liver disease (CFLD) who develop features of hepatic decompensation or intractable variceal bleeding. We aimed to review the outcomes of patients within our region who had undergone liver transplantation for CFLD.
Method: We utilised the Australia and New Zealand Liver and Intestinal Transplant Registry (ANZLITR) to retrospectively review data from all patients in Australia and New Zealand who had undergone liver transplantation for CFLD, including those who underwent liver transplantation as a component of a multi-organ transplantation.
Results: A total of 54 patients (25 children and 29 adults) underwent liver transplantation for CFLD in Australia and New Zealand between January 1989 and July 2022. Mean age at time of transplantation was 12.2 ± 4.3 years and 28.5 ± 6.0 years for the paediatric and adult groups, respectively. Thirty-six patients (67%) underwent isolated liver transplantation (22 of 25 children (88%); 14 of 29 adults (48%)). Eighteen patients (33%) underwent liver transplantation as a component of a multi-organ transplantation (combined liver-heart-lung in 8, combined liver-lung in 5, combined liver-pancreas in 4, and combined liver-pancreas-kidney in 1). Three patients underwent re-transplantation for liver graft failure. Causes of death following transplantation included pulmonary disease (12 patients), sepsis (2 patients), intra-abdominal haemorrhage (1 patient), and multi-organ failure (1 patient). The overall 5-year survival rate for the children was 92.0% (95% confidence interval [CI]: 71.6–97.9%) versus 66.2% (95% CI: 44.8–80.9%) for the adults. The 5-year survival rate for those who underwent isolated liver transplantation was 82.6% (95% CI: 65.3–91.8%) versus 67.7% (95% CI: 38.3–85.3%) for those undergoing multi-organ transplantation. Survival at 5- and 10-years after transplantation for the entire group was 78.1% (95% CI: 63.8–87.3%) and 71.0% (95% CI: 54.3–82.5%), respectively.
Conclusion: Liver transplantation remains a viable treatment option in children and young adults with CFLD. Survival outcomes are comparable to those previously reported in the literature, with superior survival rates observed among both children and those undergoing isolated liver transplantation.

THU-523
Which is the best therapy for not transplantable patients with multinodular early HCC?
Alessandro Vitale1, Fabrizio Romano2, Fabio Farinati1, Franco Trevisani2, Umberto Cillo1, 1Azienda Ospedaliero Universitaria Padova, Padua, Italy; 2Università Milano Bicocca, Italy; 3Università di Bologna, Italy; 4Royal Children’s Hospital Melbourne, Parkville, Australia
Email: alessandro.vitale@unipd.it
Background and aims: The 2022 version of the BCLC staging system recommends a treatment stage migration from liver transplantation (LT) directly to trans-arterial chemo-embolization (TACE) in patients with multinodular early stage HCC, when LT is not feasible. We sought to compare the effectiveness of liver resection (LR), percutaneous radiofrequency ablation (PRA), and TACE in patients with not transplantable but potentially resectable multinodular early HCC.
Method: Only multinodular not transplantable early stage (2 or 3 nodules ≤3 cm) HCC patients were considered. LR patients were obtained from the HE.RC.O.LE.S. register, whereas PRA and TACE patients were obtained from the ITA.LLA.CE register. Since the aim of this study was to compare the effectiveness of three potential treatments in resectable patients, the statistical method “matching-adjusted indirect comparison” (MAIC) was used to match the PRA and TACE groups to the LR group.
Results: Between 2008 and 2020, 655 HCC cirrhotic patients were enrolled: 303 in LR, 204 in PRA, and 148 in TACE groups. Age, sex, Charlson Comorbidity index, Child-Pugh grade, MELD, platelets count, etiology of cirrhosis, number, and diameter of nodules, and alpha-fetoprotein were weighted by MAIC to create two PRA and TACE pseudo-populations balanced with the LR group. After MAIC, 1–3–5 years OS was 88%, 71%, 56% for LR (median survival 67 months), 97%, 63%, 22% for PRA (median survival 53 months), and 88%, 58%, 32% for TACE (median survival 41 months) (p < 0.001). At Cox multivariable weighted regression, the survival benefit of LR over alternative treatments was confirmed: LR group as the reference; PRA (hazard ratio 1.44; 95% confidence interval 1.19–1.84, p = 0.0045); TACE (hazard ratio 1.70; 95% confidence interval 1.25–2.31; p = 0.0007).

Conclusion: In multinodular early, not transplantable HCC, LR should be the first option, followed by PRA and TACE only when LR is not feasible.

THU-524
Management in hepatology: cost analysis of two opposite options for pretransplantation evaluation
Irene Peñas Herrero1, Gloria Sánchez Antolín1, Carmen Alonso Martín1, Félix García Pajares1, Carolina Almohalla Alvarez1, Beatriz Burgueño1, Sandra Izquierdo Santervá1, Isabel Ruiz Núñez1, Jorge Ruiz Rodríguez1, Alicia San José Crespo1, Cristina Martínez Cuevas1, Esteban Fuentes Valenzuela1, Soledad Sahudo García1, 1Hospital Universitario Rio Hortega, Hepatology Unit, Valladolid, Spain; 2Hospital Clínico Universitario, Gastrointestinal and Hepatology Department, Valladolid, Spain; 3Hospital Universitario Rio Hortega, Admission and Clinical Documentation Department, Valladolid, Spain
Email: ipenash@saludcastillayleon.es
Background and aims: Pretransplantation evaluation before a liver transplant is a critical step in every liver transplant program. It establishes the indication of liver transplant in every patient, and it detects any contraindication that risks the life of patients or the survival of liver graft. This evaluation can be done as an inpatient manner or in an outpatient clinic. In our tertiary hospital, from 2011 the pretransplantation evaluation is done in the outpatient setting with an specific hepatology clinic. It includes at least 2 onsite visits. The aim of our study is to compare the cost associating to the
Liver transplant recipients with autoimmune hepatitis in the Swiss transplant cohort study have a higher risk of graft loss and vascular complications

Aurélie Rosat1, Benedetta Terzirolì2, Linard Hoessly2, Susanne Stampf3, Michael Koller4, Nicolas Goossens5, Montserrat Fraga Christinet6, Annalisa Berenguer4, Jordi Colmenero2, Javier Bustamante3, Mario Romero1, Jordi Colmenero2, Laura Benitez Gutierrez11, Alejandra Otero9, Cristina Corchado10, Laura Benitez Gutierrez11, Marina Berenguer4, Fernando Díaz1, Luis Menchén Viso1, Marina Berenguer4, Miguel Cova2, Sergio Rodriguez-Tajes2, Silvia Tomás4, Isabel Conde5, Rosa Martín-Mateos5, María Luisa Gonzalez Dieguez6, Sonia Pascual7, Emilio Fabrega8, Alejandra Otero9, Cristina Corchado10, Laura Benitez Gutierrez11, Mario Romero1, Jordi Colmenero2, Javier Bustamante3, Marina Berenguer4, Fernando Díaz1, Luis Menchén Viso1, Rafael Bañares1, Magdalena Salcedo1, Carolina Otero9, Cristina Corchado10, Laura Benitez Gutierrez11, Mario Romero1, Jordi Colmenero2, Javier Bustamante3, Marina Berenguer4, Fernando Díaz1, Luis Menchén Viso1, Rafael Bañares1, Magdalena Salcedo1, Carolina Otero9, Cristina Corchado10, Laura Benitez Gutierrez11.
were women, the median age was 49 (IQR 39–58) years, follow-up time 3.36 (1.69–5.20) years, and MELD score 20 (15–32); graft loss and death rates were 34.8% (n = 8) and 21.7% (n = 5), respectively. There was no significant difference in death rates between AIH and other groups but graft loss was significantly higher in AIH patients (p = 0.002) (Figure). Eighteen (78.3%) AIH patients had a relevant complication, 77.8% (n = 14), 44.4% (n = 8) and 27.7% (n = 5) of them having a vascular, biliary or infectious complication, respectively. In the multivariante analysis, AIH was independently associated with a higher risk of complications (HR 1.693, 95% CI 1.024–2.799, p = 0.040), along with pre-LT MELD score (HR 1.013, 95% CI 1.002–1.024, p = 0.017), living donation (HR 3.165, 95% CI 2.069–4.841, p < 0.005), and rejection (HR 3.452, 95% CI 2.487–4.791, p < 0.005).

Conclusion: Patients transplanted for AIH have a higher risk of early graft loss compared to other etiologies, likely explained by a higher rate of vascular complications.

THU-527
Primary sclerosing cholangitis recurrence after liver transplantation: a nationwide survey in Italy
Maria Cristina Morelli1, Martina Gambato2, Silvia Martinì3, Paola Carrara4, Pier Luigi Toniutto5, Valero Giannelli6, Maria Francesca Donato7, Ilaria Lenci8, Luisa Pasulo9, Chiara Mazzarelli10, Alberto Ferrarese11, Maria Grazia Rendina12, Antonio Grieco13, Alfonso Galeota Lanza14, Gianluca Svegliati-Baroni15, Nicola De Maria16, Laura Mamei17, Simona Marenco18, Patrizia Burra19, IRCCS Azienda Ospedaliero-Universitaria di Bologna, Italy; Internal Medicine Unit for the treatment of Severe Organ Failure, Bologna, Italy; 1Multivisceral Transplant Unit, Padua University Hospital, Padua, Italy; 2Gastrohepatology Unit, ASST Grande Ospedale Metropolitano Niguarda, Milan, Italy; 3Gastroenterology and Hepatology Unit, Polytechnic University of Marche, Ancona, Italy; 4Hepatobiliary Surgery and Liver Transplantation Unit, University Città della Salute e della Scienza di Torino, University of Torino, Turin, Italy; 5Hepatobiliary Surgery and Liver Transplantation Unit, University of Pisa Medical School and Hospital, Pisa, Italy; 6Hepatology and Liver Transplant Unit, Department of Medical Area, Udicne University Hospital, Udine, Italy; 7San Camillo Hospital, Department of Transplantation and General Surgery, Rome, Italy; 8Gastroenterology and Hepatology Division, Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Milan, Italy; 9Hepatology and Transplant Unit, Fondazione Policlinico Tor Vergata, Rome, Italy; 10Gastroenterology and Transplant Hepatology Department, Papa Giovanni XXIII Hospital, Bergamo, Italy; 11Gastroenterology and Hepatology Department, Liver Unit, ASST Grande Ospedale Metropolitano Niguarda, Milan, Italy; 12Unit of Gastroenterology, Borgo Trento University Hospital of Verona, Verona, Italy; 13Gastroenterology Unit, Department of Emergency and Organ Transplantation, University of Bari, Bari, Italy; 14Liver Transplant Medicine Unit, Gastroenterological Area, Department of Gastroenterological, Endocrine and Metabolic Sciences, Fondazione Policlinico Universitario Gemelli, Catholic University of the Sacred Heart, Rome, Italy; 15Liver Unit, Cardarelli Hospital, Naples, Italy; 16Liver Injury and Transplant Unit, Politecnico University of Marche, Ancona, Italy; 17Gastroenterology Unit, Department of Medical Specialties, University of Modena and Reggio Emilia and Azienda Ospedaliero-Universitaria di Modena, Modena, Italy; 18Liver and Pancreas Transplant Center, Azienda Ospedaliero-Brotzu, Cagliari, Italy; 19Department of Internal Medicine, Gastroenterology Unit, Ospedale Policlinico San Martino, Genova, Italy; 20Multivisceral Transplant Unit, Padua University Hospital, Padua, Italy

Background and aims: Primary sclerosing cholangitis recurrence (rPSC) after liver transplantation (LT) occurs at a variable rate among different studies from different geographical areas; moreover, the impact of rPSC on patient and graft survival has not been fully defined. We aimed to investigate the rate and impact of rPSC after LT in an Italian cohort.

Method: In April 2022, we conducted a nationwide survey of LT in PSC over the past 15 years, including 85% of Italian LT centers. Participating centers were instructed to define rPSC according to established Mayo criteria and were asked to report rPSC rates at 1, 5 and 10 years. In addition, we explored the effect of rPSC on graft and patient survival.

Results: From January 2007 to December 2021, 445 patients with PSC were listed for LT and 411 underwent LT. The median age at LT was 46 years (18–73), with a prevalence of males of 70% (287/411). rPSC was diagnosed in 81 patients (20%), 24% in the first year, 64% in the first three years, and 91% in the first five years. The prevalence of rPSC varied among centers according to surveillance procedures; the one center that performed protocol liver biopsies reported a higher prevalence than those that did not (24% vs. 15%). rPSC was more frequent in recipients with inflammatory bowel disease (66%) than in recipients with isolated PSC. Recurrence was symptomatic in 69% of the cases, and the main symptoms were cholangitis (66%), pruritus (86%) and jaundice (60%). The overall post-LT mortality was 15% (66/441): 24 patients died in the first year (50% from surgical complications and 25% from infection); 33 patients died between 1 and 5 years (36% rPSC, 21% recurrence of occult CCA) and 9 patients after 5 years (56% cancer, 44% rPSC). 22 out of 81 (27%) patients with rPSC were retransplanted, with an overall survival of 72%; three developed early recurrence one year after the second LT.

Conclusion: In our Country, the rate of rPSC was 20% at five years after liver transplantation. Recurrent PSC was a major cause of long-term mortality and the leading cause of retransplantation.

THU-528
Statins and metformin after liver transplantation: a nationwide cohort
Cyrrle Feray1, Christophe Desterke1, Nathalie Goutte1, Daniel Azoulay2, Eric Vibert3, Didier Samuel4, Paul Landais5, INSERM 1193, Villejuif, France

Email: cyrrle.feray@gmail.com

Background and aims: LT is the treatment for decompensated cirrhosis or liver cancer. Along with immunosuppressants, drugs such as statins, oral antidiabetics, aspirin, proton pump inhibitors and many others are prescribed over the long term. We studied, in the total population of French 8658 liver transplanted recipients between 2009 and 2018, the influence of non-immunosuppressive drugs on survival and other outcomes.

Method: The French health insurance SNDS database, linked with the national hospital database (PMSI), contains information on at least 95% of the French population: all ICD–10 codes, medical procedures (MP) and prescribed drugs and the vital status. The drugs were evaluated as a time dependent covariate in a cox model using propensity score adapted to studied drug and to the outcome. Outcome on other relevant events were defined by algorithm combining ICD and MP.

Results: Among the 10 most prescribed drugs, statin and oral antidiabetic (OAD) were associated to a favorable survival (HR for statin: 0.53–0.85p = 0.0003, HR for OAD: 0.51–0.89p < 0.005) (Figure). Statins were associated to less hepatic events and better survival after cardiovascular, renal and infectious events. OAD were associated to less kidney, hepatic and infectious events. None of them
were associated neither to the incidence of de novo cancer nor the recurrence of liver cancer. A dose-dependent action was established for both. Hydrophilic more than lipophilic statins and metformin more than other OAD were associated to a better survival. Multivariate analysis showed that the action of statin and OAD were independent each other and to other drugs (including immunosuppression) and was not synergic.

**Background and aims:** Recurrence of hepatocellular carcinoma (HCC) after orthotopic liver transplantation (OLT) has an unfavourable prognosis. The potential of novel HCC biomarkers for prediction and early detection of HCC recurrence after OLT is not established. We have assessed the value of the GALAD score for detection and prediction of HCC recurrence after OLT.

**Method:** In this retrospective monocentric study all patients who underwent OLT due to HCC between 2010 and 2020 in one University Hospital were included. Inclusion criteria were diagnosis of HCC by imaging before OLT, 6, 12 and 24 months after OLT, with complete clinical data for 5 years, with a median observation time of 32 ± 30 (1–144) months. The GALAD score was calculated as previously published.

**Results:** A total of 77 patients was enrolled. The mean observation time was 68 ± 44 (range 2–144) months. HCCR was diagnosed in 20 patients after a mean period of 32 ± 30 (1–104) months. The median recurrence free survival after OLT was 135 months (95% CI: 126, 144 months). The GALAD score before OLT was associated with the number of HCC nodules (p = 0.009), with HCC grading (p = 0.025) and total HCC diameter in the explanted liver (p = 0.004). GALAD score correlated negatively with the time between first diagnosis of HCC recurrence and OLT (p = 0.047). Regular determination of the GALAD score within the first two years after OLT showed a positive score (cut-off value of −1.55) in 8 of the 9 patients with HCC recurrence. GALAD score became positive on average 2.13 ± 3.5 (0–10) months before radiological diagnosis of HCC recurrence. The mean GALAD score was higher before OLT in patients with early HCC recurrence diagnosed within 6 months of OLT (n = 4), as compared to those with late or no HCC recurrence or (2.23 ± 2.1 (0.84–4.61) vs −0.97 ± 2.6 (−5.88–11.21); p = 0.02).

**Conclusion:** The GALAD score may be a useful tool to improve the prediction and early diagnosis of HCC recurrence after OLT.

**THU-530**

**Post reperfusion syndrome in liver transplant after normothermic perfusion: experience of a reference center**

Luciano Beltrão Pereira1, Alice Loughnan1, Yamen Jabri1, Lucy Dancy1, Fionnuala Schwartz2, Wayel Jassem1, Juliana Pereira1, Gudrun Kunst1, Zoka Milan1,1 King’s College Hospital, Institute of Liver Studies, United Kingdom

Email: lpereira@me.com

**Background and aims:** Post reperfusion syndrome (PRS) is defined as severe haemodynamic instability, with a greater than 30% drop below the anhepatic mean arterial blood pressure (MAP) within 5 minutes of reperfusion sustained for at least 1 minute. It is an important factor in graft survival, morbidity and mortality. Therefore diminishing PRS is essential and the type of donor liver storage could affect it such as preserving the organ in specialised cold storage (CS) reaching 4°C, conventional method, or with normothermic machine perfusion (NMP), modern method, which may reduce ischemic reperfusion liver damage because of its continuous normothermic perfusion of the donor liver.

**Method:** This was a retrospective case controlled study. Patients were recruited between January 2011 and December 2013. A total of 22 patients were included; 11 patients received a NMP Organ Ox perfused liver (OX), and 11 patients formed a control group, who received liver grafts from CS. Recipient and donor demographics were evenly matched between patients (Table 4). The primary outcome was the incidence of PRS with secondary outcomes being inotrope, blood product and fluid requirements. Data was examined for normality, and compared using Fisher exact test or Mann-Whitney.

**Results:** PRS occurred in 54% (n = 6) of the CS group compared to 18% (n = 2) of the OX group, p = 0.183. The percentage drop in MAP was significantly lower for the OX (15.8%) compared with the CS group (15.8%) (p = 0.02).
This German nationwide study investigated 10,787 patients in this study over a period of 14 years.

**Background and aims:** Liver transplantation (LT) is so far the only cure for end-stage liver disease or progressive acute liver failure (ALF), hepatocellular carcinoma (HCC), as well as other chronic liver diseases. However, LT bears also morbidities and mortality, even post-LT. Different comorbidities may follow, and further increase mortality and morbidity. We investigated the outcomes in hospitalized patients, evaluated for LT and in the post-LT patients in Germany.

**Method:** This German nationwide study investigated 10,787 patients hospitalization for LT evaluation, 14,745 on the waiting list, 12,836 underwent LT and 142,809 admissions of patients after LT.

**Results:** The number of admissions for LT evaluation or waiting list increased approximately three times over the observational years (from 2005 to 2018). Importantly, post-LT patients with AKI and biliodigestive anastomosis are associated with highest in-hospital mortality and should be addressed.

**Conclusion:** A reduced incidence of PRS in patients receiving NMP compared to CS livers was observed, with improved haemodynamics and lower adrenaline requirements.

**THU-531**

**Comorbidities and complications of patients hospitalized for liver transplantation evaluation, transplant and post-LT: a fourteen-year nationwide study in Germany**

Wenyi Gu, Louisa Schaaf, Hannah Hortlik, Yasmin Zeleke, Maximilian Joseph Broil, Andreas Schnitzbauer, Wolf Bechstein, Alexander Queck, Michael Tischendorf, Andreas Pascher, Michael Praktiknjo, Martin Schulz, Frank Erhard Uschner, Florian Rennebaum, Jonel Trebicka, Michael Praktiknjo, Martin Schulz, Frank Erhard Uschner, Florian Rennebaum, Jonel Trebicka. 1University Hospital Muenster, Department of Internal Medicine B, Germany; 2University Hospital Frankfurt, Germany

**Background and aims:** Liver transplantation (LT) is so far the only cure for end-stage liver disease or progressive acute liver failure (ALF), hepatocellular carcinoma (HCC), as well as other chronic liver diseases. However, LT bears also morbidities and mortality, even post-LT. Different comorbidities may follow, and further increase mortality and morbidity. We investigated the outcomes in hospitalized patients, evaluated for LT and in the post-LT patients in Germany in this study over a period of 14 years.

**Method:** This German nationwide study investigated 10,787 patients hospitalization for LT evaluation, 14,745 on the waiting list, 12,836 underwent LT and 142,809 admissions of patients after LT. All data were based on the diagnosis related groups (DRG) system with ICD-10 and procedure key (OPS) codes.

**Results:** The number of admissions for LT evaluation or waiting list increased approximately three times over the observational years from 2005 to 2018. Balance between LT evaluation and LT waiting list entering reached in 2014. LT number decreased by 2.3% overtime, while waiting-list mortality rate increased by 5%. By contrast, the in-hospital mortality rate decreased over the observational period, especially in ALF patients with a drop by 16%. Interestingly, admissions of post-LT patients for complications almost doubled, driven mainly by complications of immunosuppression (e.g. respiratory diseases, infections, acute kidney injury [AKI], malignant diseases, gastritis and diarrhea), which nearly tripled (from 2,748 to 7,290). Importantly, post-LT patients with AKI and biliodigestive anastomosis showed the highest in-hospital-mortality rate of 20% and 18% of all complications, respectively.

**Conclusion:** A reduced incidence of PRS in patients receiving NMP compared to CS livers was observed, with improved haemodynamics and lower adrenaline requirements.

**THU-532**

**Long-term benefit of mTOR inhibitors for dropping calcineurin inhibitors in liver transplant recipients**

Yael Milgrom, Ashraf Imam, Alaa Jammal, Suha Shabaneh, Johnny Amer, Asher Shafir, Muhammad Massarwa, Wadi Hazou, Abed Khakayla, Rifaat Safadi, 1Hadassah-Hebrew University Hospital, Liver Institute, Jerusalem, Israel

**Background and aims:** Dropping the calcineurin inhibitors (CNI) with an antimetabolite (azathioprine or mycophenolate mofetil (MMF)) or mTOR inhibitor (mTORi) became common practice to protect renal function in liver transplant recipients (LTR). We retrospectively assessed our real-life experience in a trans sectional study 2020–2022.

**Method:** Long-term follow-up of CNI drop in 169 LTR compared in 4 regiments (study groups): CNI drop that needed an addition of mTORi (n = 44, 26%), MMF (58, 34%), both mTORi and MMF (7, 4%) or no additional therapeutic regimen (60, 36%). ANOVA, Hochberg Multiple Comparisons, Chi-Square Tests used for the comparison analysis.

**Results:** After post-transplant follow-up of 10.9 ± 8.7 years, the used immunosuppression included steroids in 38.9% of LTR, CNI; usually tacrolimus (81.7%) but also cyclosporine-A (6.5%), MMF in 38.9% and mTORi in 30.2% (usually everolimus in 24.9%, but also sirolimus in 5.3%). All 4 regiments (study groups) share a similar means and distributions of ages, gender, ethnicity, smoking, BMI, post-transplant follow-up, etiologies (except of significantly higher HCV and PBC in mTORi and MMF groups, respectively), HCC, incidence of impaired glucose homeostasis, hypertension, hematology, liver enzymes, eGFR, LDL, HDL, TG, HBA1c, and the incidence for using some medications (glucose lowering agents, cyclosporin-A, and UDCA). Comparing to MMF, mTORi group found with significantly increased serum fasting glucose, lower total bilirubin, increased incidence of using statins, decreased number of immunosuppressants, decreased incidence of steroids (without impact on daily dosages) and of prograf (with reduced dosages and trough levels), and lower death rates along the study follow-up 2020–2022 (2.3% in mTORi, 14.3% in mTORi and MMF, 6.9% in MMF, and none in the no additional therapeutic regimen).

**Conclusion:** Comparing to MMF, the long term CNI drop with mTORi was safer than MMF in LTR needed an additional therapeutic CNI.
Sparing. Although mTORi introduced for LTR with higher risk factors (high HCV background and worse metabolic homeostasis of glucose and lipid), it allowed better CNi drop to achieve similar renal outcomes with lower bilirubin levels and favorable survival.

THU-533
Sarcopenia at listing for liver transplantation is a negative predictor for post-transplant survival, but not for graft survival
Guido Stirnimann1, Anja Beugger1, Federico Storni1, Vanessa Banz1, Annalis Bezziott1, Verena Obmann2, 1Inselspital, Bern University Hospital, Department of Visceral Surgery and Medicine, Bern, Switzerland; 2Inselspital, Bern University Hospital, Department of Radiology, Bern, Switzerland
Email: guido.stirnimann@insel.ch

Background and aims: Sarcopenia is a common finding in patients listed for liver transplantation (LT), independent of the underlying liver disease. Sarcopenia has a known influence on wait-list mortality and is associated with an unfavourable outcome after LT including longer intensive care and hospital stay, short-term mortality, higher incidence of infections, and higher overall health care cost. To date, data on the influence of sarcopenia on patient long-term and graft survival is scarce.

Method: In this retrospective tertiary care center analysis, patients with first LT only between 2012 and 2022 and a CT scan ±3 months before/after listing for LT were included. CT slides were analyzed with sliceOmatic, TomoVision, Canada. Total skeletal muscle area was measured at lumbar level L3 and normalized by height to obtain skeletal muscle index (SMI). Sarcopenia was defined by gender-specific cut-offs (<50 cm²/m² in males and <39 cm²/m² in females). Survival was visualized with Kaplan Meier survival curves and assessed with the Breslow (generalized Wilcoxon) test.

Results: In total, 161 patients were included (male = 113, 70.2%). Mean age at listing was 55.8 (±11.8) years. 59 (36.6%) patients were sarcopenic (mean age 57.6 ± 10.9 years), 102 (63.4%) were not sarcopenic (mean age 54.8 ± 12.3 years). Mean wait-list time was 10.1 (±7.9) for sarcopenic and 9.9 (±8.2) months for non-sarcopenic patients. Mean post-LT follow-up time was 49.3 (±36.5; range 0–131) months for non-sarcopenic sarcopenic patients, respectively. Mean SMI was 43.3 (±5.0) in the sarcopenic group and 54.3 (±10.0) cm²/m² in the non-sarcopenic group. Kaplan Meier survival curve is displayed in the figure. Overall post-LT survival was significantly shorter for sarcopenic patients compared to non-sarcopenic patients (94.1 (±7.5) versus 107.8 (±4.6) months, p = 0.039) Breslow (generalized Wilcoxon) test. Pre-transplant sarcopenia did not have a relevant effect on graft survival (p = 0.65).

Conclusion: Sarcopenia at listing for LT is a negative predictor for post-transplant survival, but not for graft survival. To what extent counteracting sarcopenia in this patient population improves post-transplant outcome remains to be elucidated.

THU-534
Safety of coronary angiography with consecutive dual antiplatelet therapy in patients with liver cirrhosis and esophageal varices as part of an evaluation for liver transplantation
Moritz Passenberg1, Aycan Bogazliyan1, Alexandra Frey1, Hartmut Schmidt1, Roxane Autuhersen-Grudmann1, Katharina Willuwiet1, Jassin Rashidi-Alavijeh1, 1University of Duisburg-Essen, Medical Faculty, Department of Gastroenterology, Hepatology and Transplant Medicine, Essen, Germany
Email: jassin.rashidi@uk-essen.de

Background and aims: For patients with advanced liver cirrhosis, liver transplantation is the only curative therapeutic option most cases. Inclusion on the waiting list for liver transplantation usually requires extensive evaluation examinations, which in many cases include coronary angiography. Depending on the findings, this may lead to the placement of a stent with subsequent use of dual antiplatelet therapy. To date, there are only limited data on the influence of dual antiplatelet therapy on bleeding events and transplant-free survival.

Method: Clinical data from 228 patients with liver cirrhosis who underwent coronary angiography with or without stenting were collected and statistically analyzed.

Results: Of 228 patients who underwent coronary angiography, 21 (9%) had a bleeding event within 6 months after the intervention, whereas 207 (91%) did not have a bleeding event during the same period. After multivariate analysis, the occurrence of bleeding events was significantly associated with the laboratory parameters INR (HR 15.96 [2.57, 99.10]; P = 0.003), albumin (HR 0.42 [0.19, 0.93]; P = 0.033), and the placement of a stent after coronary angiography (HR 2.68 [1.07, 6.74]; P = 0.036). However, neither platelet count nor the presence of esophageal varices showed an independent and significant association with bleeding events. Furthermore, an analysis was performed to determine the impact of stent placement on the occurrence of ACLF, here, stent placement (HR 2.94 [1.2, 7.18]; P = 0.018) was shown to be an independent risk factor for the occurrence of ACLF, in addition to the parameters bilirubin (HR 1.12 [1.03, 1.21]; P = 0.018) was shown to be an independent risk factor for the occurrence of ACLF, in addition to the parameters bilirubin (HR 1.12 [1.03, 1.21]; P = 0.009) and hemoglobin (HR 0.81 [0.65, 0.99]; P = 0.042).

Conclusion: The performance of coronary angiography with stent placement and consecutive antiplatelet therapy in patients with liver cirrhosis is significantly associated with bleeding events during the period of taking this medication. However, the occurrence of bleeding events is not dependent on the presence of esophageal varices or the extent of thrombocytopenia. Despite increased bleeding events, stenting was not associated with a significantly more frequent occurrence of ACLF or worsening of transplant-free survival.

THU-535
Incidence of de novo tumors after liver transplantation (LT) in HIV infected is similar to non-HIV patients: a single center comparative study
Isabel Terol Cháfer1, Carmen Vinaixa1, Sonia García1, Víctor Argumánez Tello1, Marina Berenguer1-2, Victoria Aguiler Sancho1, 1La Fe University and Polytechnic Hospital, Valencia, Spain; 2Facultad de Medicina y Odontología, Departamento de Medicina, Valencia, Spain
Email: vinaixa.carmen@gmail.com

Background and aims: De novo tumors and cardiovascular diseases are one of the leading causes of death after LT. Our aim was to describe the incidence of de novo tumors in a HIV-infected LT patients and compared to non-HIV-infected LT patients.

Method: We conducted a retrospective study based on a prospectively maintained database including patients who underwent liver transplantation (LT) from June 2004 to December 2020 in a single LT center. HIV-infected patients were matched to 2 non-HIV-infected controls each by age, sex, liver disease etiology, and date of LT. Pre-LT baseline features, HIV related variables, and post-LT outcomes were recorded.
**THU-536**

**Biliary strictures in liver transplant recipients: novel strategies for identifying therapeutic targets of biliary fibrosis**

Alex Bofill1,2, Pablo Ruiz3, Ylliam Fundora2, Carla Montironi5, Manuel Morales-Ruiz2, Andres Cardenas2,3, Institute of Digestive Diseases, Liver Unit, Spain; 2ICMDDM, GI Unit, Barcelona, Spain; 3Institute of Digestive Diseases, HBP Surgery, Spain; 4Pathology Department, Spain; 5Biochemistry and Molecular Genetics Department, Spain; 6Institute of Digestive Diseases, GI/Liver Unit, Spain

Email: acardena@clinic.cat

**Background and aims:** Biliary anastomotic strictures (BAS) are the most common biliary complication in liver transplant (LT) recipients. The mechanisms of BAS fibrosis are unknown; however, overexpression of transforming growth factor beta-1 (TGF-$\beta_1$) and interleukin-6 (IL-6) is described in animal models. Per-oral digital cholangioscopy (POCS) allows direct visualization of the bile duct and adequate sampling of the biliary epithelium to evaluate factors associated with BAS. We aimed to determine gene expression of TGF-$\beta_1$ and IL-6 from POCS samples as a potential therapeutic target for local therapies. In addition, confirm the role of POCS for classifying BAS. We present preliminary data of this study.

**Method:** Prospective and single-center study of patients who underwent BAS after LT. Biliary samples were obtained with POCS and from surgical bile duct samples as a potential therapeutic target for local therapies. In addition, confirm the role of POCS for classifying BAS. We present preliminary data of this study.

**Results:** Twenty-two recipients have been included, 82% male, median age 62 years (IQR 58–67). The underlying etiology that led to LT was cirrhosis due to alcohol, MAFLD, HCV and HCC. All patients received a cadaveric organ. The median period from LT to POCS or surgery was 12.7 months (IQR 5–48). POCS was successfully performed in 18 patients (4 of them had surgery). Of all patients treated 12 had BAS pattern A (scar), and 6 pattern B (sloughing, ulcer). Molecular studies (mRNA expression of TGF-$\beta_1$ and IL-6) have been performed in 13 (4 had insufficient RNA). Figure 2/18 had mild pancreatitis (11%).

**Conclusion:** Preliminary results indicate mRNA expression of TGF-$\beta_1$ and IL-6 in BAS of LT recipients. Overexpression of TGF-$\beta_1$ and IL-6 are potential therapeutic targets for local endoscopic therapy of BAS.

---

**Figure:**

**Conclusion:** In the post-LT setting, incidence of de-novo tumors in HIV-infected patients was similar to non-HIV patients. Smoking after LT was the only factor significantly associated with development of de-novo tumors (p 0.008).

**Results:** A total of 156 LT recipients were included (52 HIV-infected and 104 non-HIV-infected). Baseline characteristics were similar in both groups, except for age and body mass index, which were lower in HIV-infected patients. Mean follow-up post-LT was 7.5 years in the HIV group vs 8.2 years in the non-HIV group. Incidence of de novo tumors was 17% in HIV patients vs 12% in non-HIV, pNS. The mean time of appearance of de novo tumors since LT was similar in both groups (6.25 years in HIV-infected patients vs 6.18 years in non-HIV infected, pNS) (see graph 1). Approximately one third of patients in each group died during follow-up, leading to similar overall survival between groups. De novo tumors were the leading cause of death in both groups (5 HIV patients and 8 on-HIV patients). Smoking after LT was the only factor significantly associated with development of de-novo tumors (p 0.008).

**Background and aims:** The most common complication in LT recipients is the development of de-novo tumors. The incidence increases the longer recipients remain alive. Many patients are treated with POCS. The role of POCS is not well established. The aim of this study was to determine the role of POCS for classifying and from surgical bile duct samples as a potential therapeutic target for local therapies. In addition, confirm the role of POCS for classifying BAS. We present preliminary data of this study.

**Method:** Prospective and single-center study of patients that developed BAS after LT. Biliary samples were obtained with POCS and from surgical bile duct samples as a potential therapeutic target for local therapies. In addition, confirm the role of POCS for classifying BAS. We present preliminary data of this study.

**Results:** Twenty-two recipients have been included, 82% male, median age 62 years (IQR 58–67). The underlying etiology that led to LT was cirrhosis due to alcohol, MAFLD, HCV and HCC. All patients received a cadaveric organ. The median period from LT to POCS or surgery was 12.7 months (IQR 5–48). POCS was successfully performed in 18 patients (4 of them had surgery). Of all patients treated 12 had BAS pattern A (scar), and 6 pattern B (sloughing, ulcer). Molecular studies (mRNA expression of TGF-$\beta_1$ and IL-6) have been performed in 13 (4 had insufficient RNA). Figure 2/18 had mild pancreatitis (11%).

**Conclusion:** Preliminary results indicate mRNA expression of TGF-$\beta_1$ and IL-6 in BAS of LT recipients. Overexpression of TGF-$\beta_1$ and IL-6 are potential therapeutic targets for local endoscopic therapy of BAS.

**THU-537**

**Coronary computed tomography angiography in pre-liver transplant cardiac work-up**

Chiara Manuli1, Margherita Saracco1, Bruna Lavezzo2, Alessandro Depaoli3, Fabrizio D'Ascenzo4, Renato Romagnoli3, Silvia Martini1, 1Gastrohepatology Unit, AOI Città della Salute and della Scienza, University of Turin, Italy; 2Anesthesiology and Intensive Care Unit, AOI Città della Salute e della Scienza, University of Turin, Italy; 3Department of Imaging Diagnostics and Radiotherapy, AOI Città della Salute e della Scienza, University of Turin, Italy; 4Cardiology Unit, AOI Città della Salute e della Scienza, University of Turin, Italy; 5General Surgery 2U, Liver Transplantation Center, AOI Città della Salute e della Scienza, University of Turin, Italy

Email: chiara.manuli@gmail.com

**Background and aims:** Controversies persist around the optimal screening of pre-liver transplant (LT) candidates for coronary artery disease (CAD). Dobutamine-stress-echocardiography (DSE) is used in many centers, but real-life studies demonstrated its poor performance. Coronary-computed-tomography-angiography (CCTA) is emerging as a promising non-invasive tool to detect CAD; therefore, we aimed to describe its role in the pre-LT setting.

**Method:** All patients (pts) who underwent CCTA during the pre-LT work-up from 01/01/2022 to 31/12/2022 in our Centre were included. Pts with previous CAD or with cardiac symptoms underwent pre-LT work-up. CCTA was performed in pts with at least one major cardiovascular risk factor (age >65 years, insulin-dependent diabetes, NASH-cirrhosis, severe peripheral vascular disease, previous stroke). Significant CAD (S-CAD) was defined as ≥50% stenosis in major-vessels (left main, left anterior descending or right coronary artery) or ≥70% stenosis in moderate-sized vessels. Pts with S-CAD or non-diagnostic CCTA underwent CATH.

**Results:** During the study period, 122 pts underwent pre-LT work-up in our Centre. CCTA was performed in 42/122 (34%) pts, who represent our study population. Median age was 65 years (IQR 60–68), 24/42 (57%) pts had diabetes (22 insulin-dependent), 16/42 (38%) had NASH-cirrhosis, 3/42 (7%) peripheral vascular disease, 4/42 (10%) previous stroke. As additional risk factors, 19/42 (45%) suffered from arterial hypertension, 9/42 (21%) dyslipidemia and 15/42 (36%) were active smokers. CCTA identified S-CAD in 17/42 (40%) pts and was non-diagnostic in 2/42 pts (5%); 15 of these 19 pts (79%) underwent CATH; in 2/19 (10.5%) CATH was not performed after careful evaluation with
and sodium-glucose co-transporter-2 inhibitors compared with Safety and efficacy of glucagon-like peptide-1 receptor agonists THU-538

DAPT at the end of the study period, 1 died and 2 were excluded from LT for extra-cardiac reasons.

doctorial specialist and the remaining 2/19 (10.5%) were excluded from LT for extra-cardiac reasons.

CATH showed S-CAD needing revascularization in 8/15 pts (53%); 7/8 pts (88%) underwent percutaneous coronary intervention (PCI) (one complicated by myocardial infarction), 1/8 (12%) required surgical-bypass. After PCI, the median duration of dual-antiplatelet therapy (DAPT) was 1 month (IQR 1–4.5). After revascularization, 1 patient underwent uneventful LT, 3 were listed for LT, 1 was still in DAPT at the end of the study period, 1 died and 2 were excluded from LT for extra-cardiac reasons.

To date, among the 23 pts without S-CAD on CCTA, 14 (61%) underwent LT without early cardiological events. To date, among the 23 pts without S-CAD on CCTA, 14 (61%) underwent LT without early cardiological events.

Conclusions: During a 1-year study period, 42/122 (34%) pts evaluated for LT listing at our Centre had at least one major cardiovascular risk factor and underwent CCTA which identified S-CAD in 17/42 (40%). 8 pts underwent successful revascularization and the median duration of DAPT was 1 month.

THU-538
Safety and efficacy of glucagon-like peptide-1 receptor agonists and sodium-glucose co-transporter-2 inhibitors compared with the standard of care in a cohort of liver transplanted patients: a retrospective study

Aida Rebiha1, Alessandra Mazzola1, Philippe Sultanik2, Dominique Thabut2, Olivier Scatton2, Olivier Bourron3, Filomena Conti1, APHP-Pitié-Salpêtrière Sorbonne University, Liver Transplant Unit, Hepato-Gastroenterology, France; 2APHP-Pitié-Salpêtrière Sorbonne University, Hepato-Gastroenterology, Paris, France; 3APHP-Pitié-Salpêtrière Sorbonne University, Hepatobiliary and Liver Transplantation Surgery, Paris, France; 4APHP-Pitié-Salpêtrière Sorbonne University, Diabetology, Paris, France

Email: alessandra.mazzola3@gmail.com

Background and aims: Few data on the safety and efficacy of the use of Glucagon-like peptide-1 receptor agonists (GLP-1RAs) and sodium-glucose co-transporter-2 inhibitors (iSGLT2) are available after liver transplantation (LT). The aims of this study were to evaluate the safety and the efficacy of this treatment 6 months after LT compared to the standard of care treatment.

Method: We performed a retrospective monocentric comparative study on 36 liver recipients with post and/or pre-transplant diabetes treated with GLP1-RAs and/or iSGLT2 after LT. A control group of recipients receiving the standard of care therapy, matched (1:2) according to the time of LT, sex, age and causes of chronic liver disease was performed to compare clinical and biological outcomes. The effectiveness was defined as: glycated hemoglobin (Hb1Ac) target – 81.2% (n = 26) and 75.9% (n = 41) of patients in GLP1-RA and/or iSLGT2 group. The hypoglycemia rate was similar between the two groups.

Results: A total of 36 LT adult patients between 2019 and 2022 were treated in our center with GLP-1RAs and/or iSGLT2 after LT. The majority of patients were male (88.8%, n = 34) with a mean age of 58.91 years old (±8.4). The median MELD score was 14 (IQR 10–21). The most common etiology of liver disease was alcohol in 52.7% of patients (n = 19) and NASH in 44.4% (n = 16). Pre-transplant diabetes was reported in 47.2% of patients (n = 17). After LT 63.9% of patients (n = 23) have GLP1-RAs and 61.1% (n = 22) iSGLT2 therapy. Patients were comparable for clinical and biological characteristics to the control group. Non-serious adverse event was reported in patients receiving GLP1-RAs and/or iSGLT2 treatment. 21% of patients had moderate side effects: 4 patients developed gastrointestinal disorders. The hypoglycemia rate was similar between the two groups (p = 0.1). Fasting glycemia target was achieved in 78.1% (n = 25) and in 61.8% (n = 34) of patients in the GLP1-RA and/or iSGLT2 group compared to the control group (p = 0.1). Hb1Ac <7% was achieved for 81.2% (n = 26) and 75.9% (n = 41) of patients in GLP1-RAs and/or iSGLT2 group and in the control group (p = 0.5), respectively. Fast and slow acting insulin withdrawals were statistically significantly different between the 2 groups, especially in the sub-group of patients with post-transplant diabetes receiving GLP1-RAs and/or iSGLT2 treatment (s) (p = 0.001, p < 0.001).

Conclusion: In our study performed on liver transplant recipients with a higher rate of NASH and alcoholic diseases, the use of GLP1-RAs and SLGT2 treatments for diabetes was safe. The effectiveness was similar to the standard of care with a remarkable benefit of insulin withdrawal in a subgroup of patients with post-transplant diabetes. Futures prospective studies are needed to evaluate the benefit of the GLP1-RAs and SLGT2 treatments on long-term cardiovascular events, obesity, liver steatosis and mortality.

THU-539
Influence of marginal organs on the drug metabolism in liver transplantation

Laura Büttow1, Dominik Schröter1, Uta Dahmen1, Peter Schlatmann1, Utz Settmacher1, Hans-Michael Tautenhahn1, 1Jena University Hospital-Hospital Lobeda, Jena, Germany; 2Else Kröner Graduate School for Medical Students “JSAM”, Jena University Hospital, Jena, Germany

Email: hans-michael.tautenhahn@med.uni-jena.de

Background and aims: Metabolic zonation is a phenomenon of the liver that describes the differential distribution of functions between liver lobules. One important liver function is drug degradation, which is realized by cytochrome P450 enzyme (CYP). Alteration of CYP expression and activity is being studied in marginal donor livers to better characterize these high-risk organs and improve the transplant selection process to allow for better risk assessment in the allocation process. We hypothesize that marginal organ factors influence drug metabolism in donor livers of transplanted patients.

Method: The first step of the study is to investigate the influence of marginal organs on drug metabolism, by comparing the steatosis severity, the donor age, and the CIT to the CYP expression and activity. The measurements will be correlated with changes in reperfusion and ischemia-reperfusion-injured grafts. Second, to evaluate the LiMAX assay as a CYP 1A2 point-of-care diagnostic, in vivo and in vitro CYP measurements will be correlated. Experimental results will be correlated with patient outcome, particularly the prevalence of delayed graft function, and validated clinical chemistry parameters.

Results: Forty patients undergoing liver transplantation at Jena University Hospital in 2022 who gave informed consent will be studied. For an exploratory approach, 10 subjects per independent variable are needed. With the tissue samples we perform an H.E. staining for the morphological analysis of the donor organs. CYP expression will be visualized using an indirect immunohistochemistry more specifically CYP 1A2, CYP 3A4, CYP 2C19. Additionally, fluorescence assay is performed to measure CYP 1A2 activity in vitro, and a breath assay (LiMAX) to measure CYP activity in vivo.

Conclusion: It is likely that LiMAX can be used to better predict liver regeneration after transplantation.
Background and aims: Thrombin is a local hemostatic drug commonly used during surgical interventions and can promote blood coagulation by bypassing the initial enzymatic step of the coagulation pathway. Topical recombinant human thrombin is a potentially safer substitute for plasma-derived thrombin and has demonstrated hemostatic activity in a Phase I/II study. This study was designed to evaluate the hemostatic effect of human recombinant thrombin for capillary and venule errhysis during surgical operation and for any conditions when conventional surgical hemostasis is ineffective or inapplicable.

Method: A total of 510 subjects are expected to be enrolled at 33 study sites in China by the end of the study. Enrolled subjects were randomized to the thrombin group and the placebo group in a 2:1 ratio. An interim analysis was conducted after about 70% of the subjects had completed the observation, and O’Brien Fleming spending function was used to control the total α level at a two-sided significance level of 5%. If the results of the interim analysis supported efficacy, the study was to be terminated early. The primary efficacy end point was the hemostasis rate within 6 min of the evaluable bleeding point. Safety analysis was performed within one month after operation and positive rates of antidrug antibody (ADA) and neutralizing antibody were evaluated.

Results: At the interim analysis, a total of 348 subjects had been enrolled and 114 (19.1%) out of 594 adult patients underwent LT for ALD during the study period; 26 (22.8%) were ACF and 88 (77.1%) were ESLD. Mean age (52.0 vs 29.31, years. P = 0.13), MELD (22.0 vs 20.6, P = 0.231), diabetes (19.2% vs 22.7%, P = 0.793), LDLT (92.3% vs 97.7%, P = 0.223) did not differ between the groups. Spontaneous bacterial peritonitis (34.6% vs 15.9%, P = 0.05), was significantly higher in the ACLF group. Post-operative parameters such as ICU stay (9.08 vs 8.32, P = 0.223), diabetes (19.2% vs 22.7%, P = 0.793), LDIT (92.3% vs 97.7%, P = 0.223) did not differ between the groups. Sepsis was significantly higher in the ACLF group. Post-operative parameters such as ICU stay (9.08 vs 8.32, P = 0.223), diabetes (19.2% vs 22.7%, P = 0.793), LDIT (92.3% vs 97.7%, P = 0.223) did not differ between the groups. Spontaneous bacterial peritonitis (34.6% vs 15.9%, P = 0.05), was significantly higher in the ACLF group. Post-operative parameters such as ICU stay (9.08 vs 8.32, P = 0.223), diabetes (19.2% vs 22.7%, P = 0.793), LDIT (92.3% vs 97.7%, P = 0.223) did not differ between the groups.

Conclusion: Topical recombinant human thrombin has a significant hemostatic effect for capillary and venule errhysis during surgical operation and has shown good safety and immunogenicity.
Liver transplantation as treatment option for cholangiocellular carcinoma

Gabriela Berlakovich1, Georg Györi2, David Pereyra3, Jule Dingfelder2, Thomas Solomon4. 1Medical University of Vienna, Division of Transplantation, Vienna, Austria; 2University of Vienna, Division of Transplantation, Vienna, Austria

Email: gabriela.berlakovich@meduniwien.ac.at

Background and aims: The choice for treatment of cholangiocarcinoma is surgery and the most important predictor of outcome is a complete margin-negative resection (R0) with an adequate future liver remnant. This goal is only achieved in 60%-80% of cases with a recurrence rate of more than 50%. The 90-day postoperative mortality is up to 10% and the hospital mortality is approximately 50%-60% of patients who die are dying from post-hepatectomy liver failure. Disappointingly, long-term survival following radical resection remains low, ranging from 20% to 40% at 5 years. On the basis of the anatomic site of origin, cholangiocarcinoma is classified into intrahepatic (iCCA), perihilar (pCCA) and distal (dCCA). Surgery is a potential curative option for all subtypes. However, most patients (~70%) are diagnosed at late stages due to lack of specific symptoms.

Method: Review.

Results: Liver transplantation for pCCA was initially determined to be contraindicated due to a high rate of recurrence (~50%). However, a multicenter retrospective study analyzed 216 patients with early-stage, unresectable pCCA treated with neoadjuvant chemoradiotherapy and followed by liver transplantation showing 5-year disease-free survival of 72%, in the standard group. Several predictors of a patient dropping out before liver transplantation were identified: mass size >3 cm, positive or suspicious intraluminal brushing or biopsy, elevated CA 19-9 >500, and higher MELD score ≥20. The dropout rate was nearly one third of these already highly selected patients. Of those transplanted, the recurrence rate was 20%. Despite selection and neoadjuvant treatment R1 was diagnosed in 47% of explanted livers. Liver transplantation for iCCA might be of great value for patients with cirrhosis and small tumors. 5-year survival following transplantation in patients with small, incidental iCCA (<2 cm) was 65%. In larger iCCA transplantation is reserved for unresectable cases and should only be performed under strict clinical protocols.

Conclusion: Liver transplantation could be a cure for iCCA (1) upfront in patients with very early iCCA (single tumor ≤2 cm) in a cirrhotic liver. (2) Higher selected pCCA patients with a single small tumor <3 cm and treated in a specific protocol with neoadjuvant chemoradiation may be candidates and (3) patients with advanced iCCA in a noncirrhotic liver may become transplant candidates if the disease remains stable after neoadjuvant therapy. In any case, the number of patients with cholangiocarcinoma eligible for liver transplantation is very small.

Liver tumours Clinical aspects except therapy

THU-546
Liver transplantation in patients with schistosomiasis in a reference hospital in Sao Paulo, Brazil
Martina Zannini1, Patricia Zitelli2, Javier Fernandez3, Alberto Farias4, Maria de Fatima Sanz1, Isabel Requejo1, Laia Zamora1, Laura Lenz1, Miriam Valdivieso1, Eva Centelles1, Foix Valles4, Susana Nieto1, 1Nurse in Liver Unit ICU Hospital Clinic de Barcelona, Spain; 2Investigation nurse at Hospital das Clínicas de Sao Paulo, Brazil; 3Head of the Liver unit ICU, Spain; 4Hepatologist at Hospital das Clínicas de Sao Paulo, Brazil; 5Nurse coordinator of the Liver unit ICU, Spain; 6Research nurse in Liver unit ICU Hospital Clinic de Barcelona, Spain
Email: zannini@clinic.cat

Background and aims: Schistosomiasis is a parasitic disease caused by a trematode which belongs to the Schistosoma genus. Globally, this illness causes a huge amount of morbimortality (around 240.000 people die every year). Although schistosomiasis is unusual in Europe, globalization increases the risk of facing imported cases in our continent. Hepatosplenic schistosomiasis causes presinusoidal portal hypertension requiring pharmacological, endoscopic or surgical treatment. LT is indicated in refractory cases. LT is a common reality in decompensated hepatosplenic schistosomiasis in Brazil, where the illness is endemic. The aim is to describe prevalence and outcome of patients with schistosomiasis transplanted in Hospital das Clínicas, Universidade de Sao Paulo between years 2010–2021.

Method: Retrospective, descriptive analysis on patients with liver disease caused by Schistosoma mansoni requiring LT. Clinical records of 1354 liver transplant patients were reviewed.

Results: Among the investigated population, 24 had an infection by this trematode (2% of the total series of LT). The mean age was 54, 63 ±10, 64 years and 58% were men. In 67% of cases schistosomiasis was associated with other concomitant etiologic factor. Portal vein thrombosis after LT occurred in 33%, whereas portal thrombosis before LT were not relevant. One-year survival rate of LT patients with hepatosplenic schistosomiasis was 75%, figure slightly higher than that observed in the non-schistosomiasis group (72%; p = 1330).

Conclusion: Schistosomiasis was an infrequent cause of LT in Hospital das Clínicas de Sao Paulo. Prognosis of patients requiring LT is good with survival rates similar to those observed in other LT recipients.
using the methylation values of 19 genes. For analytical modeling, GLM was performed for individual genomic feature-based model construction in the training cohort. Tenfold cross-validation was used in parameter optimization. The probability score of each genomic and serologic feature for each sample was generated by base models, in which a higher score represented a higher probability for cancer.

**Results:** We analyzed blood samples from a cohort of 175 patients, including 87 HCC patients and 88 non-HCC patients with liver cirrhosis. Individual panels have various accuracy for HCC detection: AUC of 0.849 (95% CI: 0.791–0.907) for mutation, 0.914 (95% CI: 0.870–0.958) for methylation, 0.896 (95% CI: 0.848–0.945) for CNV, 0.768 (95% CI: 0.698–0.838) for 5 prime end motif, 0.839 (95% CI: 0.779–0.899) for serum protein markers (AFP, AFPL3%, DCP). An integrated model, which combined the biomarkers of mutation, methylation, CNV, 5 prime end motif, and protein markers exhibited a consistently strong screening potential, achieving an AUC of 0.971 (95% CI: 0.946–0.997), 93.1% sensitivity and 94.3% specificity. The sensitivity increased with HCC stages: 100% (5/5) for BCLC stage 0, 89.4% (42/47) for stage A, 93.8% (15/16) for stage B, and 100% (19/19) for stage C, respectively. When stratified by etiology, the performance remains excellent: AUC of 0.964 (95% CI: 0.910–1.000), 93.5% sensitivity, 90.9% specificity in alcohol-associated HCC, AUC of 1 (95% CI: 1.000–1.000), 100% sensitivity, 100% specificity in non-alcoholic steatohepatitis associated HCC, AUC of 0.934 (95% CI: 0.861–1.000), 72.7% sensitivity, 93.5% specificity in viral hepatitis associated HCC.

**Results:**

This interim analysis included 1306 patients (83.1% male, age at CT 62.2 ± 10.8 years, median follow-up 5.3 [2.8–8.3] years), with 391 patients (29.9%) developing recurrence within the first year. 564 (43.2%), 141 (10.8%) and 601 (46.0%) patients were included in the training, internal validation and external testing cohorts respectively, and the model was trained for 200 epochs. In the internal validation cohort, the deep learning-based model achieved AUC of 0.783 (95% CI 0.643–0.821; PPV 70.5%; NPV 79.6%) for predicting HCC recurrence at 1-year, which was significantly better than MVI (AUC 0.546 [95% CI 0.446–0.649]; PPV 43.2%; NPV 66.7%) (p < 0.04). In the external testing cohort, the deep learning-based model achieved AUC of 0.709 (95% CI 0.546–0.762; PPV 47.8%; NPV 81.0%) for HCC recurrence at 1-year, which was numerically higher than MVI (AUC 0.614 [0.525–0.670]; PPV 34.5%; NPV 86.8%). In both the validation and external testing cohorts, the deep learning-based model had better discriminative ability on 1-year recurrence risk when compared with MVI (Fig 1: 70.5% vs 43.2% and 47.8% vs 34.5% respectively, both p < 0.05).

**Conclusion:**

A deep learning-based model on pre-treatment CT can accurately predict HCC recurrence within the first year after surgery, outperforming MVI in risk stratification. Our deep learning-based model will be developed, and has potential to become a novel tool for pre-treatment prognostication of short- and long-term outcomes in HCC.
Background and aims: We recently developed the C-reactive protein (CRP) and alpha-fetoprotein (AFP) derived from serum CRP and AFP values prior to AB initiation by adding one point each for CRP ≥ 1 mg/dL and AFP ≥ 100 ng/ml resulting in the following categories: 0 points = CRAFITY-low, 1 point = CRAFITY-intermediate, 2 points = CRAFITY-high. The prognostic (overall survival (OS) and progression-free survival (PFS)) and predictive ability (best radiological response) of the CRAFITY score were assessed using uni- and multivariable analyses.

Results: Overall, 274 patients (66.1 ± 11.0 years; male: n = 224, 82%) were included, of which 208 (76%) had cirrhosis. Most patients had BCLC C (n = 198, 72%). While 97 patients (35%) had CRAFITY-low, n = 113 (41%) and n = 64 (23%) had CRAFITY-intermediate and CRAFITY-high, respectively.

Figure: Comparison of overall (A) and progression-free survival (B) across CRAFITY score

Median OS (Panel A) and PFS (Panel B) were significantly worse in patients with higher CRAFITY scores (OS: low: 23.4 (95%CI: 14.8–32.0) vs. intermediate: 15.9 (95%CI: 11.9–19.5) vs. high: 8.6 (95%CI: 5.6–11.6) months, p < 0.001; PFS: low: 11.1 (95%CI: 9.3–12.9) vs. intermediate: 6.5 (95%CI: 5.0–8.1) vs. high: 3.2 (95%CI: 2.7–3.7) months, p < 0.001). Upon multivariable analyses, CRAFITY was independently associated with OS (aHR: intermediate vs. low: 1.51 (95%CI: 0.92–2.48), p = 0.103; high vs. low: 2.56 (95%CI: 1.52–4.33), p requires validation in patients treated with atezolizumab and bevacizumab (AB), the current standard of care in systemic first-line treatment for advanced HCC.

Method: AB-treated patients with HCC at 15 centers in Europe and Asia between 12/2018 and 01/2023 were included. CRAFITY was derived from serum CRP and AFP values prior to AB initiation by adding one point each for CRP ≥ 1 mg/dL and AFP ≥ 100 ng/ml resulting in the following categories: 0 points = CRAFITY-low, 1 point = CRAFITY-intermediate, 2 points = CRAFITY-high. The prognostic (overall survival (OS) and progression-free survival (PFS)) and predictive ability (best radiological response) of the CRAFITY score were assessed using uni- and multivariable analyses.
< 0.001) as well as PFS (aHR: intermediate vs. low: 1.77 (95%CI: 1.21–2.59), p = 0.003; high vs. low: 2.90 (95%CI: 1.91–4.39), p < 0.001). CRAFITY was also significantly associated with radiological response (complete/partial response (CR/PRI)/stable disease (SD)/progressive disease (PD), which was evaluable in 245 patients (89%): low: n = 34 (38%)/n = 45 (50%)/n = 11 (12%) vs. intermediate: n = 37 (37%)/n = 28 (28%)/n = 34 (34%) vs. high: n = 12 (21%)/n = 18 (32%)/n = 26 (46%); p < 0.001). Disease control rates (DCR) were 88% vs. 66% vs. 54% (p < 0.001), respectively. Upon multivariable logistic regression, a higher CRAFITY score was independently associated with a lower probability of disease control (aOR: intermediate vs. low: 0.25 (95%CI: 0.11–0.55), p = 0.001; high vs. low: 0.15 (95%CI: 0.06–0.35), p < 0.001).

Conclusion: The CRAFITY score identifies AB treated patients with a favourable prognosis and response and may help with patient counselling.

FRI-274
Baveno VI and VII criteria are not suitable for screening of large size esophageal varices and clinically significant portal hypertension in patients with HCC
Manon Allaire1, Bertrille Campion1, Edouard Larrey1, Mathilde Wagner1, Marika Rudler1, Charles Roux1, Lorraine Blaise2, Nathalie Ganne-Carrié2, Dominique Thabut1, 1Hôpital Pitié Salpêtrière, France; 2Hôpital Avicenne, France
Email: allama5@hotmail.fr

Background and aims: Baveno VI and VII criteria are used in patients with cirrhosis to rule-out large size varices (EV) and rule-in/out CSPH. Their diagnostic performance is still unclear in patients with HCC. Method: All Child-Pugh A cirrhotic patients with HCC with endoscopy, liver stiffness measurement (LSM) and platelet count within 6 months were retrospectively included and classified according to the BCLC stage in 2 centers. Favorable Baveno VII criteria were defined by LSM <20 kPa and Plt >150 G/l, favorable Baveno VI criteria if LSM ≤15 kPa and Plt ≥150 G/l. Clinical significant portal hypertension (CSPH) was defined by a HVPG ≥10 mmHg or the presence of EV regardless the size. Results: 185 Child-Pugh A cirrhotic patients were included in the study (male 87%, median age 63 years, etiology of cirrhosis alcohol/metabolic syndrome/hepatitis C/hepatitis B in 46%/36%/20%/31% of cases and mixed for 33% of patients). Esophageal varices (EV) were present in 44% of patients (23% large size EV) and HVPG ≥10 mmHg in 41.7% (mean HVPG 8 mmHg). Median platelet count and elastometry were 148 × 103/mm3 and 25 kPa respectively, 50% had platelet count <150 × 103/mm3 in the cohort. 46% of patients were classified as BCLC-0/A, 28% as BCLC-B and 26% as BCLC-C, and 18% had received prior treatment for HCC. A multinodular and infiltrative form was present in 52 and 15% of patients respectively, with a location in the right liver in 78% of cases. Compared to BCLC 0/A HCC (21 kPa), elastometry was higher in BCLC-B (25 kPa, p = 0.005) and BCLC-C (27 kPa, p < 0.001) patients. There was no difference in platelet count between the different groups. In patients with favorable Baveno VI criteria, 7.8% in the whole cohort (Se 93%, PNV 92%), 11.1% of BCLC-0/A (Se 89%, PNV 89%) and 10.0% of BCLC-C patients (Se 91%, PNV 90%) had large EV. Among the patients with HVPG <10 mmHg, i.e. without CSPH, 5.7% had large size EV and 17.1% small EV. CSPH was present in 26.7% of patients with favorable Baveno VII criteria in the whole cohort and in 23.5% of those of the BCLC-0/A subgroup. Specificity of LSM ≥25 kPa to rule-in CSPH was of 63%.

Conclusion: Baveno VI criteria are not appropriate to rule-out the presence of high-risk EV and Baveno VII criteria to rule-in/out CSPH in HCC patients.

FRI-275
Multi-omic large scale risk prediction for hepatocellular carcinoma
Jan Clusmann1, Kai Markus Schneider1, Christian Trautwein1, Carolin V. Schneider1, 1RWTH Aachen University, Department for Gastroenterology, Metabolic Disorders and Internal Intensive Medicine, Aachen, Germany
Email: janclusmann@ukaachen.de

Background and aims: Hepatocellular carcinoma (HCC) is the third-leading cause of cancer-related death worldwide and a crucial public health concern. Many patients with HCC are only diagnosed at advanced tumor stages, with low to no chance of curative treatment. Meanwhile, high-risk populations for liver cancer are well known. This highlights the urgent need for improved risk stratification, especially as multi-omics pave the way for personalized medicine.

Method: In a systematic approach we analyzed the population-based UK Biobank with n >500,000 subjects. We assessed population characteristics, electronic health records, death registers, lifestyle, physical and biological measures as well as single nucleotide polymorphisms (SNPs) associated with risk of HCC for ~500,000 subjects (508 with HCC) and nuclear magnetic resonance based (NMR) metabolomics for 106,000 subjects. We train several machine learning algorithms on the different data modalities, to assess relevance for risk stratification (Figure 1A).

Figure: a) Study design for multimodal risk prediction of HCC (Created with BioRender.com). b) Associations of metabolic biomarkers with development of HCC. Hazard ratios (with 95% confidence intervals) are presented per 1-SD higher metabolic biomarker on the natural log scale, stratified by age, sex, body mass index and previous diagnosis of liver cirrhosis. *False discovery rate-controlled p < 0.01. DHA, docosahexaenoic acid; FA, fatty acids; FAw3/6, omega-3/6 fatty acids; HDL, high-density lipoprotein; NMR, nuclear magnetic resonance.
Macrotrabecular-massive pattern is associated with aggressive factors, but it is not an independent predictor of tumor recurrence and overall survival in patients with hepatocellular carcinoma treated with liver resection

Ezequiel Mauro1, Carla Fuster2, Joana Ferrer3, Berta Caballol1, Marco Sanduzzi Zamparelli1, Jordi Bruix1, Josep Fuster3, María Reig1, MTM, as well as to evaluate its association with aggressive recurrence. The aim of the study was to describe the subgroup of patients with HCC–adjuvant therapy. The presence of macrotrabecular-massive histological pattern (MTM) and microvascular invasion and/or satellitosis (mVI/S) was 7.8% (95% CI: 0.77. The presence of the MTM histological pattern was significantly associated with aggressive recurrence (HR: 157 (0.53–4.43), p=0.0154), and the presence of mVI/S was the only independent predictor of aggressive recurrence [HR: 3.31 (1.74–6.29), p < 0.001]. Regarding OS, in the univariate analysis the presence of MTM was associated with a higher risk of death [HR: 2.50 (1.19–5.29), p=0.016], but after adjusting for AFP and mVI/S, it was not a predictor of OS [HR: 1.32 (0.49–3.52), p=0.573]. The presence of mVI/S was the only independent predictor of mortality [HR: 2.23 (1.27–3.91), p=0.005].

Conclusion: The MTM pattern is significantly associated with clinical and histological features of poor prognosis (worse degree of differentiation, mVI/S, and elevated AFP values), but it does not represent an independent predictor for recurrence/OS. Finally, the presence of mVI/S was the only independent risk factor of aggressive recurrence or lower OS rate.
FRI-278
Alternative surveillance using CT/MR improves clinical outcomes by detecting early-stage hepatocellular carcinoma in High-risk patients with chronic hepatitis B
Su Jong Yu¹, Dong Ho Lee², Heejin Cho¹. ¹Seoul national university hospital, Internal Medicine, Korea, Rep. of South; ²Seoul national university hospital, Radiology, Korea, Rep. of South Email: dhlee.rad@gmail.com

Background and aims: This study aimed to evaluate the outcome of alternative hepatocellular carcinoma (HCC) surveillance using CT/MR compared to that of US only in chronic hepatitis B (CHB) patients.

Method: We enrolled consecutive CHB patients undergoing regular HCC surveillance, classifying into two groups: US only group and alternative surveillance group. The risk estimation for HCC in CHB (REACH-B) score was calculated to categorize high and low risk. Outcomes included 10-year overall survival (OS), Size and Barcelona Clinic Liver Cancer (BCLC) stage of HCC, and OS after HCC diagnosis.

Results: A total of 2024 patients were enrolled with 1012 patients in each group. In alternative surveillance group, all of 1012 patients underwent contrast enhanced CT (median number, 3; IQR, 1–6; range, 1–24) instead of scheduled US for HCC surveillance during the follow-up. Contrast enhanced MR was done in 222 patients (median number, 1; IQR, 1–2; range, 1–10). There was no significant difference in OS (96.0% in US only vs. 96.8% in alternative surveillance; P = 0.379). In both groups, HCC occurred in 66 patients. Medium size of HCC in alternative surveillance was significantly smaller than US only (1.6 cm vs. 2.1 cm; P < 0.001). The rate of BCLC 0 stage HCC was also significantly higher in alternative surveillance than US only (71.2% [47/66] vs. 42.4% [28/66]; P = 0.003). OS after HCC diagnosis in alternative surveillance group was significantly better than that in US only group (83.0% vs. 67.0%; P = 0.025). In high risk group including 970 patients, alternative surveillance provided significantly better OS (97.3% vs. 93.6%; P = 0.029) and OS after HCC diagnosis (83.0% vs. 60.6%; P = 0.010) than US only. However, there was no significant difference in both OS (p = 0.202) and OS after HCC diagnosis (p = 0.937) in 1054 patients with low risk.

Conclusion: Alternative surveillance using CT/MR enabled the detection of HCC in earlier stage with smaller size than US only, and had a potential to improve OS after HCC diagnosis, especially for patients with high risk.

FRI-279
Presence of esophageal varices regardless their size is associated with overall survival in patients with advanced HCC treated with Atezolizumab/Bevacizumab
Philippe Sultanik¹, Edouard Larrey¹, Berthile Campion¹, Manon Evain¹, Christine Brochet², Héloïse Giudicelli¹, Mathilde Wagner³, Jérôme Denis², Marika Rudler¹, Dominique Thabut¹, Manon Allaire¹. ¹Hôpital Pitié-Salpêtrière, Liver Unit, Paris, France; ²Hôpital Pitié-Salpêtrière, Biochemical Department, France; ³Hôpital Pitié-Salpêtrière, Radiology Department, France Email: philippe.sultanik@aphp.fr

Background and aims: Portal hypertension (PHT) and hepatocellular carcinoma (HCC) are 2 closely related complications of cirrhosis. The presence of PHT is associated with higher mortality with locoregional treatments of HCC. Our objectives were to investigate whether PHT parameters were associated with progression-free survival (PFS) and overall (OS) in HCC patients (pts) treated with Atezolizumab/Bevacizumab (Atezo/Beva).

Method: Data from all pts treated with Atezo/Beva were collected prospectively since August 2020. OS and PFS were assessed using Kaplan Meier. Progression was defined as a composite (progression and/or side effects/hepatic decompensation requiring discontinuation). The influence of baseline characteristics on events during follow-up was assessed by Cox model.

Results: Data from 75 pts treated with Atezo/Beva were collected prospectively since August 2020. OS and PFS were assessed using Kaplan Meier. Progression was defined as a composite (progression and/or side effects/hepatic decompensation requiring discontinuation). The influence of baseline characteristics on events during follow-up was assessed by Cox model.

Conclusion: Alternative surveillance using CT/MR enabled the detection of HCC in earlier stage with smaller size than US only, and had a potential to improve OS after HCC diagnosis, especially for patients with high risk.

FRI-279
Presence of esophageal varices regardless their size is associated with overall survival in patients with advanced HCC treated with Atezolizumab/Bevacizumab
Philippe Sultanik¹, Edouard Larrey¹, Berthile Campion¹, Manon Evain¹, Christine Brochet², Héloïse Giudicelli¹, Mathilde Wagner³, Jérôme Denis², Marika Rudler¹, Dominique Thabut¹, Manon Allaire¹. ¹Hôpital Pitié-Salpêtrière, Liver Unit, Paris, France; ²Hôpital Pitié-Salpêtrière, Biochemical Department, France; ³Hôpital Pitié-Salpêtrière, Radiology Department, France Email: philippe.sultanik@aphp.fr

Background and aims: Portal hypertension (PHT) and hepatocellular carcinoma (HCC) are 2 closely related complications of cirrhosis. The presence of PHT is associated with higher mortality with locoregional treatments of HCC. Our objectives were to investigate whether PHT parameters were associated with progression-free survival (PFS) and overall (OS) in HCC patients (pts) treated with Atezolizumab/Bevacizumab (Atezo/Beva).

Method: Data from all pts treated with Atezo/Beva were collected prospectively since August 2020. OS and PFS were assessed using Kaplan Meier. Progression was defined as a composite (progression and/or side effects/hepatic decompensation requiring discontinuation). The influence of baseline characteristics on events during follow-up was assessed by Cox model.

Results: Data from 75 pts treated with Atezo/Beva were analyzed prospectively (median age 65 years, 21% women, 81% cirrhotic pts). Risk factors for cirrhosis were viral infection (57%), excessive alcohol consumption (47%) and metabolic syndrome (35%). 37% had a mixed cause of cirrhosis. At inclusion, 74% of the pts were Child-Pugh A and 49% had esophageal varices (EV) (25% large size EV). On the day of treatment, 65% of pts were BCLC-C and 52% were treatment-naive for
HCC was multi-nodular in 68%, with a median size of 59 mm for the largest lesion, 33% had infiltrating HCC and 47% vascular invasion. At inclusion, median bilirubin was 14 μM, INR 1.14, albumin 35 g/L, platelets 170,000/mm³, MELD score 9.0, PIVKA 3.358 and AFP 207 ng/ml. Of the patients, 15% had an ALBI score of 3 and 18% had thrombocytopenia <100,000/mm³. Median follow-up was 13 months, 33% of pts had a response to treatment (regression or stability). The PFS was 30% at 12 months. In univariate analysis, the presence of ≥3 HCC lesions (HR = 1.4, 95% CI [0.6–3.2], p = 0.02), platelet count (HR = 1.01, 95% CI [1.01–1.1], p = 0.03), albumin level (HR = 0.9, 95% CI [0.89–0.99], p = 0.04), PIVKA (HR = 1.01, 95% CI [1.01–1.1], p = 0.003), AFP (HR = 1.01, 95% CI [1.01–1.1], p = 0.003) and the presence of large EV (HR = 2.2, 95% CI [1.2–4.2], p = 0.02) were associated with PFS. Only the presence of large EV was associated with PFS in multivariate analysis (HR = 3.5, 95% CI [1.5–8.3], p = 0.005). OS was 54% at 12 months. Death was related to HCC in 59%, liver failure in 15%, sepsis in 15% and other causes in 11%. In univariate analysis, BMI (HR = 1.1, 95% CI [1.02–1.2], p = 0.01), presence of ≥3 HCC lesions (HR = 1.1, 95% CI [0.4–2.2], p = 0.001), ALBI grade (HR = 1.9, 95% CI [1.2–3.3], p = 0.01), PIVKA (HR = 1.01, 95% CI [1.01–1.1], p = 0.001), AFP (HR = 1.01, 95% CI [1.01–1.1], p = 0.001), presence of EV regardless the size (HR = 2.2, 95% CI [1.2–4.2], p = 0.02) were associated with OS. Only the presence of EV regardless of the size was associated with OS in multivariate analysis (HR = 2.2, 95% CI [1.1–6.9], p = 0.03). During the follow-up, 8% of pts presented an acute variceal bleeding (AVB): 60% of them had a history of AVB, 60% small size EV and 40% large size EV at the pre-treatment endoscopy. Primary prophylaxis for AVB was started only in pts with large size EV according to Baveno VI recommendations. None of the pts died secondary to AVB.

Conclusion: The presence of EV regardless of their size is associated with OS in patients with advanced HCC treated with Atezo-Beva. Among the patients who presented AVB under treatment, 60% had small size EV, motivating the implementation of an AVB prophylaxis with beta-blockers in all patients with EV regardless of their size.

FRI-280
A machine learning enabled score based on large varices predicts 5- and 10-year hepatocellular carcinoma (HCC) development in a 12-year prospective cohort of patients with compensated advanced chronic liver disease
Sara Ascari1, Rodolfo Sardone2, Fabio Castellana3, Filippo Schepis1, Valentina Baldacimi1, Filippo Semellini1, Alessandra Pivetti1, Lorenza Di Marco1, Barbara Lei1, Nicola De Maria1, Francesco Dituri2, Gianluigi Giannelli2, Erica Villa1. Gastroenterology, Chirnomo, Modena, Italy; “S. De Bellis Research Hospital, National Institute of Gastroenterology, Italy
Email: erica.villa@unimore.it

Background and aims: Most scores for HCC prediction can assess at most 3- or 5-year HCC risk, as the observation period of the derivative cohort is usually short. We aimed to develop a 5- and 10-year HCC risk score from a prospective cohort of patients with compensated advanced chronic liver disease (cACLD) followed up for 12 years.

Method: 545 patients with cACLD, HCC-free, prospectively enrolled from 2011 to 2022, using a convenience sampling, underwent at enrolment upper g.i. endoscopy, liver ultrasound/elastography, HVPG measurement, lab tests. Cox proportional models were used to assess the association between esophageal varices, adjusted for all the selected covariates, and HCC incidence. Random Survival Forest (RSF), a machine learning (ML) prediction model, was used as a
sensitivity analysis to test prediction power of the same covariates, considering all the possible interactions and non-linear relationships with HCC incidence as the outcome.

Results: Median f-up time was 5.9 years. We observed 78 incident HCCs (14.3%). In the fully adjusted Cox proportional models after the adjustment for covariates, patients with large esophageal varices had 4 times the risk of developing HCC (HR:4.02; 95% C.I.: 2.42–6.86) than patients with small/without varices. The covariates, viral aetiology (HR: 2.61;95% C.I.: 1.57–4.35), LSM (for each kPa) (HR: 1.01;95% C.I. 1.01–1.03), male sex (HR:1.94 C.I. 95%: 1.10–3.41), were also meaningfully associated with HCC risk. As a sensitivity analysis we performed the RSF selection algorithm to rank all the variables of the Cox models, according to their prediction power (using minimal depth metric) for the incidence of HCC. Large esophageal varices had the best prediction power for HCC, followed by LSM, viral aetiology, BMI, albumin, and age at the enrolment. Interestingly, RSF prediction power was in line with the magnitude of association with Cox model, but ML further identified BMI and albumin as related and excluded sex. The score built with the RSF-selected variables (Esophageal Varices [EV] score) had excellent discrimination and calibration in both 5- (AUROC 0.823) and 10-year (AUROC 0.792) HCC risk assessment both time points than aMAP score, built on the same data irrespective of aetiology, with a significantly better overall performance.

Conclusion: The machine learning approach, used to build this score, would develop an advanced HCC in 9 months after diagnosis if HCC risk (underlining the critical pathogenetic role of long-lasting and severe portal hypertension in HCC development). This score also obtained better prediction for 5- and 10-year HCC development than aMAP score (i.e. the best score so far for HCC prediction independently from aetiology) tested in the same dataset. The proposed score is highly reliable. Being based on routine clinical data of the patients with cACLD it can be easily applied worldwide.

**FRI-282**

Validation of serum biomarker panels for early HCC detection: results from a large prospective European and Latin American multicenter study

Boris Beudeker1, Siyu Fu1, Domingo Balderaramo2, Angelo Z. Mattos3, Enrique Carrera4, Javier Diaz-Ferrer5, Joen Prieto6, Marco Arrese2, Arndt Vogel5, Jesus Maria Banales9, Jeffrey Olivera1, Anthony Groshuismink1, Gertine Oord1, Robert De Man1, Jose Debes10, Andre Boonstra1, Erasmus MC, Gastroenterology and hepatology, Rotterdam, Netherlands; 2Hospital Privado Universitario de Cordoba, Argentina; 3Federal University of Health Sciences of Porto Alegre, Brazil; 4Hospital Eugenio Espejo, Ecuador; 5Hospital Nacional Edgardo Rebagliati Martins, Peru; 6Centro de Enfermedades Hepaticas y Digestivas (CEHYD), Colombia; 7Facultad de Medicina, Chile; 8Medizinische Hochschule Hannover, Germany; 9Biodonostia Health Research Institute, Spain; 10University of Minnesota, United States. Email: b.beudeker@erasmusmc.nl

Background and aims: HCC is a major cause of cancer death. Guidelines recommend routine 6-month ultrasonography surveillance for high-risk patients, but its effectiveness in early-stage HCC detection is limited. PIVKA-II, AFP, and the GALAD panel of serum biomarkers are linked to HCC, but inconsistent use in guidelines limits their value.

Method: In a multi-center study, 2045 patient samples were retrospectively or prospectively collected from 7 countries and analyzed for cancer diagnosis and liver disease etiology. The performance of multivariable models based on AFP and PIVKA were tested for early stage HCC detection, low AFP HCC, 12 months pre-diagnostic HCC (n = 92, range 9–15 months), and compared to cirrhosis and other liver tumors.

Results: The GALAD model showed excellent ability to differentiate HCC from liver cirrhosis in the prospective Latin American cohort (n = 288), with an AUC of 87.9. A novel multivariable model was developed to detect early-stage HCC with low AFP levels, by combining sex, age, AFP, and PIVKA-II (also called GAAD), with an AUC of 87.3. Both GALAD and GAAD effectively differentiated low AFP HCC from cirrhosis in both European and Latin American patients, with AUCs of 82.8 and 81.6, respectively. Aiming to improve and recalculate the GALAD model in early HCC cirrhotic cases performed similarly to the original. 12 Months prior to HCC diagnosis, GAAD differentiated cirrhosis (n = 193) from pre-diagnostic HCC (n = 92) (p < 0.0001), with 59% sensitivity and 85% specificity in those who would develop an advanced HCC in 9–15 months. In addition, GAAD differentiated non-cirrhotic HCC (n = 243) from other malignant and benign liver tumors with an AUC of 91.9, and it was 100% sensitive and specific in hemangioma cases (n = 64).

Conclusion: The GALAD model has proven to be robust in early stage HCC and diverse patient populations, and its performance remains consistent even when recalculated using different patient cohorts. Our findings warrant its consideration for inclusion in international guidelines for HCC diagnosis and surveillance. With high accuracy, sensitivity, and specificity, the GAAD models have the potential to revolutionize the routine HCC surveillance and diagnosis, in both high-risk cirrhotic and non-cirrhotic cases and in low AFP early stage HCC.

**FRI-283**

A novel AFP-M2BPGi score has better performance than CRADITY score for predicting survival in patients with viral hepatocellular carcinoma undergoing immunotherapy

Pei-Chang Lee1, Chijung Wu1, Kuo-Wei Huang2, ChiehJu Lee1, I-Cheng Lee1, Ming-Chih Hou1, Yi-Hsiang Huang1, 1Taipei Veterans General Hospital, Taiwan; 2Taipei City Hospital Yang- Ming branch, Taiwan. Email: yihuang@vghtpe.gov.tw

Background and aims: CRADITY score has been developed to predict the clinical outcomes of patients who received immune checkpoint inhibitors (ICI) for unresectable hepatocellular carcinoma (HCC).
However, it remains uncertain about the performance of CRAFTIFY score in patients with viral HCC undergoing ICI-based therapy. Serum Mac-2 binding protein glycosylation isomer (M2BPGi) is a novel biomarker reflecting liver fibrosis for chronic hepatitis B and C. In this study, we aimed to investigate the role of serum M2BPGi in predicting the survival of ICI-treated viral HCC.

**Method:** From May 2017, 243 consecutive patients had received ICI-based immunotherapy for unresectable HCC in Taipei Veterans General Hospital. The prognostic value of baseline variables, including M2BPGi, on overall survival was analyzed.

**Results:** During the follow-up period, 140 patients died and the median overall survival (OS) was 13.9 months (95% confidence interval [CI]: 10.6–17.2). Patients with baseline low CRAFTIFY score had the significantly longest median OS (not yet reached) than the others. However, the OS could not be significantly differentiated between CRAFTIFY-intermediate and CRAFTIFY-high patients (median OS: 13.3 vs. 9.5, p = 0.105), particularly in patients with viral HCC having lower than 1.68 COI acceptably predicted OS in these patients (AUROC: 0.629, hazard ratio: 2.599, 95% CI: 1.594–4.238, p < 0.001). Combined with baseline serum alpha-fetoprotein level (AFP ≥100 ng/ml), a new score including AFP and M2BPGi was developed. Patients who fulfilled no criterion (0 points) had the longest median OS (not yet reached), followed by those fulfilling 1 point (17.2 months, 95% CI: 7.6–26.8), and patients meeting both criteria (12.8 months, 95% CI: 3.8–12.8) (p = 0.038, <0.001, and 0.001 for score 0 vs.1, 0 vs. 2, and 1 vs. 2). Besides, the new AFP-M2BPGi scoring model had a higher homogeneity value (21.85 vs. 11.21) and lower corrected Akaike information criterion value (582.76 vs. 593.41) compared to the CRAFTIFY score.

**Conclusion:** A new AFP-M2BPGi score would be superior to CRAFTIFY score to predict survival in patients receiving ICI-based immunotherapy for viral HCC. This new score may have better clinical application for HCC patients in areas endemic for viral hepatitis.

**FRI-284**

Implication of patients experience in the liver cancer multidisciplinary approach

_Gemma Iserte_1,2,4, _Eva Palou_4, _Neus Llarch_1,2,3,5, _Jessica Farre_4, _Maria Angéles García-Criado_1,2,3,5, _Joana Ferrer_1,2,3,7, _Alba Díaz_1,2,3,8, _Marta Burrel_1,2,3,6, _Montse Brañas_4, _Antònia Murcia_4, _María Reig_1,2,5,10, _Joan Escarrabill_4, _BCLC group. Fundació Clinic per a la Recerca Biomèdica-IDIBAPS, Barcelona, Spain, Spain; _CIBERehd, Madrid, Spain; Liver Oncology Unit. Institut de Malalties Digestives i Metaboliques. Hospital Clinic of Barcelona, Barcelona, Spain, Spain; _Patient Experience and Chronicity Department. Hospital Clinic of Barcelona, Barcelona, Spain, Spain; _University of Barcelona, Barcelona, Spain, Spain; _Radiology Department, Hospital Clinic of Barcelona, Barcelona, Spain, Spain; _Liver Oncology Unit. Hepatobilipancreatic Surgery and Liver and Pancreas Transplant Department. ICMDM. Hospital Clinic of Barcelona, Spain, Spain; _Pathology Department, Hospital Clinic of Barcelona, Barcelona, Spain, Spain; _Institut de Malalties Digestives i Metaboliques. Hospital Clinic of Barcelona, Barcelona, Spain, Spain; _Liver Oncology Unit. Liver Unit, Hospital Clinic of Barcelona, Barcelona, Spain, Spain; Email: escarrabill@clinic.cat

**Background and aims:** The three pillars of the Quality of Health Care are efficacy, safety and patients experience (PE). Additionally, it has been demonstrated that the multidisciplinary approach is associated to better outcome. The last version of BCLC staging system includes the chapter on ‘clinical decision-making’ showing the multiparametric approach used by physicians when selecting treatments including patient perspective. Aim: to evaluate PE in the BCLC group.

**Method:** The project was divided into 3 parts: 1) The Patient Experience Team (PExT) and professionals from BCLC map the patient journey, the stakeholder map, and identify the patient meta-categories (Figure 1). The most frequent meta-categories were identified and were grouped into 23 categories and 6 meta-categories (Figure 1). The three pillars of the Quality of Health Care showed the multiparametric approach used by physicians when selecting treatments including patient perspective. 2) Based on the information from part 1, the PExT designed questions. The BCLC nurses, according the archetypes, invited patients for the focal groups/interviews and 3) PExT did the focal groups/interviews. All the interventions were recorded and verbatim transcription was analyzed through MAXQDA software.

**Results:** A total of 11 patients and 3 caregivers of patients who died due to liver cancer were invited. Eleven patients participated in 3 focal groups and 3 caregivers were interviewed. In the focal groups 91 concepts were identified and were grouped into 23 categories and 6 meta-categories (Figure 1). The most frequent meta-categories were related to the information received, the contact with professionals, the impact of cancer in their life and the support received. The majority of patients did not need to look further information on the internet, they found that the information at diagnosis was clear, precise and enough but they would like to have more time to clarify doubts. The patients were aware of the role of the different professionals and saw them as a coordinated group but some of
them requested more information regarding the ‘clinical decision process.’ The majority of patients agreed that the diagnosis had affected their lives and most of them commented that the best support was their family despite of the fact that some received external support. In the caregivers interviews the good coordination between the Hospital and palliative home care teams was mentioned. However, they raised the difficulties that they had to openly speak about death with their relatives due to the cultural barrier and the need of support for caregivers in this regard. The PE can be positive even in situations where outcomes worsen, such as in the case of the end of life.

Results: Of 124 patients included (male: n = 110, 89%), MVI involved the main portal vein in 47 patients (38%), and 49 individuals (40%) had additional non-tumorous thrombus apposition. Fifty of 80 patients (63%) with available endoscopy had varices. Twenty-four individuals (19%) received therapeutic anticoagulation and 94 patients (76%) were treated with effective systemic therapies. The use of therapeutic anticoagulation did not significantly affect the course of the malignant thrombosis at 3–6 months. Systemic therapy (aHR: 0.26 [95%CI: 0.16–0.40]) but not anticoagulation was independently associated with reduced all-cause mortality. In patients with known variceal status, adequate management of varices was independently associated with reduced risk of variceal bleeding (aHR: 0.12 [95%CI: 0.02–0.71]). In the whole cohort, non-selective beta blockers were independently associated with reduced risk of variceal bleeding or death from any cause (aHR: 0.69 [95%CI: 0.50–0.96]).

Conclusion: Adequate bleeding prophylaxis and systemic anti-tumour therapy but not anticoagulation were associated with improved outcomes in patients with HCC and MVI.

FRI-285
Management of varices but not anticoagulation is associated with improved outcome in patients with hepatocellular carcinoma and macrovascular tumour invasion
Lorenz Balcar1,2, Arpad Mrekva1, Bernhard Scheiner1,2, Katharina Pomej1,2, Tobias Meischl1,2, Mattias Mandorfer1, Thomas Reiberger1, Michael Trauner1, Dietmar Tamandl1, Matthias Pinter1,2. 1Medical University of Vienna, Division of Gastroenterology and Hepatology, Department of Internal Medicine III, Vienna, Austria; 2Medical University of Vienna, Liver Cancer (HCC) Study Group Vienna, Vienna, Austria; 3Medical University of Vienna, Department of Radiology, Vienna, Austria; 4Hanusch Krankenhaus, 3rd Medical Department (Hematology and Oncology), Vienna, Austria
Email: lorenz.balcar@meduniwien.ac.at

Background and aims: The value of bleeding prophylaxis and anticoagulation in patients with hepatocellular carcinoma (HCC) and macrovascular tumour invasion (MVI) is unclear. We evaluated the impact of anticoagulation on thrombosis progression, bleeding events, and overall mortality, and assessed the efficacy of adequate management of varices as recommended for patients with cirrhosis.

Method: HCC patients with MVI who had Child-Turcotte-Pugh A-B7 were included between Q4/2002 and Q2/2022. Localization of the tumour thrombus and changes at 3–6 months were evaluated by two radiologists. Univariable and multivariable logistic/Cox regression analyses included time-dependent variables (i.e., anticoagulation, systemic therapy, non-selective beta blocker treatment). The occurrence of portal-hypertension-related complications was recorded.

Results: Of 124 patients included (male: n = 110, 89%), MVI involved the main portal vein in 47 patients (38%), and 49 individuals (40%) had additional non-tumorous thrombus apposition. Fifty of 80 patients (63%) with available endoscopy had varices. Twenty-four individuals (19%) received therapeutic anticoagulation and 94 patients (76%) were treated with effective systemic therapies. The use of therapeutic anticoagulation did not significantly affect the course of the malignant thrombosis at 3–6 months. Systemic therapy (aHR: 0.26 [95%CI: 0.16–0.40]) but not anticoagulation was independently associated with reduced all-cause mortality. In patients with known variceal status, adequate management of varices was independently associated with reduced risk of variceal bleeding (aHR: 0.12 [95%CI: 0.02–0.71]). In the whole cohort, non-selective beta blockers were independently associated with reduced risk of variceal bleeding or death from any cause (aHR: 0.69 [95%CI: 0.50–0.96]).

Conclusion: Adequate bleeding prophylaxis and systemic anti-tumour therapy but not anticoagulation were associated with improved outcomes in patients with HCC and MVI.
patients (89%) had cirrhosis, among whom 82% had a Child-Pugh A score and a median MELD score of 8.5 [IQR: 7–11]. 28% of cirrhotic patients had a prior history of liver decompensation. The median time between cirrhosis and liver cancer diagnosis was 72 months [IQR: 37–126]. 78% of liver cancers were diagnosed during regular surveillance. 385 patients (97.8%) developed hepatocellular carcinoma (HCC), 7 patients (1.7%) developed cholangiocarcinoma and 2 (0.5%) patients had hepato-cholangiocarcinoma. At diagnosis, 243 of liver cancers (62%) were single tumors, with a mean diameter of 28.5 mm, while 67 (17%) were associated with portal vein thrombosis or invasion and 22 (6%) were metastatic (27% of lung metastasis). Among HCV-infected patients, 126 developed liver cancer after achieving sustained virological response (SVR) and were compared to 215 patients who developed it before SVR. Multinodular HCC were more frequent in HCV-infected patients (43% vs 33%, p < .0001), while single tumors were more frequent in patients who achieved SVR (66% vs 56%, p = 0.0075). The median time between SVR and liver cancer diagnosis was 23 months [IQR: 9–36]; 96% of liver cancers occurred within the five first years after SVR. Multiple treatments were performed: among 364 curative treatments-189 (51%) percutaneous tumor ablations, 112 (31%) liver resections and 63 (17%) liver transplants; among 501 palliative treatments-217 (43%) trans-arterial chemoembolizations and 128 (26%) systemic therapies. During follow-up, 110 patients died.

Conclusion: In our large cohort of patients with viral chronic liver disease, followed-up before and after viral eradication or control, liver cancers developed mostly in cirrhotic liver. The most frequent type of liver cancer was HCC, which in more than half of patients was a single tumor, detected during a surveillance program. There was no significant phenotypical difference between HCC occurring before or after SVR, except for the multinodular type, which seemed to be more frequent before SVR. In our cohort, most of liver cancers (96%) occurred within the five first years after SVR.

FRI-287
Predicting cardiovascular risk in patients with HCC receiving tyrosine kinase inhibitors: comparison of two different scores
Bernardo Stefanini1, Francesco Tovoli1, Alessandro Granito5, Franco Trevisani2, Tiziana Pressiani3, Andrea Casadei Gardini4, Rodolfo Sacco1, Fabio Piscaglia1. Division of Internal Medicine, Hepatobiliary and Immunological Diseases, IRCCS Azienda Ospedaliero-Universitaria di Bologna, Bologna, Italy; 2Semeiotica Medica, Azienda Ospedaliero-Universitaria di Bologna, Bologna, Italy, Italy; 3Medical Oncology and Hematology Unit, Humanitas Clinical and Research Center, IRCCS Humanitas Research Hospital, Rozzano (Milan), Italy, Italy; 4Department of Oncology, IRCCS San Raffaele Scientific Institute Hospital, Milan, Milan, Italy, Italy; 5Gastroenterology Unit, Azienda OspedallieGastroenterology and Digestive Endoscopy Unit, Foggia University Hospital, Foggia, Italy, Italy

Background and aims: Antineoplastic agents targeting the VEGF-VEGFR pathway increase the risk of major adverse cardiac and cerebrovascular events (MACE). In the HCC setting these agents include bevacizumab (as part of the first-line combination treatment) and TKIs. The European Society of Cardiology proposed a risk stratification algorithm for cardio-oncology (ESC-2022), never been tested in HCC. The CARDIOSOR score has been also proposed (Carballo-Folgoso, 2021) but lacks external validation in predicting MACE in sorafenib-treated patients.

Method: Retrospective analysis of the ARPES and ITALICA databases to test the ESC-2022 and CARDIOSOR abilities in predicting MACE in sorafenib-treated HCC patients (2010–2018 timeframe). Evolutive events after sorafenib start (including the occurrence of MACE) were available for all patients. Competing-risk regressions for each score were performed to address the study aim.

Results: This study included 815 patients, 28 suffered at least one MACE (3.4%). The four-tier ESC classification showed an sHR 1.42, (p = 0.015) per every risk-class (1-year risk 1.7%, 2.1%, 4.3%, and 8.0% in the low, medium, high, and very-high-risk tiers, respectively). The dichotomous CARDIOSOR scale identified a high-risk group with a 4-fold increased risk of MACE (sHR 4.12, p = 0.007; 1-year risk 3.2% and 13.1%). Both score had similar predictive ability (Akaike information criterion 360 and 366, respectively).

Figure: (abstract: FRI-287).
Conclusion: The risk of MACE in patients receiving TKI for HCC was non-negligible. Both scores discriminated this probability accurately, with different perks and pitfalls. These tools will be useful in the near-future to identify high-risk patients, candidate for anti-VEGF-free regimens (i.e. tremelimumab-durvalumab).

FRI-288
A prospective multicenter study to examine the impact of acquired and genetic predictors on Hepatocellular carcinoma risk in patients with advanced NAFLD: first report
Serena Pelusi1, Cristiana Bianco1, Luisa Ronzoni1, Alessandro Cherubini1, Ilaria Marini1, Francesco Malvestiti1, Roberta D’Ambrosio1, Anna Ludovica Fracanzani1, Annalisa Cespiati1, Giorgio Soardo1,2, Stephanie Pivetta2, Luca Miele3, Antonio Liguori4, Elisabetta Bugianesi5, Chiara Rosso6, Salvatore Pettà6, Grazia Pennisi6, Umberto Vespasiani Gentilucci7, Federica Tavaglione7, Alessandro Federico8, Francesco Paolo Russo9, Paola Zanaga9, Mario Masaroni10, Daniele Prati1, Luca Valentì1,11RCCS Co’ Grand Ospedale Maggiore Policlinico Milano, Italy; 2University of Udine, Department of Medicine, Italy; 3Italian Liver Foundation AREA Science Park, Italy; 4Università Cattolica del Sacro Cuore, Department of Internal Medicine, Roma, Italy; 5University of Torino, Department of Medical Sciences, Division of Gastroenterology, Torino, Italy; 6University of Palermo, Palermo, Italy; 7University Campus Bio-Medico of Rome, Roma, Italy; 8University of Campania, Napoli, Italy; 9University of Padova, Padova, Italy; 10University of Salerno, Salerno, Italy
Email: serenapelusi@libero.it

Background and aims: In parallel with the diabesity pandemic, hepatocellular carcinoma (HCC) is increasingly being diagnosed in non-alcoholic fatty liver disease (NAFLD), often at a late stage. Aim was to estimate the impact of acquired and genetic factors on HCC incidence in a prospective multicenter cohort of patients with advanced NAFLD.

Method: Inclusion criteria were NAFLD diagnosis, age 45–75 years, fibrosis stage F3-F4, determined histologically or by non-invasive assessment (stiffness >7.9 kPa by Fibroscan and FIB-4 ≥1.3), regular 6-months surveillance. Clinical parameters were collected and the cohort was genotyped for rs738409C>G in PNPLA3, rs1260326C>T in GCKR, rs58542926C>T in MBOAT7 and rs72613567:TA in PNPLA3.

Results: We enrolled 429 individuals (59% male) with median follow-up of 46 months (IQR 34–53). Of these, 213 (49%) showed overt cirrhosis; diabetes was present in 196 (45%), whereas 231 (53%) had hypertension. Twelve patients developed HCC during follow-up. Of these, 11 had cirrhosis and 1 showed F3 fibrosis at liver biopsy. The cumulative 5-year Incidence of HCC was 3.7% (95%CI 2.6–4.8), 1.2% (95% CI, 0.5–2.5%) in the first year. We registered 6 HCC-related deaths, median survival after HCC diagnosis was 19.5 months (IQR 2–24). At Kaplan-Meier analysis, time of progression to HCC was not influenced by diabetes, sex or hypertension but it was faster in patients with cirrhosis (p = 0.006; fig. 1) and in those homozygous for the GCKR P446 variant (Wilcoxon, p = 0.02). At multivariable Cox regression, considering sex, age, diabetes, platelets count, albumin and FIB-4, higher FIB-4 and lower albumin were correlated with faster progression to HCC (p = 0.01; P = 0.005). In this cohort the best FIB-4 cut-off to identify HCC risk was 4.09 (Sn100%, Sp83%, AUC 0.92).

Conclusion: In a large cohort of patients with HCC identified from the national French Healthcare Database, notable differences were

FRI-289
Sex disparities in presentation and outcome of hepatocellular carcinoma: results of a nationwide study in France
Charlotte Costentin1,2, Mélanie Minoves3, Sylvain Kotski3, Nathalie Goutte4, Olivier Farges5, Thomas Decaens1,2, Zuzana Macek-Jílková1,2, Sébastien Bailly3,1Centre Hospitalier Universitaire de Grenoble, Hepatology, gastro-enterology and digestive oncology, La T充ne, France; 2Institute for Advanced Biosciences, INSERM U1209/CNRS UMR 5309, Grenoble, France, France; 3Centre Hospitalier Universitaire de Grenoble, HP2 Laboratory, Grenoble Alps University, INSERM U1300, La T充ne, France; 4Hôpital Paul-Brousse AP-Hp, Paris XI University, INSERM UMR-1193, DHU Hépatinov and centre hépatobiliaire, Villejuif, France; 5Hospital Beaujon AP-HP, Hepatobiliary surgery department, Clichy, France
Email: charlotte.costentin.pro@gmail.com

Background and aims: Men are disproportionately affected by hepatocellular carcinoma (HCC) compared to women across the globe. A growing body of evidence also suggests differences in risk factors as well as prognosis. Our aim was to assess sex disparities in HCC in France, leveraging the national French Healthcare Database (PMSI).

Method: Incident cases of HCC were identified between 2009 and 2012. We only retained patients with 1) at least one hospital stay more than 3 months before the diagnosis and 2) one rolling year of follow-up from the first hospital stay preceding the diagnosis to ensure a minimum depth into the patient's history. Etiology was ascertained according to ICD-10 codes.

Results: We identified 26,117 patients (5,458 women and 20,659 men). Women were older at the time of HCC diagnosis (mean 73 years vs 68 years; p < 0.01). The underlying etiology was unclassified in 50.8% of cases in women, while alcohol was retained as the only etiology in 50.1% of cases in men. From patient with unclassified etiology (n = 8664; including 2772 women and 5892 men), metabolic comorbidities and in particular diabetes were less frequent in women than in men (diabetes 22.7% and 36.4% respectively; p < 0.01). Cirrhosis was less often documented in women (45.9% vs. 62.7% in men: p < 0.01), and less often recognized before diagnosis HCC (24.0% vs. 28.7% in men: p < 0.01). At the time of diagnosis, liver complications were less frequent in women than in men (ascites: 19.3% vs. 23.6%; hepatic failure: 12.9% vs. 16.2%; hepatorenal syndrome 1.3% vs. 2.4%; variceal banding 2.6% vs. 4.6%; p < 0.01). Women less often than men received treatment with curative intent (resection, radiofrequency or transplantation: 16.9% vs 20.2%). However, in univariate analysis, 12-month survival was higher for women than for men (p = 0.026).

Conclusion: In a large cohort of patients with HCC identified from the national French Healthcare Database, notable differences were
observed between women and men in terms of risk factors and severity of the underlying liver disease. Interestingly, women experienced higher 12-month survival.

**FRI-290**

Artificial intelligence assisted qFibrosis as a pathological “biomarker” to evaluate disease severity in patients with hepatocellular carcinoma

Chih-Yang Hsiao1, Yayun Ren2, Elaine Chng2, Kutbuuddin Akbary2, Dean Tai2, Kai-Wen Huang1. 1National Taiwan University Hospital, Surgery, Taiwan; 2HistoIndex Pte Ltd, Singapore

Email: cyhsiao1102@gmail.com

**Background and aims:** Hepatocellular carcinoma (HCC) is highly heterogeneous in both intra-tumoral and inter-patient features and its manifestations in its pathology. Tumor grade is a comprehensive index that is subjectively judged by a pathologist, which does not reflect the local regional differences of tumor cells and different disease characteristics relating with its pathological heterogeneity. Our hypothesis is that collagen features of pathology in HCC analyzed by artificial intelligence assisted qFibrosis could be used as a pathological “biomarker” to evaluate disease severity.

**Method:** Tumor specimen from 201 patients with HCC who underwent curative treatment were scanned by the second harmonic generation (SHG) microscopy (HistoIndex Pte Ltd., Singapore). Digital image analysis generated 33 collagen parameters. Patients were grouped into tumor grades ≤2 and tumor grades ≥3 groups. Collagen features of tumor specimen between the two groups were compared, and the features with most significant differences were selected. A combined index was built using the selected collagen features. The usefulness of the combine index to predict survival outcome and the correlation between the combine index and tumor grade were tested. Leave-one-out cross-validation method was utilized.

**Results:** Total of 5 collagen features has been selected by sequential selection methods to build a combine index model. In addition, the value of each collagen features is shown in the radar map (Figure A), so that the dynamics of the extracellular matrix can be visualized instead of just a single number, tumor grade. These collagen features are further illustrated (Figure B) to help researchers to visualize and investigate the histopathological relevance for further disease studies and treatment efficacy evaluations. With specific cut-off values, the combine index model was significant in distinguishing patients with tumor grades ≤2 and ≥3 (p < 0.05), as well as in distinguishing patients with long-term survival and early death (p < 0.05). Moreover, it can be seen in the radar map that the features that are relevant include intersections of collagen strings, ratio between distributed and aggregated collagens. This implies the physical characteristics of extracellular matrix (ECM) is correlated to long-term survival of the patients.

**Conclusion:** Pathological heterogeneity of HCC could be profiled by artificial intelligence assisted qFibrosis. Selected collagen features of HCC could be used as a pathological “biomarker” that has the potential to be a parameter to evaluate disease severity in patients with HCC. Quantitative measurements and the new visualization tools like radar map better reveals dynamic of ECM with other cell types, enhances disease studies and drug development programs in the future.

**FRI-291**

Cryptogenic non-cirrhotic HCC: clinical, prognostic and immunologic aspects of an emerging HCC etiology

Boris Beudeker1, Rael Guha1, Kalina Stoyanova1, Jan Ijzermans2, Robert De Man1, Dave Sprengers1, Andre Boonstra1. 1Erasmus MC, Gastroenterology and hepatology, Rotterdam, Netherlands; 2Erasmus MC, Surgery, Rotterdam, Netherlands

Email: p.a.boonstra@erasmusmc.nl

**Background and aims:** The incidence of hepatocellular carcinoma (HCC) in non-cirrhotic livers is increasing. In order to better understand this trend, we conducted a comprehensive study to investigate the characteristics of HCC in non-cirrhotic livers in detail.

**Method:** Data was analyzed of 2304 HCC cases diagnosed at a large referral center in the Netherlands between 2009 and 2020, and 1654 cases with a complete medical record were included for analysis. Patient characteristics, liver disease etiologies, post-diagnosis survival rates, genetic risk factors, and immune profiles were analyzed.

**Results:** Of the 1654 included HCC cases, 371 (22%) were non-cirrhotic. The incidence of non-cirrhotic HCC rose by 61% between 2009 and 2020, with 39% of cases diagnosed in the absence of underlying liver disease classified as cryptogenic non-cirrhotic HCC. Cryptogenic non-cirrhotic HCC cases were similar to non-cirrhotic NAFLD HCC cases in terms of patient characteristics, but had more advanced tumors, a higher prevalence of symptoms (such as significant weight loss) at the time of diagnosis, and shorter survival times. Overall survival of non-cirrhotic cryptogenic HCC was dismal.

Figure: (abstract: FRI-290): (A) Radar map showing 5 parameters: total orientation of strings (StrOrientation), total number o intersections (#Intersection), the ratio of distributed collagen area and aggregated collagen area (Dis/Agg), average perimeter for one string (AveStrPerimeter) and average number of intersections within each string; (B) graphical illustration of how collegen strings are defined and measured.
compared to viral and non-viral causes of HCC (figure 1). In a multivariable analysis, cryptogenic etiology was found to be an independent negative prognostic factor \((p = 0.037)\), along with intermediate and advanced tumor stage and older age. More advanced stages of cryptogenic HCC were associated with higher levels of circulating interleukin-6. Analysis of a balanced sub-cohort of non-cirrhotic cryptogenic and NAFLD HCC cases revealed comparable immune profiles and HCC risk gene phenotypes.

**Conclusion:** These findings suggest that cryptogenic non-cirrhotic HCC may represent a unique HCC etiology, with more aggressive traits such as advanced tumors and a pro-inflammatory immune protein signature in the blood. These observations made us postulate that cryptogenic non-cirrhotic HCC may be a group of patients with “burned-out” NAFLD. Further research is needed to identify risk factors and guide better clinical management.

**Background and aims:** Combination of abdominal ultrasound (US) and alpha-fetoprotein (AFP) is widely recommended as a surveillance tool for hepatocellular carcinoma (HCC). Lens culinaris-agglutinin-reactive fraction of AFP (AFP-L3) and protein induced by vitamin K absence or antagonist-II (PIVKA-II) are potential biomarkers for small HCC detection. This study was aimed to determine the add-on benefits of AFP-L3, PIVKA-II and GALAD score to routine use of US plus AFP for HCC surveillance.

**Method:** This prospective study enrolled patients with cirrhosis or high risk non-cirrhotic chronic hepatitis B (HBV). US and three biomarkers were measured and GALAD score was calculated. Triple phase computed tomography (CT) or dynamic magnetic resonance imaging (MRI) was performed in all patients who had new liver nodule larger than 1 cm or abnormal biomarkers (cutoff: 20 ng/ml for AFP, 10% for AFP-L3, and 40 mAU/ml for PIVKA-II). All patients were followed at 6-month for the missed lesions.

**Results:** Among 1003 enrolled patients, the mean age was 60 years, 56% were men, 72% had cirrhosis (95% were Child A). The major etiologies of chronic liver disease were HBV (79%), hepatitis C (12%), and alcohol (3%). HCC was diagnosed in 33 patients (3.3%) with the median size of 1.85 cm and all of lesions were within Milan criteria. Among three biomarkers, PIVKA-II showed the highest sensitivity (51.5%) followed by AFP-L3 (24.2%) and AFP (9.1%) for detecting small HCC. The sensitivity and specificity of US plus AFP were 54.5% and 97.5% respectively, whereas the combination of triple markers with US increased the sensitivity to 87.9% but decreased the specificity to 94.6%. The area under the curve (AUC) of US plus AFP and combination of triple markers with US were 0.961 and 0.944 respectively. GALAD score had lower sensitivity than triple markers (48.3% vs 57.6%), and the addition of GALAD score to US did not provide more sensitivity than combined triple markers with US (86.2% vs 87.9%).

**Conclusion:** Routine use of US plus AFP appears to be suboptimal for detecting small HCC. The addition of AFP-L3 and PIVKA-II to US plus AFP increase the sensitivity for HCC detection at an early stage. GALAD score does not provide superior sensitivity than using of triple markers.
FRI-293

Addition of des-gamma-carboxy prothrombin to standard of care is effective for HCC surveillance among high-risk patients
Grishma Hirode1,2,3, Hooman Farhang Zangneh1, Orlando Cerocchi1, Lima Awad El-Karim4, Korosh Khalili5, Harry LA Janssen1,5, Bettina Hansen1,6,7, Jordan J. Feld1,2,3,1.; Toronto Centre for Liver Disease, Toronto General Hospital, University Health Network, Toronto, Canada; 2The Toronto Viral Hepatitis Care Network (VIRCAN), Toronto, Canada; 3Institute of Medical Science, University of Toronto, Toronto, Canada; 4Joint Department of Medical Imaging, University Health Network, Toronto, Canada; 5Department of Gastroenterology and Hepatology, Erasmus University Medical Center, Rotterdam, Netherlands; 6Department of Epidemiology, Biostatistics, Erasmus University Medical Center, Rotterdam, Netherlands; 7Institute of Health Policy, Management and Evaluation, University of Toronto, Toronto, Canada
Email: grishma.hirode@gmail.com

Background and aims: Despite regular surveillance, several patients are diagnosed with hepatocellular carcinoma (HCC) at an advanced stage. An understanding of the effectiveness of current methods and the development of novel strategies are required to improve early-stage HCC diagnosis. We aim to analyze the utility of each specific biomarker from a study evaluating ultrasound (US) alone compared to US plus serum biomarkers (BM) for HCC surveillance.

Method: Prospective study of patients with cirrhosis or high-risk HBV infection (REACH-B score ≥9) randomized to HCC surveillance with US alone (Group A) or US and BM (Group B) measuring alpha-fetoprotein (AFP), des-gamma-carboxy prothrombin (DCP) and lectin-reactive fraction of AFP (AFP-L3). For all analyses using Group B data, any BM levels above the specified thresholds (AFP >100 ng/ml, DCP >2 ng/ml, AFP-L3 >10%) or a positive US result triggered further imaging for HCC confirmation. US or AFP is the current standard method of surveillance. We examined the incremental value of adding DCP, AFP-L3, or both to US and AFP by comparing sensitivity and specificity between groups; US and AFP was used as the reference group.

Results: Among 603 patients in Group A (mean age at baseline 58 ± 9.8 years, 72% male, 64% with cirrhosis at baseline), 35 patients were diagnosed with HCC (30 early-stage, 5 advanced) with a sensitivity of 80% and specificity of 35% for the detection of early-stage HCCs using US alone. Among 605 patients in Group B (mean age at baseline 58 ± 9.9 years, 72% male, 63% with cirrhosis at baseline), 27 patients were diagnosed with HCC (22 early-stage, 5 advanced). US or AFP had a sensitivity of 78% and specificity of 35% (Figure). The addition of DCP to AFP and US yielded higher sensitivity (81%, p = 0.32) but slightly lower specificity of (34%, p = 0.01) whereas the addition of AFP-L3 to AFP and US did not change the sensitivity (78%) and resulted in lower specificity (32%, p < 0.001). The overall sensitivity and specificity for Group B using US or BM were 81% (p = 0.32) and 31% (p < 0.001), respectively; that is with the addition of both DCP and AFP-L3 to US or AFP. There was no significant difference in sensitivity or specificity between the two study arms. Among the individual biomarkers, AFP-L3 had both low sensitivity and specificity.

Conclusion: In this large study, US and DCP was the most sensitive while US and AFP was the most specific for an early diagnosis of HCC. The addition of DCP to the existing standard of care using US plus AFP would optimize sensitivity and specificity. Lower AFP thresholds may also be beneficial for enhanced HCC surveillance.

FRI-294

A radiogenomics study for hepatocellular carcinoma: distinct transcriptome patterns underlying different radiomics phenotypes in early recurrence
Weijia Liao1, Lijing Ren2, Dongbo Chen2, Tingfeng Xu3, Bigeng Zhao1, Zhipeng Zhou1, Yong He1, Junxiang Yu4, Minjun Liao6, Hongsong Chen2,1; Laboratory of Hepatobiliary and Pancreatic Surgery, Affiliated Hospital of Guilan Medical University, China; 2Peking University People’s Hospital, Peking University Hepatology Institute, Beijing Key Laboratory of Hepatitis C and Immunotherapy for Liver Disease, China; 3Department of Radiology, Affiliated Hospital of Guilan Medical University, China; 4Department of Radiology, the Second Affiliated Hospital of Guilan Medical University, China; 5Department of Anesthesiology, Affiliated Hospital of Guilan Medical University, China; 6Guangdong Provincial Key Laboratory of Gastroenterology, Department of Gastroenterology and Hepatology Unit, Nanfang Hospital, Southern Medical University, China
Email: liaoweijia288@163.com

Background and aims: The prognosis of early-recurrence (within 2 years) hepatocellular carcinoma (HCC) remains poor. We aim to explore the biological pathway underlying the radiomics phenotypes. Method: The datasets involved in this study were collected from Guilan Medical University and The Cancer Genome Atlas dataset, with contrast-enhanced CT images and corresponding transcription data. Low and high radiomics phenotypes based on the rad-score were determined to predict early recurrence. Radiomics features were annotated with biological pathways. The most relevant gene modules underlying the radiomics phenotypes were identified and radiomics hub genes were selected.

Results: Rad-score constructed by 6 radiomics features illustrated a predictive value for HCC early recurrence in both training (AUC: 0.915, 95% CI: 0.796–1.033) and external validation datasets (AUC: 0.794 95% CI: 0.731–0.858). Patients with high risk radiomics phenotype were prone to early recurrence. Early recurrence related radiomics features were associated with metabolism, proliferation and immune-related pathways. Further, the red module was considered as the most relevant radiomics gene module, in which the 6 hub genes (ACACA, ACILY, ATRNL1, FADS2, MPV17L, ZNF492) were determined, and the model fitted by the hub genes had the ability to predict early recurrence (AUC: 0.724, 95% CI: 0.509–0.930). There were significant correlations among radiomics features, hub genes, immune cell infiltration, metabolism and immune-related keys genes.

Figure: Flowchart of the study cohorts.

Figure: Flowchart of the study cohorts.
Figure 2: Construction and validation of the rad-score for the early recurrence of HCC.

Figure 3: Weighted Correlation Network analysis (WGCNA) of the radiomics gene modules.

Figure 4: Radiomics hub genes and their predictive value for early recurrence.

Conclusion: Rad-score derived from enhanced CT of HCC could effectively predict early recurrence. Metabolic, proliferative and immune-related pathways varied in low and high radiomics phenotypes, in which the hub genes might play an important role.
**Background and aims:** Sarcopenia is a common problem in patients with hepatocellular carcinoma (HCC) and may be diagnosed using clinical or imaging-based assessments. This study aimed to evaluate the prognostic and predictive value of transversal psoas muscle thickness (TPMT) measurement at baseline in patients with HCC undergoing immunotherapy.

**Method:** Patients with HCC treated with PD- (L)1-based therapies between 06/2016 and 10/2022 at the Vienna General Hospital (n = 80) and the Hôpital Beaujon Clichy (n = 96) were included. TPMT at the level of the third lumbar vertebrae was measured independently by two radiologists in the Vienna cohort to evaluate inter-reader reliability and by one radiologist in the Clichy cohort. Clinical outcomes were evaluated in the pooled cohort. TPMT <12 mm/m in men and <8 mm/m in women indicated sarcopenia.

**Results:** Overall, 176 patients (age: 66.3 ± 11.7 years; male: n = 143, 81%) were included, of which 131 (74%) had cirrhosis. Most patients had BCLC C HCC (n = 121, 69%). Inter-reader agreement for the diagnosis of sarcopenia based on TPMT was 90% and Cohen’s Kappa showed a strong agreement (κ = 0.80 (95% CI: 0.66–0.93)). Sarcopenia was present in 59 patients (34%) and predominantly observed in men (n = 56 (39%) vs. women: n = 3 (9%), p = 0.001). Sarcopenia was associated with shorter overall median OS, 8.0 (95% CI: 4.1–11.9) vs. 24.7 (95% CI: 19.1–30.4); p < 0.001, Figure A) and progression-free survival (median PFS, 5.0 (95% CI:0.8–9.2) vs. 9.7 (95% CI: 6.0–13.4), p = 0.003), and an independent predictor of overall (HR: 1.80 (95% CI:1.10–2.95)) and progression-free mortality (HR: 1.54 (95% CI:1.03–2.30)) in multivariable analyses. Radiological response was evaluable in 161 subjects (91.5%). Objective response rate per mRECIST in patients with and without sarcopenia was 20% and 39%, respectively (p = 0.011). Outcomes were worst in patients with sarcopenia and elevated serum C-reactive protein (Figure B).

**Conclusion:** Evaluation of sarcopenia using TPMT measurement is reliable and identifies HCC patients with a dismal prognosis and response to immunotherapy.

---

**FRI-295**

**Transversal psoas muscle thickness measurement is associated with response and survival in patients with hepatocellular carcinoma undergoing immunotherapy**

Bernhard Scheiner1,2,3, Katharina Lampichler4, Katharina Pomej1,3, Duccan Beer4, Lorenz Balcar1,3, Riccardo Sartoris5, Mohamed Bouattour6, Sabrina Sidali6, Michael Trauner1, Martina Scharitzer4, Dietmar Tamandl4, David J. Pinato2,7, Maxime Ronot5,8, Matthias Pinter1,3, Bernhard Scheiner1,2,3, Katharina Lampichler4, Katharina Pomej1,3, Duccan Beer4, Lorenz Balcar1,3, Riccardo Sartoris5, Mohamed Bouattour6, Sabrina Sidali6, Michael Trauner1, Martina Scharitzer4, Dietmar Tamandl4, David J. Pinato2,7, Maxime Ronot5,8, Matthias Pinter1,3.

1Medical University of Vienna, Division of Gastroenterology and Hepatology, Department of Internal Medicine III, Austria; 2Medical University of Vienna, Liver Cancer (HCC) Study Group Vienna, Division of Gastroenterology and Hepatology, Department of Internal Medicine III, Austria; 3Medical University of Vienna, Department of Biomedical Imaging and Image-Guided Therapy, Austria; 4APHP Nord, Hôpital Beaujon, Department of Radiology, France; 5APHP Nord, Hôpital Beaujon, Department of Digestive Oncology, France; 6University of Piemonte Orientale, Department of Translational Medicine, Division of Oncology, Italy; 7University of Paris Cité, CRI INSERM U1149, France

---

**Conclusion:** Evaluation of sarcopenia using TPMT measurement is reliable and identifies HCC patients with a dismal prognosis and response to immunotherapy.
Results: The proportion of patients suffering from malignancies among chronic hepatitis C patients was lower than in the general population of Poland (any malignancy 1.5% vs 3.1%; HD 0.26% vs 0.49%; data: National Registry of Cancers). The distribution of genotypes was comparable in patients with and without malignancies, while HCV-viral load was significantly higher in hematopoieticologic patients (HD = 6.2 vs SMT = 5.7 vs HCC = 5.8 log10 IU/ml, P < 0.001). Likewise, the rate of extrahepatic symptoms was more frequent in HD patients (17.2% vs. SMT = 10.3%, HCC = 8.2%, without = 7.8%, p = 0.04). Patients with HCC had higher ALT activity (81 IU/l vs. SMT = 59.5 IU/l, HD = 52 IU/l, controls = 58 IU/l; p = 0.001) and more often F4 fibrosis (86.1% vs. SMT = 23.3%, HD = 28.8%, controls = 24.4%, p < 0.001). DAAs were well tolerated with the need for premature discontinuation in 9.4% of HCC patients, only 2.9% of HD and no SMT patients compared to 1.1% in the general population. Sustained virologic response rates were 89.55% in HD, 90.32% in SMT and 77.03% in HCC (ITT analysis), and in 93.6% HD, 90.16% SMT and 80.6% in HCC and absence of non-virologic failures.

Conclusion: A lower proportion of active malignancies among patients with chronic hepatitis C than the general population might suggest shortfalls in HCV screening or DAA uptake. Importantly, we claim the high effectiveness and safety profile of the DAAs therapy in solid tumor and hematopoietic malignancies subjects. Patients with HCC remain to be a challenging group not only considering the severity of their liver disease but also struggling to achieve SVR.

FRI-297
Abbreviated magnetic resonance imaging for secondary surveillance of recurrent hepatocellular carcinoma after curative treatment
Sun Kyung Jeon1, Dong Ho Lee1, Bo-Yun Hur1, Jiul Park2, Se Woo Kim1, Junghoa Park1. 1Seoul National University Hospital, Korea, Rep. of South; 2Severance hospital, Korea, Rep. of South
Email: dhlee.rad@snu.ac.kr

Background and aims: Given the high hepatocellular carcinoma (HCC) recurrence rate even after a long recurrence-free year following HCC treatment and the risk of developing de novo secondary HCC, long-term continued secondary surveillance (i.e., follow-up after HCC treatment) is needed. However, there is no consensus regarding the ideal imaging modality for the secondary surveillance of HCC. Recently proposed abbreviated magnetic resonance imaging (AMRI) protocols can be a promising imaging modality, however, little is known about the performance of AMRI for secondary surveillance of HCC. This study aimed to evaluate the detection performance of abbreviated MRI (AMRI) for secondary surveillance of HCC after curative treatment, including surgical resection or radiofrequency ablation (RFA).

Method: This retrospective study analysed 243 patients who underwent secondary surveillance for HCC using gadoteric acid-enhanced MRI after more than two years of disease-free period following curative treatment, including surgical resection or RFA, between January 2015 and December 2017 in tertiary academic center. Four abdominal radiologists with different experience level in liver imaging independently reviewed non-contrast AMRI (NC-AMRI) (T2-weighted, T1-weighted, and diffusion-weighted images), hepatobiliary phase AMRI (HBP-AMRI) (T2-weighted, diffusion-weighted, and HBP images), and full-sequence MRI sets. HCC was confirmed based on either histopathological confirmation or imaging-based diagnosis. Per-lesion sensitivity, per-patient sensitivity and specificity for HCC detection were compared among three image sets using generalized estimating equation.

Results: A total of 42 recurrent HCCs were confirmed in the 39 patients. The per-lesion and per-patient sensitivities did not show significant differences among the three image sets for all reviewers (p ≥ 0.338); per-lesion sensitivity, 59.5–83.3%, 59.5–85.7%, and 59.5–83.3% for NC-AMRI, HBP-AMRI, and full-sequence MRI, respectively, and per-patient sensitivity: 53.9–83.3%, 56.4–85.7%, and 53.9–83.3% for NC-AMRI, HBP-AMRI, and full-sequence MRI, respectively. Per-patient specificity was not significantly different among the three image sets for all reviewers (95.6–97.1%, 95.6–97.1%, and 97.6–98.5% for NC-AMRI, HBP-AMRI, and full-sequence MRI, respectively; p ≥ 0.117).

Conclusion: NC-AMRI and HBP-AMRI had comparable detection performance to that of full-sequence gadoteric acid-enhanced MRI during secondary surveillance for HCC after more than 2-year disease free interval following curative treatment. Based on its good detection performance, short scan time, and lack of contrast agent-associated risks, NC-AMRI can be a promising option for the secondary surveillance of HCC, and further prospective validation is needed.

FRI-298
A new biomarker panel for differential diagnosis of cholangiocarcinoma: results from an exploratory analysis
Bruno Köhler1, Marta Bes2, Henry LY Chan3, Juan Ignacio Esteban Mur4, Teerha Piratvisuth5, Wattana Sukeepsarnjaroen6, Tawesak Tanwanatee2, Anika Mang8, David Morgenstern9, Magdalena Swiatek-de Lange10, Farshid Dayyani10. 1University Hospital Heidelberg, Germany; 2Instituto de Salud Carlos III, Spain; 3The Chinese University of Hong Kong, Hong Kong; 4Hospital Universitari Vall d’Hebron, Spain; 5Songklanagarind Hospital, Thailand; 6Srinagarind Hospital, Thailand; 7Siriraj Hospital, Thailand; 8Roche Diagnostics GmbH, Germany; 9Roche Diagnostics Operations, United States; 10University of California in Irvine, United States
Email: magdalena.swiatek-de_lange@roche.com

Background and aims: Accurate diagnosis of cholangiocarcinoma (CCA) can be challenging due to unclear diagnostic imaging criteria and difficulty obtaining adequate tissue biopsy. Although serum cancer antigen 19-9 and carcinoembryonic antigen have been proposed as potential diagnostic aids, they have insufficient sensitivity and specificity. This exploratory analysis aimed to identify individual and combinations of serum tumour biomarkers that could distinguish CCA from hepatocellular carcinoma (HCC) and benign chronic liver disease (CLD) controls using samples obtained from a previously published study.

Method: This prospective, multicentre, case-control study included patients ≥ 18 years who were at high risk of HCC. Serum and ethylene diamine tetraacetic acid-plasma samples were collected prior to any treatment and a confirmed diagnosis of HCC or CCA. A panel of 14 electrochemiluminescence immunoassays or enzyme-linked immunosorbent assays were used; 14 biomarkers were subjected to
univariate analysis and 13 to multivariate analysis (per selected combinations and exhaustive search).

**Results:** Overall, 55 CCA (22 intrahepatic CCA; 11 perihilar CCA), 306 HCC and 733 CLD control samples were analysed. The biomarkers with the best individual performance were alpha-fetoprotein and matrix metalloproteinase-2 (MMP-2) (area under the curve [AUC] 86.6% and 84.4%, respectively) for distinguishing CCA from HCC, and tissue inhibitor of metalloproteinase-1 (TIMP-1) for distinguishing CCA from CLD (AUC 94.5%) and HCC + CLD (AUC 88.6%). MMP-2 and TIMP-1 combination was the best performing two-marker panel (Table), with AUC > 90% for all comparisons. Carbohydrate antigen 19-9 (CA 19-9) and carcinoembryonic antigen (CEA) performed relatively poorly as individual biomarkers (Table).

**Table:** Performance of individual biomarkers and of the TIMP-1 and MMP-2 two-biomarker panel for distinguishing CCA from HCC and/or benign CLD controls.

<table>
<thead>
<tr>
<th>Individual biomarkers (univariate analysis)</th>
<th>CCA vs HCC</th>
<th>CCA vs benign CLD</th>
<th>CCA vs HCC + benign CLD</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFP</td>
<td>86.6 (81.4–91.8)</td>
<td>53.2 (44.1–62.2)</td>
<td>63.0 (55.4–70.6)</td>
</tr>
<tr>
<td>CA19-9</td>
<td>67.5 (58.2–76.8)</td>
<td>78.4 (70.6–86.2)</td>
<td>75.2 (67.1–83.2)</td>
</tr>
<tr>
<td>CEA</td>
<td>60.5 (50.7–70.3)</td>
<td>48.3 (38.9–57.7)</td>
<td>51.9 (42.5–61.3)</td>
</tr>
<tr>
<td>MMP-2</td>
<td>84.4 (78.9–89.9)</td>
<td>72.4 (64.6–80.2)</td>
<td>75.9 (68.8–82.9)</td>
</tr>
<tr>
<td>TIMP-1</td>
<td>74.5 (68.2–80.8)</td>
<td>94.5 (92.1–96.9)</td>
<td>88.6 (85.3–91.9)</td>
</tr>
<tr>
<td>Two-biomarker panel (multivariate analysis)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIMP-1 and MMP-2</td>
<td>91.8 (88.3–95.3)</td>
<td>97.9 (96.6–99.2)</td>
<td>95.6 (93.7–97.6)</td>
</tr>
</tbody>
</table>

All results shown as AUC, % (95% CI).

**Conclusion:** MMP-2 and TIMP-1 are promising non-invasive biomarkers that could rapidly provide additional diagnostic information to help differentiate CCA from HCC and CLD.

**FRI-299**

**CRAFITY score is associated with overall survival in patients with hepatocellular carcinoma treated with transarterial chemoembolisation**

Rhea Veelken1, Anne Olbrich1, Aaron Schindler1, Sabine Lieb1, Janett Fischer1, Sebastian Ebel2, Timm Denecke2, Thomas Berg1, Florian van Bömmel1, University Hospital of Leipzig, Division of Hepatology, Department of Medicine II, Germany; 2University Hospital of Leipzig, Department of Diagnostic and Interventional Radiology, Germany; Email: rhea.veelken@medizin.uni-leipzig.de

**Background and aims:** The CRAFITY score is based on alpha fetoprotein (AFP ≥ 100 ng/ml) and C-reactive protein (CRP ≥ 1 mg/dl), and it stratifies patients by the likelihood of increased overall survival (OS) and treatment response to subsequent immunotherapy containing systemic treatment for hepatocellular carcinomas (HCC). We aimed to investigate the association of the CRAFITY score with survival and treatment response to transarterial chemoembolisation (TACE).

**Method:** A total cohort of 546 patients with HCC was treated with TACE as first-line therapy at our center between 2010 and 2020. Patients were retrospectively enrolled in our study if follow-up was documented over at least 3 months, and if CRP and AFP were available from baseline. We investigated the association of baseline variables on overall survival using Kaplan-Meier estimation and a Cox regression model.

**Results:** A total of 113 patients was included in the analysis (15 (13%) female). All patients suffered from HCC (BCLC stages A (n = 64), B (n = 37), C (n = 10) and D (n = 2)) with a median age of 63 years (range 31–85 years). Eighty-eight (78%) patients had compensated liver cirrhosis, 25 (22%) patients showed no clear signs of liver cirrhosis on imaging. Patients with a CRAFITY score 0 (n = 67) had the longest median OS of 46.82 (range, 0–140) months followed by patients with 1 point (n = 38), who had a median OS of 24.71 (range, 0–121) months and patients with 2 points (n = 8), who had a median OS of 19.38 (range, 0–67) months (p < 0.001) (Figure). In Cox regression analyses, the CRAFITY score 1 was associated with significantly increased risk of mortality with a hazard ratio (HR) of 2.4 (95% CI 1.23–4.55, p = 0.01) Moreover, patients with a CRAFITY score of 2 had a 6 times higher risk of mortality (HR = 5.9 [95% CI 2.44–14.14] p < 0.001) compared to patients with a score of 0. Interestingly, 62% of the responders at week 12 had a CRAFITY score of 0 and 33% of the responders at week 12 had a CRAFITY score of 1.

**Conclusion:** The CRAFITY score is a potential tool for the identification of patients who benefit from TACE. The potential of the CRAFITY score for the personalisation of multimodal treatment of HCCs needs to be assessed in future studies.

**FRI-300**

**Development, clinical validation and implementation of a novel algorithmic score (GAAD) for the detection of early-stage hepatocellular carcinoma**

Teerha Piratvisuth1, Jinlin Hou2, Tawesak Tanwandee3, Thomas Berg4, Arndt Vogel5, Jörg Trojan6, Enrico de Toni7, Masatoshi Kudo8, Anja Eibmaier9, Hanns-Georg Klein10, Johannes Kolja Hegel11, Kairat Madin12, Konstantin Kroeniger12, Ashish Sharma13, Henry Ly Chan14, 1Prince of Songkla University, Thailand; 2Southern Medical University, China; 3Mahidol University, Thailand; 4Universitätsklinikum Libzig, Germany; 5Medizinische Hochschule Hannover, Germany; 6Goethe Universität Frankfurt, Germany; 7Ludwig Maximilian University of Munich, Germany; 8Kindai University, Japan; 9Microcoat Biotechnologie GmbH, Germany; 10Zentrum für Humangenetik und Laboratoriumsdiagnostik, Germany; 11Labor Berlin Charité Vivantes Services GmbH, Germany; 12Roche Diagnostics GmbH, Germany; 13Roche Diagnostics International AG, Switzerland; 14The Chinese University of Hong Kong, Hong Kong; Email: teerha.p@psu.ac.th

**Background and aims:** Protein induced by vitamin K absence-II (PIVKA-II) and alpha-fetoprotein (AFP) are serum biomarkers that can support the diagnosis of hepatocellular carcinoma (HCC). The GAAD algorithm is a novel in vitro diagnostic combining quantitative measurements of Elecsys® PIVKA-II assay and Elecsys AFP assay, plus age and gender to generate a semi-quantitative result. This study aimed to establish and train the algorithm coefficients, and clinically validate clinical performance of the GAAD algorithm in differentiating HCC and benign chronic liver disease (CLD), across different regions and aetiologies.

**Method:** Participants aged ≥ 18 years were prospectively enrolled across China, Hong Kong Special Administrative Region, Spain, Germany, Japan and Thailand for Algorithm development and clinical validation studies. The HCC group had a first-time diagnosis of HCC confirmed by imaging or biopsy. The CLD control group had an
absence of HCC confirmed by imaging ≤12 months before, and diagnosis of cirrhosis or non-cirrhotic liver disease (viral or non-viral). Serum samples were analysed using the Elecsys PIVKA-II and AFP assays on a cobas e 601 analyser. The established cut-off for the detection of HCC was a GAAD score of 2.57 (range 0–10). Cut-off for detection of HCC in the Elecsys AFP assay was 20 ng/ml.

**Results:** In the HCC group (n = 366) and CLD control group (n = 303), 176 (48.1%)/136 (44.9%) were from China, 142 (38.8%)/124 (40.9%) from Europe and 48 (13.1%)/43 (14.2%) from Asia-Pacific, respectively. In the HCC group, 287 (78.4%) had cirrhosis, of which 222 (60.7%) had viral liver disease aetiology, and 174 (47.6%) had early-stage HCC (Barcelona Clinic Liver Cancer [BCLC] 0 and A). In the control group, 112 (37%) had cirrhosis including 76 (25.1%) with viral disease. GAAD performed well for differentiating both early- and all-stage HCC from benign disease controls across disease aetiologies and regions (Figure). Sensitivity for detecting early- and all-stage HCC, respectively, was 67.4% and 81.9% in cirrhotic CLD (specificity, 86.6%) and 79.5% and 87.3% in non-cirrhotic CLD (specificity, 97.9%); all sensitivity rates were higher than for AFP alone. Sensitivity was similar across China (67.3% for early-stage HCC/77.3% for all-stage HCC), Europe (76.9%/90.8%) and Asia-Pacific (72%/81.3%), with >85% specificity for CLD controls for all regions; all sensitivity rates were higher than for AFP alone. Two independent workflow options: (a) website solution with user login and manual data entry and (2) an automated integrated solution via the NA VIFY® Algorithm suite were implemented for the GAAD algorithm.

**Conclusion:** The GAAD algorithm, combining PIVKA II and AFP, plus age and gender, demonstrated good clinical performance in differentiating HCC and benign CLD, across all regions and aetiologies.

---

**FRI-301**

Gadoxetic acid-enhanced MRI-based risk scoring system development and validation for the recurrence-free survival of a single hepatocellular carcinoma after curative surgery

Bohyun Kim1, So Hyun Park2, Joon-II Choi3, Seoul St. Mary’s Hospital, College of Medicine, The Catholic University of Korea, Korea, Rep. of South; 2Gil Medical Center, Gachon University College of Medicine, Korea, Rep. of South

**Background and aims:** To develop and validate risk scoring systems using gadoxetic acid-enhanced liver MRI features and clinical factors that predict recurrence-free survival (RFS) of a single hepatocellular carcinoma (HCC).

**Method:** Consecutive 295 patients with treatment-naïve single HCC who underwent curative surgery and preoperative gadoxetic acid-enhanced MRI were retrospectively enrolled from two centers. Cox proportional hazard models developed risk scoring systems whose discriminatory powers were validated using external data and compared to the Barcelona Clinic Liver Cancer (BCLC) or American Joint Committee on Cancer (AJCC) staging systems using Harrell’s C-index.

**Results:** Independent variables—tumor size (per cm; hazard ratio [HR], 1.07; 95% confidence interval [CI]: 1.02–1.13; p = 0.005), targetoid appearance (HR, 1.74; 95% CI: 1.07–2.83; p = 0.025), radiologic tumor in vein or tumor vascular invasion (HR, 2.59; 95% CI: 1.69–3.57; p < 0.001), the presence of a nonhypervascular hypointense nodule on the hepatobiliary phase (HR, 4.65; 95% CI: 3.03–7.14; p < 0.001), and pathologic macrovascular invasion (HR, 2.60; 95% CI: 1.51–4.48; p = 0.001)—with tumor markers (AFP ≥206 ng/ml or PIVKA-II ≥419 mAU/ml) derived pre- and postoperative risk scoring systems. The risk scores showed comparably good discriminatory powers in the validation set (C-index, 0.75–0.82) and outperformed the BCLC (C-index, 0.61) and AJCC staging systems (C-index, 0.58; p < 0.05). The preoperative scoring system stratified the patients into low-, intermediate-, and high-risk for recurrence, whose 2-year recurrence rate was 3.3%, 31.8%, and 85.7%, respectively.

**Conclusion:** The developed and validated pre- and postoperative risk scoring systems can estimate RFS after surgery for a single HCC.

---

**Figure:** The GAAD algorithm, combining PIVKA II and AFP, plus age and gender, demonstrated good clinical performance in differentiating HCC and benign CLD, across all regions and aetiologies.

**Figure:** Clinical performance of GAAD for detection of (A) early-stage HCC vs benign disease control according to disease aetiology; (B) all-stage HCC vs benign disease control according to disease aetiology; (C) early-stage HCC vs benign disease control according to region; (D) all-stage HCC vs benign disease control according to region.

**Preoperative risk scoring system in validation cohort**

**Figure:** The GAAD algorithm, combining PIVKA II and AFP, plus age and gender, demonstrated good clinical performance in differentiating HCC and benign CLD, across all regions and aetiologies.
FRI-302
The apparent diffusion coefficient values predict prognosis and Ki67 expression in intrahepatic cholangiocarcinoma on diffusion-weighted magnetic resonance imaging
Daiki Hokkoku1, Kazuki Sasaki1, Shogo Kobayashi1, Yoshifumi Iwagami1, Daisaku Yamada1, Yoshito Tomimaru1, Takehiro Noda1, Hidenori Takahashi1, Yuichiro Doki1, Hitotoshi Eguchi1, 2Osaka University, Graduate School of Medicine, Department of Gastroenterological Surgery, Suita, Japan
Email: hokkokudaiki@gmail.com

Background and aims: Intrahepatic cholangiocarcinoma (ICC) is a primary liver cancer with high aggressiveness and an extremely poor prognosis. A poor prognosis with a 5-year survival rate of about 40% has been reported for ICC. However, definitive evidence regarding the lymph node metastasis and poor prognosis is lacking. Poor prognosis with a 5-year survival rate is about 40% after radical resection. Previous reports have indicated that lymph node metastasis and multiple tumors are poor prognostic factors in ICC. The aim of this study is to investigate the correlation of ADCmin and Ki67 expression in ICC.

Methods: A total of 39 ICC cases confirmed by surgical pathology were analyzed retrospectively. Subjects underwent MRI at 1.5 or 3.0 T and calculated their minimum ADCmin using DWI MRI (b:0, 50, 200, 1000, 1500 seconds/mm²). The cut-off value for ADCmin was determined according to receiver operating characteristic curve. Ki67 expression was evaluated using the receiver operating characteristic curve. We compared clinicopathological factors between two groups. Immunohistochemical analysis of Ki67 expression in ICC tumor tissues was performed, and its expression was determined as low (less than 10% immunopositive cells) or high (more than 10% immunopositive cells). We evaluated the relationship between ADCmin and Ki67 expression.

Results: The overall survival rate of the ADCmin low group was significantly lower than that of the ADCmin high group (p = 0.0404). Univariate analysis revealed that CEA (≥5 ng/ml), CA19-9 (≥35 U/ml), microvascular invasion, lymph node metastasis, and low ADCmin were prognostic factors. Multivariate analysis identified low ADCmin as an independent prognostic factor (p = 0.0020). Furthermore, the ADCmin low group more frequently expressed high levels of Ki67 than the ADCmin high group (75.0% vs. 26.1%, p = 0.0038).

Conclusion: Low ADCmin was an independent prognostic factor of ICC and correlated with Ki67 expression.

FRI-303
The Kupffer phase of Sonazoid-enhanced ultrasound as the major imaging feature for diagnosing hepatocellular carcinoma in at-risk individuals
Hyo-Jin Kang1, Jeong Min Lee1, Jeong Hee Yoon1, Jeongin Yoo1, 1Seoul National University Hospital, Radiology, Seoul, Korea, Rep. of South Korea
Email: jmsh@snu.ac.kr

Background and aims: Sonazoid has different physiologic characteristics from blood-pool ultrasound contrast agents, but there has been no consensus about the diagnostic criteria of HCC. We aimed to investigate whether the Kupffer phase (KP) can be used as a major feature without lowering specificity for diagnosing HCC in high-risk individuals.

Methods: Participants at risk of HCC with treatment-naïve solid hepatic lesions (≥1 cm) who underwent PFB-US from March 2019 to June 2022 were prospectively recruited. Three radiologists reviewed the enhancement pattern in the arterial phase, washout time and degree, and echogenicity in the KP. All malignancies were pathologically confirmed. The pooled per-lesion diagnostic performance for diagnosing HCC using five different diagnostic criteria were compared by McNemar test. Criteria 1) any arterial phase hyperenhancement (APHE) with hypoechogenicity in KP, Criteria 2) nonrim APHE with hypoechochogenicity in KP, Criteria 3) following criteria 2, but exclude early (<60 s postcontrast) and marked washout, Criteria 4) nonrim APHE with mild and late (≥60 s postcontrast) washout within 5 min, Criteria 5) nonrim APHE with mild and late washout within 5 min or hypoechogenicity in KP. Criteria 4 was identical to the diagnostic criteria of blood-pool agent-enhanced ultrasound.

Results: In total, 204 individuals with 213 lesions (mean size 32.5 ± 3.2 mm; HCC [n = 122], non-HCC malignancies [n = 21], and benign [n = 46]) were evaluated. For HCC diagnosis, the specificity of criteria 1 and 2 were significantly larger (42.9% and 72.2%) than criteria 3 (91.9%, p < .001) and 4 (p < .001). The sensitivity (63.7%) of criteria 5 was significantly higher than criteria 3 (61.5%) and 4 (63.4%), and specificity (94.1%) of criteria 4 was higher than criteria 3 (91.9%) and 5 (91.9%), but both fail to meet the statistical significance (p = .59 and .93).

Conclusion: Precluding early or marked washout and including nonrim APHE reinforced the specificity when KP was used as a major feature for diagnosing HCC. The KP imaging can be alternative to the 2–5 min postcontrast imaging without significant change in diagnostic performance.
**FRI-304**

It takes a team for HCC: improvement of outcome with the multidisciplinary ambulatory for systemic therapy

Andrea Dalbeni1, Alessandra Auriemma2, Marco Vicardi1, andrea ruzzenente3, Alfredo Guglielmi1, Michele Milella2, David Sacerdotti1, 1AOI Verona, University of Verona, Medice Department, Liver Unit, Italy; 2AOUI Verona, University of Verona, Oncology, Italy; 3AOUI Verona, University of Verona, Surgery Department, Italy

Email: andrea.dalbeni@aovr.veneto.it

**Background and aims:** Hepatocellular carcinoma (HCC) is the major cause of liver-related death worldwide. In the last years, a new approach with tyrosine kinase inhibitors (TKIs) and immune checkpoint inhibitors (ICIs) started to gain attention in HCC setting. With these new therapies multidisciplinary team (MDT) discussion becomes necessary due to increased curative treatments, frequency of stage migration, higher treatment rates and reduced mortality. In Verona Hospital, in addition to MDT discussion, a LIVER-MDT ambulatory was created, to our knowledge the first in the Italian health system, with an oncologist, an hepatologist, a surgeon, and an internist. Aim of this study was to verify if the LIVER-MDT ambulatory is useful to reduce adverse effects and mortality compared to a traditional ambulatory (ELEVETOR cohort, Liver cancer 2022).

**Method:** we collected data from patients attending the LIVER-MDT ambulatory. Major and minor adverse effects (MAE and mAE) and antituomoral doses were collected. Death and progression free survival (PFS) were also recorded.

**Results:** Among 834 patients evaluated at the MDT discussion from 2021, 40 patients were referred to the LIVER-MDT ambulatory to start systemic treatment. Median age was 69.5 (53–82), 82.5% were male. Cirrhosis etiology was 45% viral (HCV/HBV), 37.5% MAFLD and 10% alcohol. Compared to ELEVATOR cohort, less MAE were recorded (20% vs 32.7%, p < 0.01). In addition, MAE strictly due to the systemic therapy developed in 7.5%. No patients developed uncontrolled and resistant arterial hypertension or heart failure during the treatment. 32.5% died, with a median PFS of 8.85 ± 6.03 (median in ELEVATOR 6.4). Only 15% of patients needed a reduction of antituomoral drug dose, compared to 50% in ELEVATOR.

**Conclusion:** LIVER-MDT ambulatory improves the outcome of HCC patients on systemic therapy, reducing MAEs and mAEs, in particular cardiovascular complications, and seems the best approach for the increasing number of HCC patients.

**FRI-305**

Developing an aptamer biomarker model for the diagnosis of hepatocellular carcinoma

Mikkel Breinholt Kjær1, Sine Karlsen Ovesøre1, Søren Fjelstrup2, Daniel Miotto Dupont1, Jens Kelsen1, Jørgen Kjems2, Henning Grønbæk1, 1Aarhus University Hospital, Department of Hepatology and Gastroenterology, Denmark; 2Aarhus University, Interdisciplinary Nanoscience Centre (iNANO), Department of Molecular Biology and Genetics, Denmark

Email: mkj@clin.au.dk

**Background and aims:** Hepatocellular carcinoma (HCC) is the fourth leading cause of cancer-related death globally and most tumors are detected at late stages of disease. The current screening method for HCC in risk populations relies on abdominal ultrasound. While ultrasound exhibits acceptable sensitivity for detection of HCC at any stage, the sensitivity to detect early stages of disease is less so. Coupled with the fact that the chance of cure diminishes with later stages of disease warrants novel methods for detection of HCC, herein biomarkers of early-stage HCC.

Thus, the aim of this study is to explore the clinical potential of aptamer technology to distinguish patients with HCC regarding early and late-stage disease.

**Method:** In this study we utilize APTA-SHAPE, an unbiased biomarker discovery platform based on aptamer technology. Aptamers are short chemically stabilized RNA strands often termed “chemical antibodies.” The aptamers form defined 3D shapes capable of specific recognition of a biological target. Through consecutive trainings with plasma from patients with HCC we build a library specifically able to detect thousands of plasma molecules in HCC. In subsequent analysis, aptamers associated with disease stage in HCC are identified and the protein targets of these aptamers are identified by mass spectrometry.

Data for this study was generated by aptamer analysis performed on plasma samples from a cohort of 104 HCC patients and 24 healthy controls collected at the Department of Hepatology and Gastroenterology, Aarhus University Hospital from 2016 to 2018. The material was divided to generate a training set and a validation set for the constructed models. Disease severity groups were defined by TNM staging or Barcelona Clinic Liver Cancer (BCLC) score.

**Results:** An aptamer-based model for detection of HCC defined by TNM-staging was able to discriminate between healthy and early-stage disease (TNM stages 1A, 1B and 2) with an AUC in the validation set of 0.85 (95% CI: 0.73–0.97). Furthermore, the model was able to discriminate between healthy and late-stage disease (TNM stages 3A, 3B, 4A and 4B) with an AUC of 0.93 in the validation set (95% CI: 0.84–1.00). A second model based on BCLC scores were able to discriminate between healthy controls and patients with early (stages 0, A or B) or late-stage disease (stages 3 and 4) with AUCs of 0.8 (95% CI: 0.64–0.95) and 0.94 (95% CI: 0.87–1.00).

**Conclusion:** The APTA-SHAPE technology is a promising and unbiased tool to identify novel biomarkers for HCC. We developed a model capable of identifying HCC patients as well as grouping patients with regards to their disease stage and severity of disease. Future studies will aim to identify the protein plasma biomarkers discovered in this study.
Combined hepatocellular-cholangiocarcinoma: epidemiological, radiological and survival data from a retrospective single-center study

Guillaume Henin1, Ivan Borbath1, Bénédicte Delire1. Cliniques Universitaires Saint-Luc, Hepato-gastro-enterology, Belgium
Email: ghenin1993@gmail.com

Background and aims: Combined hepatocellular-cholangiocarcinoma (cHCC-CCA) is a rare primary liver malignancy with a poor prognosis and very few available data in terms of pathophysiology, risk factors, imaging features and no current consensus in terms of treatment recommendations. Therefore, our aims were to assess the risk factors, imaging-pathology correlation and survival of these patients in a real-life cohort.

Method: All patients with histologically-confirmed or with imaging-based suspicion of cHCC-CCA (classified Li-Rads M) treated between 2016 and 2021 were screened in a retrospective single-center study. Other histological subtypes of liver tumor in the absence of radiological suspicion of mixed tumor by magnetic resonance imaging (MRI) were excluded. MRI data of transplanted patients were not recorded considering the artifacts due to waiting treatments. All data were recorded based on medical records.

Results: Among 761 screened patients, 69 were included among which 38 patients (55.1%) had a cHCC-CCA lesion (cHCC-CCA group). A hepatocellular carcinoma was confirmed in 18 patients (HCC group: 26.1%) and a cholangiocarcinoma in 9 patients (CCA group: 13.0%). 4 patients had a benign tumor (5.8%). In terms of risk factors for the onset of cHCC-CCA, alcohol-related liver disease and pre-existing liver lesions were correlated to this risk (OR 4.67, p<0.024 and OR 4.16, p=0.043 respectively). In terms of imaging diagnostic accuracy in the HCC-CCA group (N = 26, liver transplant recipients excluded in this analysis), 17 patients had a positive MRI for HCC-CCA (65.4%) and 9 had a negative MRI (34.6%). In the non-HCC-CCA group (HCC, CCA, benign tumors and non-histologically investigated patients-N=735), 31 patients had a positive MRI (4.2%) and 704 had a negative MRI (95.8%) (Sensitivity = 0.65; Specificity = 0.96; positive predictive value = 0.35; negative predictive value = 0.99-PPV = 0.35; NPV = 0.99-p<0.0001) confirming the necessity to perform a tumor biopsy in case of diagnostic uncertainty. Further well-conducted prospective studies are required to establish systemic treatment guidelines, systemic treatment regimens being currently chosen based on expert opinion.

Conclusion: We highlighted alcohol-related liver disease and pre-existing liver tumor prior to histological diagnosis as risk factors for the onset of cHCC-CCA (OR 4.67, p=0.024 and OR 4.16, p=0.043). We also highlighted an excellent NPV of liver MRI for the diagnosis of cHCC-CCA but a poor PPV (PPV = 0.35; NPV = 0.99-p<0.0001) confirming the necessity to perform a tumor biopsy in case of diagnostic uncertainty. Further well-conducted prospective studies are required to establish systemic treatment guidelines, systemic treatment regimens being currently chosen based on expert opinion.

Predictors of extrahepatic recurrence after transarterial chemoembolization as first-line therapy for hepatocellular carcinoma

Elisa Pinto1, Filippo Pelizzaro1, Alessandro Vitale1, Edoardo Giannini2, Franco Trevisani1, Fabio Farinati1. 1University of Padua, Italy; 2University of Genova, Italy; 3University of Bologna, Italy
Email: pintoleisa93@gmail.com

Background and aims: The literature regarding the risk of progression to extrahepatic disease and clinical factors associated with the development of metastases in patients with hepatocellular carcinoma (HCC) treated with transarterial chemoembolization (TACE) is sparse. We aimed to assess the incidence of extrahepatic recurrence and to identify clinically relevant risk factors for the development of metastases in patients with HCC treated with TACE as first-line treatment.

Method: From the Italian Liver Cancer (ITALCCA) database, data of 981 HCC patients undergoing TACE as first-line treatment were retrieved and retrospectively analyzed. Incidence of extrahepatic recurrence was compared between two groups according to the diameter of the largest liver lesion at the time of TACE (HCC ≤3 cm vs. HCC >3 cm). Multivariate Cox regression was used to identify predictor of extrahepatic recurrence.

Results: During a median follow-up of 27.0 months (IQR, 13.2–49.0) the overall recurrence rate was 75.4%. Only 78/981 patients (8.0%) had an extrahepatic tumor localization at first recurrence (5.4% in the ≤3 cm group and 10.7% in the >3 group; p=0.002), while the overall extrahepatic recurrence rate was 26.0% (21.2% and 31.0% patients in the ≤3 cm and >3 cm groups, respectively; p=0.0006) (Figure 1). Compared to those with larger tumors, patients with HCC ≤3 cm had a significantly longer recurrence-free survival (12.0 [95% CI 10.7–13.3] vs. 9.7 [95% CI 8.2–11.2] months; p=0.02) and overall survival (52.5 [95% CI 45.5–59.4] vs. 34.7 [95% CI 30.7–38.7] months; p<0.0001). HCC size ≥3 cm, multifocality and AFP levels were independent predictors of extrahepatic recurrence.
Figure 1: Cumulative hazard of extrahepatic recurrence among patients with HCC ≤3 cm and >3 cm treated with first-line TACE.

Conclusion: Although the majority of patients treated with TACE do not develop metastases during their lifespan, knowledge of risk factors for extrahepatic recurrence (HCC size, multifocality, AFP levels) may help to assess patient prognosis and to identify patients deserving closer follow-up in order to start early systemic therapy.

FRI-309
Associations of pathologic features with integrated genomic and clinical characteristics of cholangiocarcinoma
Keun Soo Ahn1, Koo Jeong Kang2, Tae-Seok Kim2, Yong Hoon Kim2.
1Keimyung University Dongsan Hospital, Surgery, Korea, Rep. of South; 2Keimyung University Dongsan Hospital, Korea, Rep. of South

Background and aims: Pathologically, cholangiocarcinoma (CCA) can be divided as two pathological subtype; large duct type and small duct type. It represents different origin and carcinogenesis of CCA. However, its clinical impact and molecular characteristics are not well known yet, and we evaluated clinical and molecular features according to pathological subtype.

Method: On 3 different cohort (Korea; Keimyung University Dongsan Hospital, USA; Mayo clinic, TCGA), 107 cases of CCA were included which had available clinical and molecular data (RNA sequencing through mutation). For Korea and USA data, we performed next generation RNA sequencing and RNA expression, variants and fusions were analyzed. For TCGA data, we downloaded clinical and genetic information from TCGA serve. We analyzed clinical and molecular features for them.

Results: On large duct type, frequency of extrahepatic CCA (Klatskin and distal bile duct ca), periductal infiltrating type, history of cholangitis or IH stone, and N1 stage were significantly high compared to small duct type. In addition, level of serum CEA and CA 19-9 were significantly high in large duct type. In small duct type, frequency of mass forming type was similar. Patients with large duct type showed significant poor disease-free and overall survival than those with small duct type. On multivariate analysis, large duct type, lymph node metastasis and vascular invasion were independent poor prognostic factors. On mutation analysis, KRAS, PIK3CA gene mutation was common in large duct type, whether IDH1/2 mutation and FGFR2 fusion were common in small duct type. On pathway analysis, inflammation related, AKT, Wnt and KRAS related signalling were enriched in large duct type, while metabolism and EMT related pathways were enriched in small duct type.

Conclusion: Two pathological subtypes of intrahepatic CCA with distinct clinical, biological and prognostic differences were identified. Therefore, molecular characteristic of CCA can be predicted based on pathological subtype, and it may lead to more rational targeted approaches to treatment.

FRI-310
Classification of microvascular invasion of hepatocellular carcinoma: correlation with prognosis and MR imaging
Dong Ho Lee1, Haeryoung Kim2, Yoon Jung Hwang3, Jae Seok Bae3.
1Seoul National University Hospital, Radiology, Korea, Rep. of South; 2Seoul National University College of Medicine, Korea, Rep. of South; 3Seoul National University Hospital, Korea, Rep. of South

Background and aims: This study aimed to evaluate the prognostic value of classification of microvascular invasion (MVI) in hepatocellular carcinoma (HCC) and to analyze the radiologic features predictive of MVI.

Method: Total 506 consecutive patients with surgically resected solitary HCCs were enrolled for this study. We retrospectively reviewed the histological and MR imaging features of MVI. Univariable and multivariable logistic regression analyses were performed to identify factor associated with the degree of MVI. Kaplan-Meier curves were calculated to assess prognostic impact of MR imaging features on overall survival (OS) and beyond Milan recurrence-free survival (RFS).

Results: We identified MVI-positive HCCs with invasion of ≥5 vessels or those with ≥50 invaded tumor cells were significantly associated with decreased OS (p < 0.001 and 0.001, respectively). Based on these findings, the number of invaded vessels and the number of invaded tumor cells were decided to be reliable risk factors, and we classified HCCs into three group; severe MVI (presence of all two risk factors; n = 110), mild MVI (presence of one or none of the risk factors; n = 85), and no MVI (n = 311). OS and beyond Milan RFS in severe MVI group were significantly poorer than that in mild or no MVI group (p < 0.001). On multivariate analysis, severity MVI was a significant independent predictive factor for OS and beyond Milan RFS. For MRI findings, non-smooth tumor margin (OR, 2.224; p = 0.023) and satellite nodule (OR, 3.264; p < 0.001) were independently associated with severe-MVI group in multivariate analysis. Both non-smooth tumor margin and satellite nodule were associated with worse 5-year OS rate and beyond-Milan RFS rate (Ps ≤0.039).

Figure: Overall survival of hepatocellular carcinoma patients, stratified by MVI classification.

Figure: MR imaging feature for severe MVI.
Figure 1: A representative example of gadosecton acid-enhanced MRI obtained from a 47-year-old woman with hepatocellular carcinoma with severe-MVI. On the axial image of hepaticobiliary phase, there is a tumor with a non-smooth margin (arrows) in segment 7 of the liver. On coronal image, there is a satellite nodule (arrowhead) at the superior aspect of the tumor. After surgical resection, severe MVI was identified by pathological examination. Twenty-five months after surgical resection, this patient experienced recurrence with inferior vena cava invasion, and died 42 months after resection.

Conclusion: Our study revealed the histologic risk classification of MVI according to the number of invaded microvessels and invading carcinoma cells is valuable for predicting prognosis in HCC patients. Non-smooth tumor margin and satellite nodules were significantly associated with both severe MVI and poor prognosis.

FRI-311
Liver function is a predictor of survival in patients with hepatocellular carcinoma in best supportive care
Claudia Campani1, Laura Bucci2, Martina Rosi3, Valentina Adotti1, Tancredi Li Cavoli1, Umberto Arena1, Franco Trevisani1, Fabio Marra1 and Ita.Li.Ca Study Group2.

1University of Bologna, Italy; 2University of Florence, Italy; 2University of Lecce, Italy; 3University of Bologna, Italy
Email: fabio.marra@unifb.it

Background and aims: The prognosis of patients with hepatocellular carcinoma (HCC) is very variable, and the relative contribution of tumor burden and liver dysfunction to survival is uncertain. Median overall survival (OS) of patients managed with best supportive care is around 3–6 months, although longer values may be observed in clinical practice. Aim of this study was to identify the factors linked to tumor or liver dysfunction associated with survival in patients with HCC treated with BSC.

Method: We retrospectively evaluated the clinical characteristics of 1414 patients who had an indication for BSC recorded in the Ita.Li.Ca. database between 2000 and 2020. We analyzed both patient and tumor characteristics to identify predictors of OS.

Results: Median age was 69y and 76% of patients were male. Etiology included chronic viral infection (68.3%), alcohol use disorder (30.9%) and non-alcoholic steatohepatitis (8.3%). 67.4% of patients had a performance status 0–1 and 41.4% were in Child-Pugh B class. Median MELD was 13. 60% of patients had a multifocal HCC with a median number of 3 lesions and a median size of 33 mm. 533 patients had vascular invasion. Median alpha-fetoprotein was 49.25 ng/ml. 111 patients were classified as BCLC-A, 148 as BCLC-B, 791 as BCLC-C and 141 as BCLC-D. Survival progressively declined according to severity of liver function using three different scores (CPS, ALBI, pALBI, p < 0.001). Comparing patients surviving more or less than 12 months (398 vs. 1016), age, size of lesions, albumin, bilirubin, alpha-fetoprotein, and MELD were significantly different. At Cox univariate analysis presence of cirrhosis (HR: 1.201 CI 95%CI 0.998–1.445 p = 0.052), number of lesion (HR: 1.02 CI 95%CI 1.01–1.04 p = 0.013), median size (HR: 1.02 CI 95%CI 1.01–1.03 p = 0.001), vascular invasion (HR: 1.80 CI 95%CI 1.59–2.02 p < 0.001), metastasis (HR: 1.48 CI 95% CI 1.28–1.72 p < 0.001), ALBI grade (ALBI 2 HR: 1.25 CI 95%CI 1.04–1.50 p = 0.015 ALBI 3 HR :1.75 CI 95% 1.43–2.14 p < 0.001), pALBI grade (pALBI 2 HR: 0.99 CI 95%CI 0.8241.202p = 0.960 pALBI 3 HR :1.49 CI 95% 1.25–1.78 p < 0.001), MELD (HR: 1.04 CI 95%CI 1.04–1.05 p < 0.001) and CPS (HR: 1.13 CI 95%CI 1.10–1.165 p < 0.001) were significantly associated with OS. Using different models to avoid collinearity ALBI, pALBI, and CPS maintained an independent prognostic role on OS (ALBI HR 1.58 CI 1.26–1.98 p < 0.001, pALBI 1.22 CI 1.01–1.49 p = 0.43, CPS 1.12 CI 1.85–1.166 < 0.001).

Conclusion: In a large series of patients with HCC in BSC, parameters of liver function are strongly associated with survival.

FRI-312
Similar recurrence after curative treatment of HBV-related HCC regardless of HBV replication activity
Mi Na Kim1, Beom Kyung Kim2, Heejin Cho3, Myungji Goh4, Su Jong Yu3, Dong Hyun Sinn4, Soo Young Park5, Seung Up Kim2.

1Yonsei University College of Medicine, Department of Internal Medicine, Seoul, Korea, Rep. of South; 2Yonsei University College of Medicine, Korea, Rep. of South; 3Seoul National University College of Medicine, Korea, Rep. of South; 4Sungkyunkwan University School of Medicine, Korea, Rep. of South; 5Kyungpook National University Hospital, Korea, Rep. of South
Email: ksukorea@yuhs.ac

Background and aims: Antiviral therapy (A VT) is required for patients with newly diagnosed hepatitis B virus (HBV)-related hepatocellular carcinoma (HCC), if HBV DNA is detectable. We compared the risk of recurrence according to HBV replication activity at curative treatment of HBV-related HCC.

Method: Patients with HBV-related HCC who received surgical resection or radiofrequency ablation between 2013 and 2018 were enrolled in this retrospective cohort study. Patients were categorized into two groups according to HBV replication activity at curative treatment of HBV-related HCC (group 1: patients who met A VT indication for HBV-related HCC due to detectable HBV DNA, but did not met A VT indication for HBV if without HCC; group 2: patients who met A VT indication for HBV regardless of HCC).

Results: In the entire cohort (n = 911), HCC recurred in 303 (33.3%) patients during a median follow-up of 4.7 years. After multivariate adjustment for the key covariates, group 2 showed a statistically similar risk of HCC recurrence (adjusted hazard ratio [aHR] = 1.18, 95% confidence interval [CI] = 0.85–1.64; P = 0.332) compared to group 1. In addition, group 2 showed statistically similar risks of early (<2 years) (aHR = 1.31, 95% CI = 0.88–1.95), and late (≥2 years) (aHR = 0.83, 95% CI = 0.45–1.55) recurrence compared to group 1. Propensity score matching and inverse probability of treatment weighting analysis also yielded similar risks of HCC recurrence between the two groups (all P > 0.05, log-rank tests).

Figure: Definitions of groups according to HBV replication activity
FRI-313
Loss of mucosal tolerance to glycoprotein 2 isoform 1 is a novel diagnostic biomarker for cholangiocarcinoma without underlying PSC
Chang-sheng Xia1, Marcin Krawczyk2,3, Chun Di1, Łukasz Krupa4, Beata Kruk5, Wacław Hołówko5, Piotr Milkiewicz6,7, Huizhang Bao1, Xiao He1, Daming Liu1, Chunhong Fan1, Abdullah Nasser8, Chang-sheng Xia1, Chun Di1, Łukasz Krupa4, Beata Kruk5, Wacław Hołówko5, Piotr Milkiewicz6,7, Huizhang Bao1, Xiao He1, Daming Liu1, Chunhong Fan1, Abdullah Nasser8,

Method:
The PR3-ANCA, IgA and IgG to large (anti-GP21) and short (anti-GP24) GP2 isoforms were measured in sera of prospectively collected patients with CCA without underlying PSC and in patients with other hepatobiliary tumors.

Results:
Among testes antibodies, anti-GP2 1 IgA was the most prevalent one in the CCA cohorts (Chinese cohort: 65/118, 52.6%; Polish cohort: 17/38, 44.7%) and its levels were significantly elevated in the individuals with CCA patients as compared to HC and PDAC patients. Neither of the IgA autoantibody corelated with the CCA differentiation or CA19-9 in serum. Among analyzed autoantibodies, the anti-GP2 1 IgA demonstrated the best diagnostic performance for the differentiation of CCA from disease controls and HC (AUC = 0.82, 95% CI 0.77–0.86, p < 0.01). Logistic regression including GGT, patients age and anti-GP2 IgG as confounders showed that anti-GP2 1 IgA was an independent predictor of CCA occurrence.

Conclusion: Analysis of patients with hepatobiliary tumors demonstrated that the anti-GP2 1 IgA is prevalent in patients with cholangiocarcinoma. Mucosal loss of tolerance in the form of anti-GP2 IgA distinguishes patients with CCA from ones with hepatocellular carcinoma and benign pancreatic neoplasms.

FRI-314
Baseline cirrhosis in addition to the aMAP score, increased the risk of developing hepatocellular carcinoma in patients with hepatitis B
Supakorn Chaiwiriyawong1, Pimsiri Sripongpun1, Naichaya Chamroonkul1, Apichat Kaewdech1, Prince of Songkl1 University, Thailand
Email: apichatk@hotmail.com

Background and aims: Hepatocellular carcinoma (HCC) is a major global problem impacting patients’ survival with liver diseases. With a few external validation studies, the aMAP score (age, male sex, and ALBI score) was recently developed to predict the risk of HCC development. We aim to externally validate this score in patients with chronic hepatitis B (CHB) infection as well as study the additional predictive factor for HCC development.

Method: We identified all CHB patients who were followed up between January 2007 and December 2021 at our hospital. Patients with CHB infection who were over the age of 18 were eligible. The exclusion criteria were being diagnosed with HCC within 6 months of the baseline visit, coinfection with another viral infection, or other causes of chronic liver disease. Baseline data from the initial diagnosis was retrieved and tracked until the occurrence of HCC.

Results: There were 866 eligible patients among the 902 CHB patients who were followed up on, with a median follow-up time of 7.7 years. Ninety-two (10.62%) patients developed HCC. HCC patients had significantly higher age, male sex, HBeAg-negative status, cirrhosis, total bilirubin, aspartate aminotransferase (AST), and alanine aminotransferase (ALT) levels than non-HCC patients. Serum albumin and platelet count were lower in HCC patients than in non-HCC patients. Multivariate analysis showed that the presence of cirrhosis at baseline [aHR 14.9 (5.62, 39.49), p < 0.001] and a high aMAP score at baseline [aHR 2.94 (1.38, 6.26), p = 0.005] were associated with HCC development. The cumulative incidence of HCC in patients with cirrhosis and a high aMAP score is higher than in patients with medium or low aMAP score and non-cirrhotic patients, as shown in the figure.

Conclusion: Cirrhosis status at the initial diagnosis of CLD is the strongest predictive factor for HCC development. Patients with cirrhosis and high aMAP were at the highest risk of developing HCC in the future. This group of patients should undergo intensive surveillance.
FRI-315
Comparative study of scoring systems predicting outcome of transarterial chemoembolization for hepatocellular carcinoma: a nationwide cohort study
Myeong Jun Song1, Hae Lim Lee1, Seok-Hwan Kim1. 1the Catholic university of Korea, Korea, Rep. of South
Email: mjsong95@catholic.ac.kr

Background and aims: Several scoring systems have been proposed to predict the outcome of transarterial chemoembolization (TACE) in patients with hepatocellular carcinoma (HCC). However, the application of the albumin-bilirubin (ALBI) grades to TACE candidates is poorly validated. Evaluation of the applicability of prognostic factors for patients performing TACE is necessary. We aimed to develop new scoring system including ALBI grade.

Method: 3,069 patients with unresectable HCC, child class A/B and ECOG 0-1 performing TACE were included from national cohort of the Korean Central Cancer Registry between 2008 and 2017. Patients were randomly divided into training (n = 1,507) and validation cohort (n = 1,562). A prognostic model was developed and validated. We compared with previous scoring models.

Results: In entire cohort, the patient’s mean age was 62 years. The patients were hepatitis B virus (57.1%) and child class A (83.2%). The prognostic model of TACE was ‘‘largest tumor diameter+ tumor number, AFP , and ALBI grade,’’ which consistently outperformed other currently available models in both training and validation datasets. Patients were assigned points according to sum of tumor burden (≤5, 5-10, ≥10), AFP or ALBI grade. Patients were divided into four risk groups based on their TACE-prognostic (TP) scores: A, B, C and D. The median survival for the groups A, B, C and D was 80.1, 53, 35.2 and 19.4 months, respectively.

Conclusion: This new TP scoring system may prove a favorable tool to stratify ideal candidates of TACE and predict OS with favorable performance and discrimination. Further external validation is needed.

FRI-316
Liver Frailty Index is associated with progression-free survival in patients with advanced HCC treated with Atezolizumab/Bevacizumab
Philippe Sultanik1, Edouard Larrey1, Manon Evain1, Bertille Campion1, Amandine Ait Ouella1, Héloïse Giudicelli1, Mathilde Wagner2, Dominique Thabut1, Manon Allaire1. 1Hôpital Pitié-Salpêtrière, Liver Unit, Paris, France; 2Hôpital Pitié-Salpêtrière, Radiology Department, Paris, France
Email: philippe.sultanik@aphp.fr

Background and aims: Prognostic factors of response to immunotherapy (IT) for advanced hepatocellular carcinoma (HCC) are not all established. Sarcopenia is associated with poor prognosis in patients (pts) under tyrosine kinase inhibitors, but its impacts on pts treated with IT is not known. The Liver Frailty Index (LFI) is a simple bedside tool for sarcopenia evaluation and is closely related to morbimortality in cirrhotic pts awaiting for liver transplantation. Our objective was to investigate whether LFI was associated with progression-free survival (PFS) and overall (OS) in advanced HCC pts treated with Atezolizumab/Bevacizumab (Atezo-Beva).

Method: From all pts treated with Atezo-Beva in our center, we performed a prospective study with baseline LFI measurement from January 2022. Baseline sarcopenia was asserted using BMI, albumin (ALB) and LFI (as continuous [LFIc] and categorical [LFIgr] variable-defined as frail [LFI > 4.5] or no-frail [LFI < 4.5] pts). Progression was defined as a composite (progression and/or side effects/hepatic decompensation requiring discontinuation). OS and PFS were assessed using Kaplan Meier. The influence of baseline characteristics on events during follow-up was assessed by Cox model.

Results: 23 pts treated with Atezo-Beva in our center, we performed a prospective study with baseline LFI measurement from January 2022. Baseline sarcopenia was asserted using BMI, albumin (ALB) and LFI (as continuous [LFI] and categorical [LFIgr] variable-defined as frail [LFI > 4.5] or no-frail [LFI < 4.5] pts). Progression was defined as a composite (progression and/or side effects/hepatic decompensation requiring discontinuation). OS and PFS were assessed using Kaplan Meier. The influence of baseline characteristics on events during follow-up was assessed by Cox model.

Results: 23 pts treated with Atezo-Beva had a baseline LFI measurement from January to August 2022, 74% men, median age at 68 years. 17 (77%) pts had cirrhosis (heavy drinking 62%, NASH 43%, HCV 33%, HBV 10%, mixed causes 48%). At inclusion, Child-Pugh class was A for 45%, B for 45% and C for 10%, with a median MELD score at
POSTER PRESENTATIONS

11[8-15]: On the day of treatment, HCC characteristics were a median size of 60 mm for the largest lesion, infiltrative for 19% and vascular invasion for 38% pts. Pts' characteristics were: BMI 25.7[23.9-28.2] kg/m², bilirubin 11[7.9-14.1] µM, INR 1.25[1.13-1.41], ALB 31[26-36] g/l, creatinin 74[66-87] µM, platelets 133[113-202] G/mm³, AFP 126[71-252] ng/ml, ALBI score: 1 in 14%–2 in 48%–3 in 38%. LFI 4.25[1.69-4.68]. Overall, 10 (43%) pts displayed frailty (LFIgr frail). The median follow-up was 25.7[23.9-28.2] months. Median PFS was 5.3[1.9-6.8] months. Median PFS was 5.9 months, 11 (48%) pts were alive without progression. In Cox univariate analysis, platelets (p = 0.01), AFP (p = 0.03), LFI (p = 0.01) and being LFIgr frail (p = 0.02) were associated with PFS. Overall, 9 (69%) no-frail and 2 (20%) frail pts (median PFS at 4.2 months) were alive without progression, log-rank = 0.01 (Figure). AUROC of LFI for PFS was 0.77. Only LFI, (aHR 4.49, p = 0.01) and LFIgr frail (aHR 4.66, p = 0.03) were associated with PFS in multivariate analysis. Overall, 9 (39%) pts died. 10 (77%) no-frail pts and 4 (40%) frail pts (median PFS at 5.6 months) were alive, log-rank = 0.09. In multivariate analysis, platelets (aHR 1.01, p = 0.04) and ALB (aHR 0.79, p = 0.03) associated with OS but not LFI.

Figure:

Conclusion: The Liver Frailty Index is an easy tool for sarcopenia assessment which is associated with PFS in patients with advanced HCC treated with Atezo-Beva. Sarcopenia screening and treatment including nutritional and physical strengthening should be performed for all patients.

FRI-317
Characterization of the imaging signature of hepatocellular carcinoma with enhancement pattern mapping
Newsha Nikzad, David Fuentes, Millicent Roach, Tasadduk Chowdhury, Matthew Cagley, Mohamed Badawy, Manal Hassan, Khaled Elsayes, Laura Beretta, Eugene Koay, Prasun Jalal. 1Baylor College of Medicine, Houston, United States; 2MD Anderson Cancer Center, Houston, United States

Background and aims: Limited methods exist to accurately characterize risk of malignant progression of liver lesions in patients undergoing surveillance for hepatocellular carcinoma (HCC). Enhancement pattern mapping (EPM) measures voxel-based root mean square deviation (RMSD) and improves the contrast to noise ratio (CNR) of liver lesions on standard of care imaging. This study investigates the utilization of EPM to differentiate between malignant versus non-malignant lesions.

Method: Patients with liver cirrhosis undergoing MRI surveillance were studied retrospectively. Controls (n = 99) were patients without lesions during surveillance. Cases (n = 48) were defined as patients with LI-RADS 3 and 4 lesions who developed HCC within the study period. RMSD measured with EPM was compared to the signal from MRI arterial and portovenous phases. EPM signals of liver parenchyma between cases and controls were compared.

Results: With EPM, RMSD of 0.37 was identified as a quantitative cutoff for distinguishing HCC from background cirrhotic parenchyma on pre-diagnostic scans with an AUC of 0.83 (CI: 0.73–0.94). EPM RMSD signals of background parenchyma in cases and controls were similar (case EPM: 0.22 ± 0.08, control EPM: 0.22 ± 0.09, p = 0.8).

Figure:

Conclusion: EPM differentiates between HCC and non-cancerous parenchyma in a surveillance population. Future directions may involve applying EPM for early detection of HCC and risk stratification of indeterminate lesions.

FRI-318
Initial treatment response and short-term mortality of spontaneous bacterial peritonitis in cirrhotic patients with hepatocellular carcinoma
Chang Hun Lee, Hye Jin Kang, Seung Young Seo, Seong-Hun Kim, Sang Wook Kim, Seung Ok Lee, Soo Teik Lee, In Hee Kim. 1Research Institute of Clinical Medicine of Jeonbuk National University-Biomedical Research Institute of Jeonbuk National University Hospital, Internal Medicine, Jeonju, Korea, Rep. of South

Background and aims: This study aimed to investigate the initial treatment response and short-term mortality of spontaneous bacterial peritonitis (SBP) in cirrhotic patients with hepatocellular carcinoma (HCC) compared with those without HCC.

Method: A total of 245 patients with liver cirrhosis diagnosed with SBP between January 2004 and December 2020 were included. Of these, 107 (43.7%) were diagnosed with HCC.

Results: Overall, the rates of initial treatment failure, 7-day and 30-day mortality were 91 (37.1%), 42 (17.1%), and 89 (36.3%), respectively. While the baseline CTP score, MELD score, culture-positive rate, and rates of antibiotic resistance did not differ between both groups, patients with HCC had a higher rate of initial treatment failure than those without HCC patients (52.3% vs. 25.4%, p < 0.001). Similarly, 30-day mortality was also significantly higher in patients with HCC (53.3% vs. 23.2%, p < 0.001). In the multivariate analysis, HCC, renal impairment, CTP grade C, and antibiotic resistance were independent factors for initial treatment failure. Furthermore, HCC, hepatic encephalopathy, MELD score, and initial treatment failure were independent risk factors for 30-day mortality, with statistically significant poor survival outcomes in patients with HCC and initial treatment failure (p < 0.001 and p < 0.001, respectively).

Conclusion: HCC is an independent risk factor for initial treatment failure and high short-term mortality in patients with cirrhosis with SBP. It has been suggested that more attentive therapeutic strategies are required to improve the prognosis of patients with HCC and SBP.
FRI-319
Effect of different radiologic modalities for surveillance of hepatocellular carcinoma on survival of high risk cirrhotic patients
Ahmed El Sabagh1, Islam Mohamed1,2, Megha Bhongade1, Nikita Rao1, Eunji Jo3, Susan Hilsenbeck3, Prasun Jalal1. 1Baylor College of Medicine, Houston, United States; 2Ain Shams University, Medicine, Cairo, Egypt; 3Dan L Duncan Comprehensive Cancer Center at Baylor St. Luke’s Medical Center, Houston, United States
Email: ahmed.elsabagh@bcm.edu
Background and aims: European association for the study of the liver (EASL) recommends that patients with high risk of developing hepatocellular carcinoma (HCC) undergo regular surveillance with ultrasonography (US) every 6 months. However, compared to cross-sectional imaging modalities -Computed tomography (CT) and Magnetic resonance imaging (MRI)-US has lower efficacy for detection of early HCC. To our knowledge, there are no studies evaluating the overall survival and receipt of curative treatment for patients who received surveillance using the different imaging modalities.
Method: We retrospectively reviewed all patients who were diagnosed with HCC at Baylor Saint Luke’s Medical Center Hospital between January 2011 and June 2021. Patients who underwent regular surveillance were identified. Data retrieved from electronic medical records and radiology reports included demographic and laboratory features, surveillance modality, tumour characteristics, treatments received and survival data. We estimated survival using the Kaplan-Meier method and compared the different modalities using the Log Rank test. We used univariate and multivariate Cox model to evaluate factors affecting survival.
Results: A total of 183 patients developed HCC while on biannual surveillance program (115 with MRI, 34 with CT and 34 with US). Patients were similar regarding with respect to age, sex, comorbid diseases. However, our cohort showed statistically significant differences regarding race and ethnicity, with more African American and Hispanic population undergoing surveillance with US. The initial survival analysis showed that compared to other modalities MRI had statistically significant association with longer survival (p value = 0.034). However, cox-multivariate regression model with adjustment for race, ethnicity, MELD score and total tumor size at time of diagnosis shows that surveillance modality has no statistically significant association with survival (MRI: HR 1.80, p value = 0.095) (CT: HR 0.71, p value = 0.26).
Conclusion: For cirrhotic patients with high risk for HCC, surveillance with MRI or CT was not associated with higher survival rate compared. This result shed the light on importance of adherence to surveillance irrespective of modality. Additionally, racial and ethnic disparities may affect the access to the HCC surveillance.

Figure: (abstract: FRI-318).
Comparison of clinical manifestations and outcomes between non-viral-related and viral hepatitis-related hepatocellular carcinoma

Sih-Han Liao1, Shang-Chin Huang2, Tung-Hung Su1, Shih-Jer Hsu1, Jia-Horng Kao1. 1National Taiwan University Cancer Center, Taipei, Taiwan; 2National Taiwan University Hospital Bei-Hu Branch, Taipei, Taiwan; 3National Taiwan University Hospital, Taipei, Taiwan

Email: winterreise0810@gmail.com

Background and aims: After the provision of hepatitis B vaccination and antiviral therapy, the incidence and mortality of viral-related HCC, including hepatitis B (HBV) or C (HCV) virus, have improved. In contrast, the disease burden of non-viral HCC increased. Here we investigated the differences of clinical manifestations and outcomes between non-viral HCC and viral-related HCC.

Method: From 1996 to 2016, a total of 2,781 patients with complete information were identified from the Cancer Registry Database and Integrated Medical Database of National Taiwan University Hospital. Based on the information of viral hepatitis profiles, the patients were categorized into five groups as follows: group 1, non-viral HCC (triple negative for HBsAg, anti-HCV, and anti-HBc); group 2, occult HBV-HCC (only positive for anti-HBc); group 3, HBV-HCC (positive for HBsAg and negative for anti-HCV); group 4, HCV-HCC (positive for anti-HCV and negative for HBsAg); group 5, dual infection-HCC (both positive for HBsAg and anti-HCV). Overall survivals were examined using Kaplan-Meier method. Prognostic factors were explored using Cox proportional hazards regression model.

Results: The proportions of women were more in the group of non-viral HCC (48.0%) and HCV-HCC (45.3%) than other three groups (p < 0.0001). The median age at diagnosis were older in the non-viral HCC group than the groups of viral-related HCC (p < 0.0001). The maximal tumor size was larger in the non-viral HCC group (p < 0.0001). The baseline AFP level of the patients with non-viral HCC was significantly lower than the groups of viral-related HCC (p = 0.01). The estimated 1-, 3-, and 5-year overall survival rates were 42.5%, 20.5%, and 8.2% for non-viral HCC group; 20.9%, 24.9%, and 8.7% for occult HBV-HCC group; 55.9%, 28.1%, and 13.3% for HBV-HCC group; 63.1%, 31.5%, and 13.0% for HCV-HCC group; 63.4%, 33.0%, and 16.1% for dual infection-HCC group. The BCLC stage could be used to predict the prognosis for HCC with various etiologies, including non-viral and viral-related HCC (all log-rank p < 0.0001). In the multivariable analysis of overall survival for all patients, four independent prognostic predictors were identified, including HCV-HCC group, advanced BCLC stage, larger tumor size, and higher FIB-4 score.

Conclusion: The patients of the non-viral HCC were older and more women. The baseline AFP level of the patients with non-viral HCC was lower. Additionally, the overall survival of the patients with non-viral HCC was significantly worse than that of the patients with HCV-HCC, but was similar as that of the patients with other etiologies.
Impact of obesity on outcome of hepatocellular carcinoma in an Asian cohort: when should we consider obesity treatment?
Wei-Lun Liou1,2, Kaina Chen1, Ravishankar Asokkumar1, Chee-Kiat Tan1,1 Singapore General Hospital, Singapore; 2Singapore General Hospital, Gastroenterology and Hepatology, Singapore
Email: liouweilun@gmail.com

Background and aims: Obesity is associated with increased risk of hepatocellular carcinoma (HCC) development. There is however conflicting data on impact of obesity on HCC outcome and prognosis. We studied the influence of obesity on clinical characteristics of HCC and on survival in a cohort of Asians.

Method: The study cohort comprised of patients with HCC seen in our centre from 2005 to 2020. We studied and compared HCC characteristics and survival between the non-obese group (BMI <27.5) and the obese group (BMI >27.5). Survival analysis was censored on 28 November 2022.

Results: There were 271 HCC patients in this study, 202 (74.8%) were male. 73 (27%) patients were obese. Median age of the patients was 65 (IQR 14). Non-alcoholic steatohepatitis (NASH) or cryptogenic cirrhosis was more common in the obese group (47.9% vs 32.8%, p = 0.02). Tumours median diameter was significantly larger in the non-obese group (25 mm vs 21 mm, p = 0.045). There was no statistically significant difference in Barcelona Clinic Liver Cancer (BCLC) staging; BCLC 0/A, 130 patients (65.7%) in non-obese group vs 49 patients (67.1%) in obese group, p = 0.83). HCC treatment modality was similar between the two groups (curative 61.1% vs 64.4%, non-curative 20.2% vs 21.9%, palliative 18.7% vs 13.7%, p = 0.55). For the cohort of patients receiving curative treatment, there was no significant difference in HCC recurrence rate between the two groups (65.3% vs 74.5%, p = 0.28). 1, 5, 10-year survival were similar between the two groups (non-obese group 75%, 43%, 23% vs obese group 82%, 51%, 23%, p = 0.59). Multivariable analysis confirmed that patient’s BMI had no influence on overall survival (Hazard ratio 1.09, 95% CI. 0.78–1.51).

Patients with underlying NASH or cryptogenic cirrhosis had worse survival outcome than patients with HCC of other aetiologies (1, 5, 10-year survival of 73%, 32%, 9% vs 80%, 52%, 30%, p < 0.001), HCC secondary to NASH or cryptogenic cirrhosis was also a predictor for poorer survival (hazard ratio 1.76, 95% CI. 1.31–2.37).

Conclusion: In this cohort of Asian patients with HCC of all aetiologies, obesity does not affect the outcome of HCC nor patients’ survival. Patients with NASH or cryptogenic cirrhosis had poorer outcome than patients with HCC of other aetiology. Early preventive measures and therapeutic interventions to treat obesity remain vital to prevent development of non-alcoholic fatty liver disease which carries poorer HCC outcome.
**Conclusion:** CPA is a good quantitative and automated method for estimating fibrosis tissue, and together with already known predictive factors (such as histological differentiation and extent of invasion, satellite nodules, size and the number of nodules, Metavir score, LSM and SSM) can predict the recurrence of HCC after liver resection. Further studies should confirm our results to recommend adding CPA to the standard pathological analysis of liver resected HCC patients.

---

**FRI-323**

**Exploration of a holistic management procedure for liver cancer surveillance to improve the early diagnosis of liver cancer in Chinese population**

Yong Li1, Ligong Lu1, Qing Yang1, Manhua Zhong1, Xiaofeng Wang1, Lintang Li2, Yanhong Chen1, Xiaolei Zhou1, Chao Yang1, Jie Dong1.

1Zhuhai people's hospital (zhuhai hospital affiliated with jinan university), Zhuhai, China

Email: lu_ligong@163.com

**Background and aims:** China accounts for nearly half of all new hepatocellular carcinoma (HCC) cases and death worldwide each year, and over 80% of them suffer from chronic hepatitis B (CHB). In China, up to 80% of the HCC cases are diagnosed at an advanced stage, lost the chance of radical treatment. The 5-year survival rate is only 12.1%. Therefore, it is urgent to enhance HCC screening in China and improve the level of early diagnosis. Accordingly, here we aim to develop a stratified management procedure of HCC screening and surveillance for CHB patients at Zhuhai People Hospital.

**Method:** CHB patients, without previous HCC diagnosis, visiting the Department of Hepatology and Infectious Disease were recommended for enrollment by the attending physician since Jan 2022. We have established a digital platform and procedure that can collect and synthesize all-round information of enrolled patients, including comprehensive medical history, as well as laboratory and imaging examination results. Dashboards were generated for dedicated liver disease management. Each enrolled patient first took an initial HCC screening (step 2 in the figure), including abdominal ultrasound, and serum tests for AFP and PIVKA-II. Patients with abnormal results will follow standard HCC diagnostic work-up, while other patients who are not currently suspected of HCC will be classified into different risk groups (step 3 in the figure) according to local guidelines, in-house standards (Zhuhai model), and published risk stratification models (such as aMAP). These patients were thereafter matched with a risk-dependent follow-up plan for HCC surveillance. The early diagnosis rate of HCC defined as stage Ia, Ib, and Ila according to the Chinese National Liver Cancer (CNLC) standards, was evaluated and compared to the historical baseline as 30% using one-side binomial test.

**Results:** 2071 patients were enrolled in 2022. So far, 8 patients have been diagnosed with HCC during either initial screening or surveillance follow-up, of which 7 (87.5%) were at an early stage (CNLC Stage Ia), showing a significant increase as compared to baseline ($p$ value = 0.001). A total of 2030 CHB patients were risk-
stratified, 14.2% of whom were classified as high-risk for HCC, and subsequently matched with a well-designed periodic surveillance plan. Our management system has also enabled a significant increase in patient compliance to 71%.

**Conclusion:** The standardized screening and management system established has so far significantly improved the early diagnosis rate of HCC among the enrolled patients. The stratified management strategy embedded has also considerably improved the management efficiency and follow-up compliance of high-risk patients. The established system warrant further validation and promotion.

**FRI-324**

Chemerin protein in hepatocellular carcinomas is related to disease severity in European patients

Christa Büchler1, Kirsten Utpatel2, Katja Evert2, Oliver Treeck3, Florian Weber4, 1Regensburg University Hospital, Department of Internal Medicine, Germany; 2Regensburg University Hospital, Institute of Pathology, Germany; 3Regensburg University Hospital, Department of Gynaecology and Obstetrics, Germany

Email: christa.buechler@klinik.uni-regensburg.de

**Background and aims:** The chemoattractant protein chemerin is protective in experimental hepatocellular carcinoma (HCC), and high expression in HCC tissues of Asian patients leads to a better prognosis. In the present study, immunohistochemistry was used to find out whether higher chemerin in HCC is associated with less severe disease in European patients.

**Method:** Chemerin and chemokine like receptor 1 (CMKLR1) protein expressions were determined by immunohistochemistry in HCC tissues of 383 patients.

**Results:** Chemerin protein expression was low in 24%, medium in 49% and high in 27% of the tissues. Chemerin protein in the HCC tissues relates positively to T-stage, vessel invasion, higher histologic grade, Union for International Cancer Control (UICC) stage and tumour size. Chemokine like receptor 1 (CMKLR1) is a functional chemerin receptor. CMKLR1 protein was low expressed in 36%, medium expressed in 32% and high expressed in 32% of the HCCs. Tumour CMKLR1 was positively related to T-stage, vessel invasion, higher histologic grade and UICC stage. Associations of tumour chemerin and CMKLR1 protein with steatosis, inflammation and fibrosis were not observed. In summary, chemerin as well as CMKLR1 protein were positively related to disease severity of European HCC patients. This is in contrast to Asian patients where higher tumour chemerin was protective.

Figure: Chemerin (left) and its receptor CMKLR1 (right) in the liver

**Conclusion:** Current analysis provides evidence for ethnicity-related differences of HCC expressed chemerin and HCC severity.

**FRI-325**

Prognostic value of simple non-invasive tests for the risk stratification of HCC development in patients with cirrhosis due to non-alcoholic fatty liver disease

Amina Abdulle1, Angelo Armandi1, Gian Paolo Caviglia1, Chiara Rosso2, Daphne D’Amato1, Gabriele Castelnuovo1, Nuria Pérez Díaz del Campo3, Kamela Gjini1, Irene Poggioili1, Marta Guariglia1, Giorgio Maria Saracco1, Elisabetta Bugianesi1, 1University of Turin, Turin, Italy, Italy

Email: amina.abdulle.md@gmail.com

**Background and aims:** Hepatocellular Carcinoma (HCC) represents a major clinical event in the cirrhotic population, leading to a significant incidence of morbidity and mortality. The aim of our study is to assess the prognostic value of simple non-invasive tests (NITs) for the stratification of the risk of HCC development in a Non-Alcoholic Fatty Liver Disease (NAFLD) cirrhotic population on long-term follow-up (FU).

**Method:** A total of 122 patients with NAFLD-cirrhosis (median age: 62 years; males 52.5%; median BMI 30.5 kg/m2; prevalence of type-2 diabetes: 57.4%) were retrospectively analyzed. Cirrhosis diagnosis was achieved by either liver histology, instrumental findings and/or clinical evidence of portal hypertension. Clinical and biochemical data were collected at the time of diagnosis; the following NITs were calculated: FIB-4, AST to Platelet Ratio Index (APRI) gamma-glutamyl transpeptidase-to-platelet ratio (GPR), BARD.

**Results:** During a median FU of 6 (IQR 3.2–9.3) years, 13 (10.7%) patients developed HCC. Baseline FIB-4 (HR = 1.27, 95%CI 1.03–1.58, p = 0.027) and GPR (HR = 1.44, 95%CI 1.11–1.85, p = 0.005) values resulted significantly associated to HCC occurrence. Conversely, no association was observed for APRI and BARD. Conventional FIB-4 cutoff values allowed a proper patients’ stratification into 3 risk categories with different HCC incidence: FIB-4 < 1.3 = 0/18 (0%), FIB-4 between 1.3–3.25 = 7/73 (9.6%), and FIB-4 > 3.25 = 6/31 (19.4%) (Log-rank test: p = 0.009). Likewise, the cumulative HCC incidence according to GPR tertiles risk groups was: 3/41 (7.3%), 4/40 (10.0%) and 6/41 (14.6%) (Log-rank test: p = 0.041).

**Conclusion:** Baseline FIB-4 could stratify patients with NAFLD-cirrhosis on long-term FU according to their individual risk of HCC development. In such patients, this simple NITs may be useful to optimize tailored HCC surveillance strategies.

The research has been supported by the Italian Ministry for Education, University and Research (MIUR) under the programme “Dipartimenti di Eccellenza 2018–2022” Project code D15D18000410001

**FRI-326**

Exploration of the lack of systematic surveillance for hepatocellular carcinoma for patients with non-alcoholic fatty liver disease

Theresa Hydes1,2, Connor Henry Blake1,2, Mohamed Kassab2, Charmaine Matthews2, Vinay Kumar2, Elizabeth Baggus1,2, Nick Stern2, Daniel Cuthbertson1,2, Daniel Palmer1, Philip Johnson1, Tim Cross1,2, 1University of Liverpool, United Kingdom; 2Liverpool University NHS Hospitals Foundation Trust, United Kingdom

Email: therasa@doctors.org.uk

**Background and aims:** Non-alcoholic fatty liver disease (NAFLD) is emerging as a leading cause of hepatocellular carcinoma (HCC). We aimed to compare the frequencies of HCC detected in those not under systematic surveillance for people with NAFLD vs. other aetiologies of liver disease, to explore possible underlying reasons and determine impact on survival.

**Method:** A prospective dataset of 623 patients with HCC seen at a large hospital trust in Northwest England from 2007 to 2022 was examined. A diagnosis of NAFLD was made based on radiological evidence of steatosis or cryptogenic cirrhosis in the presence of the metabolic syndrome, without significant alcohol intake or other causes of chronic liver disease. Group comparisons were made using
Mann Whitney U-test where data was continuous and Chi-squared test was used to compare categorical data.

**Results:** Within this cohort 76.2% (n = 475) of patients were male, with a median age of 68 years. In total, 30.3% (n = 189) had NAFLD, 31.9% (n = 199) alcohol-related liver disease, and 19.6% (n = 122) hepatitis C infection. People with NAFLD HCC were less likely to have been enrolled in HCC surveillance (25.4% vs. 43.3% for other aetiologies of liver disease, p = 0.0001) and more likely to have a diagnosis of HCC based on symptoms (Table 1). We explored why people with NAFLD HCC presented outside of surveillance. Fewer people with NAFLD were known to secondary liver services prior to developing HCC (26.0% vs. 48.3% of people without NAFLD, p < 0.0001). We also noted more people with NAFLD developed HCC without pre-existing cirrhosis (33.9% vs. 14.8% without NAFLD, p < 0.0001). Patients with NAFLD HCC presented with a greater median diameter of their largest tumour (43 vs. 30 mm, p = 0.0009). While there was an observation that a lower frequency of patients with NAFLD met Barcelona Clinic Liver Cancer (BCLC) staging 0/A (NAFLD 32.6% vs. non-NAFLD HCC 37.6%, p = 0.2419) and were less likely to receive curative treatment (resection/transplant/ablation) (NAFLD 31.2% vs. non-NAFLD HCC 38.7%, p = 0.0802), no significant difference was detected between the groups. Patients with NAFLD HCC had similar severity of liver disease than people with non-NAFLD HCC according to the model for end stage liver disease (MELD) score (9.8% vs. 9.4% had a MELD ≤ 6, p = 0.8766), although patients with NAFLD HCC were less likely to have ascites (20.6% vs. 28.5%, p = 0.0406) and displayed lower median levels of bilirubin (13 vs. 18 mg/dl, p < 0.0001). Performance status was comparable (performance status 0, 64.6% NAFLD vs. 63.5% for people without NAFLD, p = 0.8830), despite people with NAFLD being older (median age 75 vs. 65 years, p < 0.0001) and more likely to have cardiovascular disease (37.7% vs. 21.1%, p = 0.0002). Overall median survival was comparable between groups (NAFLD HCC 484 days vs. non-NAFLD HCC 475 days, p = 0.8489).

Table 1: Clinical indications for imaging resulting in a diagnosis of HCC.

<table>
<thead>
<tr>
<th>Indication</th>
<th>NAFLD (%)</th>
<th>Non-NAFLD aetiology of liver disease (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCC Surveillance</td>
<td>15.9</td>
<td>31.9</td>
</tr>
<tr>
<td>Abnormal liver biochemistry</td>
<td>24.8</td>
<td>34.4</td>
</tr>
<tr>
<td>Rising Alpha fetoprotein</td>
<td>5.5</td>
<td>6.5</td>
</tr>
<tr>
<td>Incidental finding on other imaging</td>
<td>25.1</td>
<td>14.7</td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>8.2</td>
<td>5.4</td>
</tr>
<tr>
<td>Weight loss</td>
<td>6.0</td>
<td>2.3</td>
</tr>
<tr>
<td>Clinical stigmata</td>
<td>0.5</td>
<td>3.6</td>
</tr>
<tr>
<td>Hepatomegaly</td>
<td>1.1</td>
<td>0.5</td>
</tr>
<tr>
<td>Anaemia</td>
<td>1.1</td>
<td>0.5</td>
</tr>
<tr>
<td>Variceal bleed</td>
<td>3.3</td>
<td>1.0</td>
</tr>
<tr>
<td>Other</td>
<td>6.6</td>
<td>5.2</td>
</tr>
</tbody>
</table>

**Conclusion:** Patients with NAFLD are more likely to present with HCC outside of surveillance because they are not known to secondary care, or do not have cirrhosis at the time of HCC diagnosis. While patients with NAFLD do not appear to be significantly disadvantaged in terms of overall survival, there may be scope to optimise outcomes for this group via implementation of more widespread screening for advanced NAFLD in the community and the development of better HCC risk stratification models.

FRI-327
Aetiology and outcomes of cirrhosis and hepatocellular carcinoma in Blantyre, Malawi
Alexander Stockdale1,2, Benno Kreuels3,4,5, Isaac Shawa2,6, Niza Silungwe7, Karen Chetcuti8, Elizabeth Joekes2,7, Blessings Mbale2, Jane Mallewa4,5, Egbert Tannich3, Christina Weiler-Normann3, Marc Luettegehmann3, Peter Finch5, Emma Thomson6, Anna Maria Geretti10, Milelta Gordon11-2, 1University of Liverpool, Liverpool, United Kingdom; 2Malawi-Liverpool-Wellcome Trust Clinical Research Programme, Blantyre, Malawi; 3Bernhard Nocht Institute for Tropical Medicine, Hamburg, Germany; 4Kamuzu University of Health Sciences (KUHeS), Blantyre, Malawi; 5Queen Elizabeth Central Hospital, Blantyre, Malawi; 6University of Derby, United Kingdom; 7Royal Liverpool University Hospital, United Kingdom; 8University Medical Center Hamburg-Eppendorf, Hamburg, Germany; 9Centre For Virus Research, Bearsden, United Kingdom; 10University of Rome “Tor Vergata”, Italy
Email: a.stockdale@liverpool.ac.uk

**Background and aims:** Age-standardised mortality from liver disease is highest in African countries. We studied the aetiology and outcomes of patients with cirrhosis and hepatocellular

Figure: (abstract: FRI-327): Kaplan Meier curve. A: All participants; B: Cirrhosis stratified by liver stiffness
carcinoma (HCC) presenting to a tertiary hospital in southern Africa, to identify interventions to address liver-related mortality.

**Method:** We prospectively screened 708 patients over 18 months using transient elastography (>12 kPa) and ultrasound, diagnosing 138 patients with cirrhosis and 78 with HCC. We excluded patients with non-liver-related disease. We estimated population attributable fractions (PAF) using randomly-sampled community controls (n = 3258 for hepatitis B; n = 120 for other exposures) using binomial logistic regression with robust standard errors, with PAF represented by 1 - the ratio between the logit of the baseline likelihood and a zero exposure scenario. We tested for hepatitis B (HBsAg), anti-HCV and HCV RNA, anti-HDV, HDV RNA, HEV IgG and RNA, HIV, autoimmune serology, schistosomiasis Ag and PCR in cases and controls.

**Results:** Patients with HCC were median 40 (IQR 35–50) years old; tumour size was 13.2 cm (IQR 10.2–17.3) with median survival 40 days (95% CI:30–51). Hepatitis B (HBsAg) was attributable for 25.5% (95% CI 17.1–33.1) of cirrhosis and 73.2% (61.0–81.6) of HCC cases. HIV was the second most important cause with PAF 23.6% (13.5–32.5) for cirrhosis and 20.2 (7.4–31.2) for HCC; the association persisted after adjusting for HBV/HCV coinfection. Hepatitis C was attributable for <5% of liver disease; 6% with cirrhosis had autoimmune liver disease, and no active hepatitis D or E was diagnosed. Alcohol and smoking were attributable for 14.0% (–2.3–27.7) and 23.6% (8.4–36.3) of cases of HCC respectively, but were not associated with cirrhosis. Schistosomiasis was diagnosed in cirrhosis patients by urine antigen (30.4%) or PCR (36.2%); 12.5% had ultrasound signs of. mansoni. Liver stiffness (hazard ratio 1.13 (1.05–1.20) per 5 kPa increase, p < 0.001) and presence of ascites (HR 9.09 (2.80–29.5), p < 0.001) were predictors of 6-month cirrhosis mortality.

**Conclusion:** Hepatitis B and HIV are the principal causes of liver disease in southern Malawi. Patients with HCC are diagnosed at an advanced stage, with a dismal prognosis. There is an urgent need for community HBV screening and treatment programmes to address liver-related mortality.

**FRI-328**

Survival outcomes of patients with non-alcoholic fatty liver disease-related HCC: a retrospective cohort study

Anders Mellemkjaer1, Josefine Lahn2, Linda Skibsted Kornerup2, Gerda Elisabeth Villadsen2, Henning Groenbaek2, Aarhus University Hospital, Dept. of Gastroenterology and Hepatology, Aarhus N, Denmark; 2Aarhus University Hospital, Gastroenterology and Hepatology, Aarhus N, Denmark

Email: anders.mellemkjaer@clin.au.dk

**Background and aims:** Non-alcoholic fatty liver disease (NAFLD) is emerging as a leading cause of hepatocellular carcinoma (HCC) in many Western countries. The aim of this study was to compare survival outcomes of NAFLD-related HCC to HCC by other etiologies in Danish patients with newly diagnosed HCC.

**Method:** We retrospectively included all patients diagnosed with HCC at the tertiary liver center at Aarhus University Hospital, Denmark in 2018 and 2019. Data was derived from patients’ electronic records and follow-up was carried out until death or December 1st, 2022. To identify cases of NAFLD-related HCC, a strict definition was applied, comprising either: 1) previous NAFLD diagnosis, 2) evidence of steatosis on biopsy, ultrasonography, or computer tomography, or 3) presence of three or more features of the metabolic syndrome. Further, patients with alternative causes of HCC or current or previous record of alcohol abuse were excluded from the case definition.

**Results:** A total of 133 patients diagnosed with HCC were identified. Of these, 29 (21.8%) fulfilled our criteria for NAFLD-related HCC. Remaining etiologies included alcohol (n = 67, 50%), viral hepatitis B and C (n = 22, 17%), cholestatic liver disease (n = 4, 3%) and other or unknown etiology (n = 15, 11%). Patients with NAFLD-related HCC were older (median 76 vs. 67 years, p <0.001), fewer had cirrhosis (41% vs. 73%, p = 0.001), and fewer were smokers (7% vs. 38%, p = 0.002) compared to non-cases. Barcelona Clinic Liver Cancer (BCLC) stages was similar in the two groups (p = 0.49). The Kaplan-Meier plot (Fig. 1) revealed no differences in the survival functions (p = 0.46) or median survival time between NAFLD-related HCC cases (19.8 months) and non-cases (17.8 months). The proportional hazards model adjusted for BCLC stage and age showed no difference in hazards rates between the two groups (Hazard Ratio (HR) = 1.20, 95% CI: 0.74–1.95, p = 0.47).

**Conclusion:** NAFLD-related HCCs were more often diagnosed in older patients and in patients without cirrhosis compared to other etiologies. However, disease stage at diagnosis and overall prognosis was comparable in patients with and without NAFLD-related HCC. Larger cohort studies are needed to substantiate these findings.

**FRI-329**

Targeted surveillance for hepatocellular carcinoma is cost effective in Australia: evidence from a microsimulation study

Barbara de Graaff1, Le Tuan Anh Nguyen1, Lei Si2, John Lubel1,4, Nicholas Shackel2, Kwang Chien Yee2, Hong Wilson2, Jane Brashaw2, Kerry Hardy2, Andrew Palmer2, Christopher Leigh Blizzard1

1University of Tasmania, Menzies Institute for Medical Research, Hobart, Australia; 2Western Sydney University, School of Health Sciences, Campbelltown, Australia; 3Alfred Hospital, Gastroenterology Department, Melbourne, Australia; 4Monash University, School of Medicine, Melbourne, Australia; 5Launceston General Hospital, Launceston, Australia; 6University of Tasmania, School of Medicine, Hobart, Australia; 7Royal Hobart Hospital, Gastroenterology Department, Hobart, Australia

Email: barbara.degraaff@utas.edu.au

**Background and aims:** In Australia and many other Western countries, hepatocellular carcinoma (HCC) is one of the fastest increasing causes of cancer mortality. Recently published Australian Consensus Guidelines recommend HCC surveillance for all patients with liver cirrhosis and high-risk groups living with non-cirrhotic chronic hepatitis B (CHB) (i.e. Aboriginal and Torres Strait Islanders aged <50 years, Asian males >40 years, Asian females >50 years, people born in sub-Saharan Africa aged >20 years). The aim of this study was to assess the cost-effectiveness of these recommendations.

**Method:** A microsimulation model was developed. Three strategies were evaluated: biannual ultrasound scan (US), biannual US+alpha-fetoprotein (AFP), and usual care (i.e. no formal surveillance). A hypothetical cohort aged 40–80 years with one of the conditions: non-cirrhotic CHB, compensated cirrhosis (CC) or decompensated cirrhosis (DC), was simulated. Face, internal and external validity were assessed. One-way, probabilistic sensitivity analyses were conducted. To account for uncertainties, scenario and threshold analyses were carried out. Scenarios included surveillance of each
disease individually (CHB, CC, DC), reduced sensitivity of USS due to central adiposity and real-world adherence rates.

**Results:** The validation analyses indicated that the model is highly accurate in terms of reflecting observed real-world data. For a range of HCC surveillance scenarios for combined CHB, CC and DC patients, USS + AFP was the most cost-effective with an incremental cost-effectiveness ratios (ICER) compared to usual care less than the willingness-to-pay threshold of A$50,000 per quality-adjusted life year (QALY). Whilst USS alone was also cost-effective, it was dominated by USS+AFP. When evaluating cost-effectiveness by groups, surveillance was cost-effective in CC and DC groups (ICERs <$30,000), but not for CHB alone (ICERs >$100,000). Central adiposity decreased the performance of USS, however USS + AFP surveillance remained cost-effective.

**Conclusion:** HCC surveillance using USS ± AFP for combined target populations is cost-effective. Surveillance limited to CC and DC groups is also cost-effective. Whilst surveillance for CHB patients alone was not cost-effective, this may be due to an important limitation of this model. As there is a lack of published data for model parameters on CHB and Indigenous status, region of birth, age and sex, our model was simplified and assumed that HCC risk was the same for all CHB patients. Our model will be updated with these data as they become available. Nonetheless, HCC surveillance based on Australian recommendations for all three groups is highly likely to be cost-effective in the Australian setting.

**Liver tumours Experimental and pathophysiology**

**WEDNESDAY 21 TO SATURDAY 24 JUNE**

**TOP-066**

PD1-negative CD45RA effector-memory CD8 T-cells are essential for response to checkpoint inhibition in advanced hepatocellular carcinoma

Sarah Cappuyns1,2,3,4, Gino Philips3,4, Vincent Vandecaveye5,6, Bram Boecx7,7, Rogier Schepers3,4, Thomas Van Brussel1,4, Ingrid Arij3,4, Aurelie Mechels3,4, Ayse Bassec3,4, Francesca Lodi3,4, Joris Jaekers2, Halit Topa7, Baki Topal7, Orian Bricard3,4, Junbin Qian9,10, Eric Van Cutsem1,2, Chris Verslype1,2, Dieder Lambrechts3,4, Jeroen Dekervel1, 2.

1University Hospitals Leuven, Digestive Oncology, Department of Gastroenterology, Belgium, 2Katholieke Universiteit Leuven, Laboratory of Clinical Digestive Oncology, Department of Oncology, Belgium, 3Katholieke Universiteit Leuven, Laboratory for Translational Genetics, Department of Human Genetics, Belgium, 4Vlaams Instituut voor Biotechnologie, Centre for Cancer Biology, Leuven, Belgium, 5University Hospitals Leuven, Laboratory of Translational MRI, Department of Imaging and Pathology, Belgium, 6Zhejiang University School of Medicine, Zhejiang Provincial Key Laboratory of Precision Diagnosis and Therapy for Major Gynaecological Diseases, Women’s Hospital, China, 7Zhejiang University School of Medicine, Institute of Genetics, China

Email: sarahcappuyns@hotmail.com

**Background and aims:** Checkpoint inhibitors (CPI) have dramatically changed the treatment landscape of advanced HCC (aHCC). While PD1-expressing CD8 T-cells have repeatedly been linked to response to CPI, their role in aHCC is controversial. Using single-cell profiling,
we aimed to characterize the intra-tumoural and peripheral immune context of aHCC patients treated with CPI to identify features associated with response and/or resistance.

**Method:** Both pre-treatment tissue biopsies and serial peripheral blood mononuclear cell (PBMC) samples of aHCC patients (n = 37) treated with systemic therapy were subjected to single-cell transcriptome (scRNAseq) and T-cell receptor sequencing (scTCRseq). Patients (n = 30) treated with PD (L)1 inhibition were stratified according to clinical response and various single-cell readouts were correlated with response and clinical outcome.

**Results:** Tumours with durable response were enriched for PDL1-expressing CXCL10+ macrophages and, based on cell-cell interaction, expressed high levels of CXCL9/10/11 to attract peripheral CXCR3+ effector-memory T-cells (CD8 TEM) into the tumour. Furthermore, based on TCR sharing and pseudotime trajectory analysis, CD8 TEM preferentially differentiated into clonally-expanded PD1-negative, CD45RA effector-memory CD8 T-cells (CD8 TEMRA) with pronounced cytotoxicity. In contrast, in non-responders, CD8 TEM remained frozen in their effector-memory state. Finally, in responders, CD8 TEMRA displayed a high degree of T-cell receptor sharing with blood, consistent with their patrolling activity.

**Conclusion:** In conclusion, we propose a novel paradigm, where response to checkpoint inhibition in aHCC is driven by clonally expanded, cytotoxic CD45RA effector-memory CD8 T-cells, characterized by a high degree of TCR sharing with peripheral blood and present in the tumour prior to therapy. PDL1-expressing CXCL10+ macrophages are positioned as essential gatekeepers in the TME, interacting with the peripheral T-cell compartment to ensure effective T-cell recruitment into the TME.

**TOP-069**

Interleukin 10-mediated signaling dampens antitumor immunity and promotes liver metastasis

Tao Zhang1,2, Ahmad Mustafa Shiri1,2, Tanja Bedke1,2, Jöran Lücke1,2,3, Dimitra E. Zazara4,5, Anastasios Giannou1,2,3, Samuel Huber1,2.

1University Medical Center Hamburg-Eppendorf, Section of Molecular Immunology and Gastroenterology, I. Department of Medicine, Germany, 2University Medical Center Hamburg-Eppendorf, Section of Molecular Immunology and Gastroenterology, I. Department of Medicine, Germany, 3University Medical Center Hamburg-Eppendorf, Section of General, Visceral and Thoracic surgery, Germany, 4University Medical Center Hamburg-Eppendorf, Division for Experimental Feto-Maternal Medicine, Department of Obstetrics and Fetal Medicine, Germany, 5University Medical Center Hamburg-Eppendorf, University Children’s Hospital, Germany

Email: s.huber@uke.de

**Background and aims:** Liver metastasis is one of the most common causes of cancer-associated mortality. A presence of liver metastasis was reported to be responsible for an immunosuppressive microenvironment and a diminished immunotherapy efficacy. As a master regulator of the immune system, interleukin-10 (IL-10) targets both innate and adaptive immune cells and orchestrates immunosuppressive functions. Interestingly, IL-10 is upregulated in both human and murine liver metastasis. We aimed here to decipher the source, regulation and function of IL-10 in liver metastasis. Our long-term aim is to improve the outcome of patients with liver metastasis.

**Method:** To induce spontaneous or forced liver metastasis on mice, murine cancer cells (MC38) were injected into cecum or spleen, respectively. Cell-specific IL-10 and IL-10 receptor (IL-10R) deficient mice were used to identify source and target of IL-10 during metastasis formation. PD-L1 deficient mice were used to test the role of this check point. 3–4 weeks post injection, livers were harvested and metastatic burden including liver weight and number of metastatic sites were analyzed. Immune composition characterization was performed in IL-10-reporter mice using flow cytometry. To investigate the underlying mechanisms, hepatic myeloid cells were sorted for RNA sequencing. Hepatic CD8+ T cells were cocultured with MC38 to measure changes in antitumor immunity using flow cytometry.

**Results:** In our liver metastasis mouse models, IL-10 blockade as well as IL-10 deficient mice were protected from metastasis formation. Furthermore, by using IL-10 reporter mice, we could demonstrate that Foxp3+ regulatory T cells (Tregs) are the major cellular source of IL-10 in the liver metastatic sites. Deletion of IL-10 expression in Foxp3+ Tregs led to reduced liver metastatic sites, a finding that underlines the importance of this cytokine during metastasis formation. Ablation of IL-10R on myeloid cells, but not DCs, resulted in less liver metastatic burden, suggesting that IL-10 signaling in myeloid cells regulated liver metastasis formation. Nevertheless, Tregs themselves were shown to respond to IL-10 by highly boosting its production, which in turn triggered monocytes to upregulate the immune checkpoint mediator PD-L1. Accordingly, deletion of PD-L1 led to decreased liver metastasis. Coculture with hepatic infiltrating CD68+ T cells and MC38 cells showed that the PD-L1/PD-1 axis attenuates the CD8-dependent cytotoxicity against metastatic lesions.

**TOP-070**

Constitutive signaling from an engineered IL-21 receptor programs long-lived effector TCR-T cells for HCC therapy

Wei Zhu1, Zhiming Zhang1, Jinfang Chen2, Xiaoan Chen3, Xuan Huang4, Weikang Xu1, Xuan Yi1, Xinyu Lu1, Sha Wu2, Yongxin Li1, Jinlin Hou1, Nanfang Hospital, Southern Medical University, China, 2School of Basic Medical Sciences, Southern Medical University, China

Email: jlhousmu@163.com

**Background and aims:** Strategies to improve T cell therapy efficacy in solid tumours such as hepatocellular carcinoma (HCC) are urgently needed. The common cytokine receptor γ chain (γc) family cytokines such as IL-2, IL-7, IL-15 and IL-21 play fundamental roles in T cells development, differentiation and effector phase. The aim of this study is to determine the effect of IL-21 combination in T cell therapy against HCC and investigate optimized strategies to utilize the effect of IL-21 signal in T cell therapy.

**Method:** The contributions of IL-7, IL-15 and L-21 in human alpha fetoprotein (AFP) specific TCR engineered T cells (TCR-T) against HCC were evaluated in vitro and in vivo. The phenotypic and transcriptome alteration in AFP-specific TCR-T cells was further determined by flow cytometry and RNA sequencing. A novel IL-21 receptor transmitting IL-21 signal without exogenous IL-21 supplement was designed and expressed in AFP-specific TCR-T cells. The antitumor function of TCR-T cells expressing novel IL-21 receptor (IL-21R-TCR-T)
was evaluated in vitro and in vivo, the phenotypic and transcriptome alteration induced by engineered IL-21 receptor was investigated by flow cytometry and single-cell RNA sequencing.

**Results:** The antitumor function of AP-specific TCR-T cells was augmented by exogenous IL-21 both in coculture assay and xenograft model. IL-21 enhanced TCR-T cells proliferation capacity both after CD3/CD28 and tumor antigen stimulation. Phenotypic analysis revealed that IL-21 promoted memory differentiation, downregulated PD-1 expression and alleviated apoptosis in TCR-T cells after activation. IL-21+TCR-T showed upregulated STAT3 phosphorylation level compared with conventional TCR-T in the absence of IL-21. Superior antitumor function and proliferation capacity after activation was found in IL-21+TCR-T cells compared with conventional TCR-T cells in vitro and in vivo. Phenotypic analysis revealed that IL-21+R-TCR-T cells showed lower apoptosis level, less differentiated and exhausted phenotype and higher effector function after repetitive tumor antigen stimulation.

**Conclusion:** We designed a novel IL-21 receptor which programs long-lived effector TCR-T cells and avoids side effects induced by systemic utilization of IL-21. The novel IL-21 receptor creates new opportunities for next generation TCR-T cells against HCC.

**TOP-072**

**Antitumor activity of the G9a inhibitor EZM8266 in hepatocellular carcinoma: potential for combination with immune checkpoint inhibitors**

Maite G Fernandez-Barrena1,2, José María Herranz1,2, Elena Adan-Villaescusa1, Borja Castello1, Felipe Prosper1,4, Bruno Sangro5,6, Maria Arechederra1,6,7, Carmen Berasain1,7, Jennifer Totman8, Veronica Gibaja8, Matias A Avila1,6,7, SAT-211

**Method:** We performed a comprehensive transcriptomic analysis of 180 epigenetic modifiers and validated in silico the upregulation of G9a expression in a combined cohort including 292 HCC tissue samples, and explored its association with the different immune tumor tissue signatures. We examined the effects of EZM8266 on the growth of human (Hep3B, Huh7, PLC/PRF5, HepG2, SNUG449) and mouse (PMZ299L) HCC cell lines. We performed colony formation, migration, invasion and anchorage-independent growth assays. EZM8266 was tested on the basal and IFN-γ-triggered expression of CXCL9 and CXCL10 chemokines and CTAs in HCC cells. The effects of EZM8266 on the growth of PMZ299L cells orthotopically implanted in immunocompetent mice, alone and in combination with a-PD1 antibodies, were also evaluated.

**Results:** G9a is consistently overexpressed in HCCs, positioned as one of the most highly deregulated epigenetic modifiers in HCC patients and most prominently in the “non-inflamed” transcriptomic sub-classes. EZM8266 inhibited HCC cells proliferation and all malignant traits tested in vitro. EZM8266 induced the expression of CTAs, CXCL9 and CXCL10, potentiating the effect of IFNγ on these chemokines. In vivo, EZM8266 inhibited the growth of PMZ299L cells, and enhanced the effects of a-PD1 resulting in a remarkable antitumoral activity. No signs of systemic or liver toxicity were observed.

**Conclusion:** G9a is confirmed as an effective druggable target in HCC. Pharmacological inhibition of G9a with EZM8266 antagonizes HCC cells growth and leverages the efficacy of ICIs. Our findings provide strong support for the combination immunotherapy with epigenetic drugs such as EZM8266 for HCC treatment.

**SATURDAY 24 JUNE**

**SAF-211**

**Oncostatin M promotes a pro-tumorigenic inflammatory response in NASH-related HCC**

Beatrice Foglia1, Salvatore Sutti2, Jessica Nurcis1, Chiara Rosso3, Marina Maggiora1, Claudia Bocca1, Patrizia Carucci2, Silvia Gaia4, Elisabetta Bugianesi5, Emanuele Alban5, Maurizio Parola1, Stefania Cannito1, 1University of Turin, Clinical and Biological Sciences, Torino, Italy, 2University of Turin, Medical Sciences, Torino, Italy, 3University of Turin, Medical Sciences, Torino, Italy, 4Città della Salute e della Scienza University-Hospital, Division of Gastroenterology, Torino, Italy

**Background and aims:** Oncostatin M (OSM) is a pleiotropic cytokine belonging to the interleukin (IL)-6 family that acts on a large variety of cells involving two distinct heterodimeric receptor complexes: leukemia inhibitory factor receptor beta (LIFRbeta) and OSM receptor beta (OSMRbeta) that is the receptor able to mediate the most relevant biological effects of OSM in mice. OSM has been proposed to contribute to the progression of chronic liver diseases, hepatocellular carcinoma (HCC) development and metastasis. High levels of OSM were found in cirrhotic patients with different etiology carrying HCC. In particular we observed that OSM serum levels are significantly higher in patients carrying non-alcoholic steatohepatitis (NASH)-related HCC, as compared to those with viral etiologies, and their...
increase parallels the disease progression from simple steatosis to HCC. Noteworthy, OSM serum levels are significantly higher in patients with intermediate/advanced HCC and correlate with poor survival. This work discusses the role of OSM in relation to the development of HCC in a NASH background.

**Method:** We investigated the role of OSM in NASH-related HCC taking advantage of: a) cohort of NASH patients with HCC; b) human THP1 macrophage cell lines exposed to human recombinant OSM (hrOSM); c) Wild type (wt) mice fed with a control diet (CSAA) or a lipogenic diet (CDAa) for 24 weeks in order to reproduce the non-alcoholic fatty acid disease (NAFLD)/NASH pathogenic phenotype (CSAA-CDAa protocol); d) Wild type (wt) and OSMRbtae knockout (OSMRbeta/-/) mice treated with a protocol of NASH-related liver carcinogenesis (DEN/CDAa protocol).

**Results:** In patients with NASH-related HCC, OSM is expressed in cancer cells in relation to CD68+ macrophages infiltrating tumour. In in vitro experiments, conducted on human THP1 macrophages exposed to hrOSM, we found that OSM is able to promote an M2 pro-tumorigenic phenotype, which is due to the activation of STAT3 and PI-3K/Akt signaling pathways. Accordingly, OSM expression, which was found increased in NASH-related liver tumours of wt mice during the progression of NAFLD/NASH towards HCC, correlates with F4/80 gene expression. This data suggests an interplay between OSM and macrophages recruitment/functions in the tumor microenvironment. In particular, wt mice treated with the DEN-CDAa protocol show a stronger promotion of the M2 phenotype compared with the M1 and in these mice OSM transcript levels correlate better with M2 macrophage polarization markers. As OSMRbta is fundamental for the activation of the OSM-related STAT3 and PI-3K/Akt signaling pathways, the OSMRbta/-/- murine model was employed to exploit the role of OSM in this regard. In this respect, the data obtained in the OSMRbta/-/- murine models shows that the livers of these animals develop smaller tumours. This event appears to be due to: i) a decreased amount of M2 Tumor Associated Macrophages (TAMs) in the nodules as revealed by the reduction of transcription levels of CD163, PDL1, CD206 and CCR2 compared with wt mice; ii) a impairment of the angiogenic process as shown by lower transcript levels of VE-cadherin, VEGFR2 and CD105 compared with wt mice.

**Conclusion:** Experimental data highlight a pro-carcinogenic contribution for OSM in NASH, by promoting pro-tumorigenic inflammation, suggesting a possible role for the OSM-OSMRbtae axes as therapeutic target for NASH-related HCC.

**SAT-212 Novel platinum-based chemotherapeutic agents halt cholangiocarcinoma progression through the induction of inter-strand DNA breaks, preventing DNA repair mechanisms**

Irene Olazloa1, Mikel Odriozola2, Maitane Asensio3,4, Paula Olazloa1,4, Ivan Rivilla2,5, Amanda Guimaraes2, Francisco J. Caballero1, Elisa Herrera2,3,4, Oscar Briz1,4, Pedro Miguel Rodrigues1,4,5, María Jesús Perugorria1,4,6, Luis Bujanda1,4, Jose Marin3,4, Fernando Pedro Cossío2, Paula Olaizola1,4, Ivan Rivilla2,5, Amanda Guimaraes2, Francisco J. Caballero1, Elisa Herrera2,3,4, Oscar Briz1,4, Pedro Miguel Rodrigues1,4,5, María Jesús Perugorria1,4,6, Luis Bujanda1,4, Jose Marin3,4, Fernando Pedro Cossío2.

**Background and aims:** Cholangiocarcinoma (CCA) comprises a heterogeneous group of biliary malignant tumors characterized by dismal prognosis. The first-line treatment for advanced CCA [cisplatin (CisPt) and gemcitabine] is considered palliative due to the high chemoresistance of this cancer, barely impacting on patients’ overall survival. Here, we aimed to design, synthesize and study a new generation of platinum (Pt)-derived chemotherapeutic drugs that produce inter-strand DNA breaks (vs classical single-strand breaks induced by CisPt and related compounds) and thus, prevent the development of DNA repair mechanisms in cancer cells.

**Method:** Ten Pt-derivatives (Aurki-Pt#s) were designed and synthesized. Atomic Force Microscopy (AFM) and Transmission Electron Microscopy (TEM) were used to characterize the binding of Aurki-Pt#s to DNA. The antitumoral effect of the two best candidates (Aurki-Pt#1 and #2) was evaluated by measuring the viability of human CCA cells (EGI-1 and HUCC1T), newly generated CisPt-resistant EGI-1 CCA cells, normal human cholangiocytes (NHC) and cancer-associated fibroblasts (CAFs). The DNA damage induced by Aurki-Pt#1 and #2 was assessed using the comet assay. To ascertain the internalization mechanism of Aurki-Pt#1 and #2, substrate competition studies through flow cytometry and accumulation studies using HPLC-MS/MS were carried out. Finally, the effect of Aurki-Pt#1 and #2 was also tested in vivo on a subcutaneous xenograft model of CCA.

**Results:** Aurki-Pt#s induced inter-strand DNA breaks, and the subsequent DNA fragmentation, contrary to CisPt. Aurki-Pt#1 and #2 significantly reduced CCA cell viability. Both compounds triggered increased DNA damage in CCA cells when compared to CisPt, augmenting the reactive oxygen species levels and being more effective when inducing apoptosis in vitro. Additionally, Aurki-Pt#1 and #2 decreased the proliferative capacity of those CCA cells that survived. Importantly, Aurki-Pt#1 and #2 also promoted cell death in CisPt-resistant CCA cells. Moreover, Aurki-Pt#1 and Aurki-Pt#2 caused CCA spheroid shrinkage. On the contrary, Aurki-Pt#1 and #2 did not induce a lethal effect in NHC in culture, but promoted cell cycle arrest. Besides, Aurki-Pt#1 and Aurki-Pt#2 had an impact on the survival of CAFs. Aurki-Pt#1 and #2 were transported into cells through OCT1, OCT3, CTR1 and OATP1A2, which did not transport CisPt. Finally, Aurki-Pt markedly hampered tumor growth on a subcutaneous xenograft model of CCA in comparison with CisPt or vehicle control.

**Conclusion:** This new generation of Pt-derived chemotherapeutic drugs selectively diminishes CCA cell viability through the induction of inter-strand DNA breaks, and has an impact on its tumor microenvironment, representing a promising therapeutic tool for naïve or CisPt-resistant CCA tumors.

**SAT-213 Dynamic evolution of the serum metabolome reflects human hepatocarcinogenesis**

Johann von Felden1, Tim Rose2, Lorenz Adlung1, Manuela Peschka1, Thorben Frueend1, Ismail Labgaa2, Philipp Haber1, Carolin Zimpel3, Darko Castven4, Arndt Weinmann5, Teresa Garcia-Lezana4, Moritz Waldmann5, Thomas Renne1, Hannah Voß1, Manuela Moritz1, Dorian Orlikowski1, Helmut Schlüter1, Myron Schwartz4, Kornelius Schulze1, Jens Marquardt5, Augusto Villanueva4, Josch Pauling2, Henning Wege1.

**Background and aims:** Liver cancer is associated with rising incidence and mortality rates. Mechanisms of hepatocarcinogenesis are poorly understood and current tools for early detection of hepatocellular carcinoma (HCC) remain suboptimal. The aim of this
The study was to confirm that the human serum metabolome undergoes significant alterations during hepatocarcinogenesis.

**Method:** This global, multicenter study included a total of N = 552 patients and n = 691 biospecimens from United States, Germany, and China. We performed targeted metabolomics by ultra-high pressure liquid chromatography coupled to tandem mass spectrometry in sera of N = 406 patients across the spectrum of hepatocarcinogenesis. Deregulated metabolites and respective pathways were identified by differential abundance, unsupervised biclustering using MoSbi, lipid network analysis with LINEX2, and pathway enrichment analysis. Findings were validated by mRNA sequencing and proteome profiling of primary HCC tissue and adjacent non-tumoral tissue in two independent cohorts (n = 285 specimens), including a publicly available dataset (Jiang et al. Nature 2019). Finally, we performed a phase 2 biomarker case-control study for early-stage HCC detection using blood samples (N = 375).

**Results:** Aspartic acid, glutamic acid, taurine, and hypoxanthine were among the top differentially abundant metabolites in the serum across chronic liver disease, cirrhosis, early HCC, and progressed HCC, independent of sex, age, and etiology (all p < 2*10^{-16}, n = 406). Unsupervised biclustering (FDR < 0.05), lipid network analysis (>1.5-log2 fold change, FDR < 1*10^{-5}), and pathway enrichment analysis (up to 30% impact, FDR = 1.43*10^{-2}) further confirmed alterations in amino acids, lipid-, and nucleotide-related pathways. In tissue, these pathways were significantly deregulated on gene expression and protein abundance levels in two independent datasets, including upregulation of DUT, GMPS, NME6, and RRM2 (purine metabolism and/or nucleotide metabolism), BCA1 and PYCR2 (biosynthesis of amino acids), and NEU1 (sphingolipid metabolism) (all FDR < 0.05, n = 285). Finally, a phase 2 biomarker case-control study yielded high accuracy for a 10-metabolite signature from serum to discriminate between early HCC and cirrhotic controls (AUC 92%, n = 330).

**Conclusion:** Our findings demonstrate that serum metabolome profiling reflects deregulated metabolites and pathways during human hepatocarcinogenesis and identifies actionable candidates for chemoprevention. In addition, this liquid biopsy approach accurately detects early-stage HCC.

**SAT-214**

**TAK1 deficiency promotes liver injury and tumorigenesis via ferroptosis and macrophage eGAS-STING signaling**

Haoming Zhou, Wantong Su, Qi Wang, Xun Wang, Ling Lu. The First Affiliated Hospital of Nanjing Medical University, Hepatobiliary Center, China

Email: lvling@njmu.edu.cn

**Background and aims:** Oxidative stress-mediated ferroptosis and macrophage-related inflammation play an important role in various...
liver diseases. Here, we explored if and how hepatocyte ferroptosis regulates macrophage STING activation in the development of spontaneous liver damage. Fibrosis, and tumorigenesis. **Method:** We used TAK1 deficiency-induced liver spontaneous damage, fibrosis, and tumorigenesis model to investigate hepatocyte ferroptosis and its impact on macrophage STING signaling. Primary hepatocytes and macrophages were used for in vitro experiments. **Results:** Significant liver injury and increased numbers of intrahepatic M1 macrophages were found in hepatocyte-specific TAK1-deficient (TAK1ΔHEP) mice, peaking at 4 w and gradually decreasing at 8 w and 12 w. Meanwhile, activation of STING signaling was observed in livers from TAK1ΔHEP mice at 4 w and had decreased at 8 w and 12 w. Treatment with a STING inhibitor promoted macrophage M2 polarization and alleviated liver injury, fibrosis, and tumor burden. TAK1 deficiency exacerbated liver iron metabolism in mice with a high-iron diet. Moreover, consistent with the results from single-cell RNA-Seq dataset, TAK1ΔHEP mice demonstrated an increased oxidative response and hepatocellular ferroptosis, which could be inhibited by ROS scavenging. Suppression of ferroptosis by ferrotatin-1 inhibited the activation of macrophage STING signaling, leading to attenuated liver injury and fibrosis and a reduced tumor burden. Mechanistically, increased intrahepatic and serum levels of 8-OHdG were detected in TAK1ΔHEP mice, which was suppressed by ferroptosis inhibition. Treatment with 8-OHdG antibody inhibited macrophage STING activation in TAK1ΔHEP mice. **Conclusion:** Hepatocellular ferroptosis-derived oxidative DNA damage promotes macrophage STING activation to facilitate the development of liver injury, fibrosis, and tumorigenesis. Inhibition of macrophage STING may represent a novel therapeutic approach for the prevention of chronic liver disease.

**SAT-215**

Targeting the E2F/MCM axis in cholangiocarcinoma halts disease progression in experimental models by rewiring lipid metabolism

Mikel Ruiz de Gauna1, Ana Nieva-Zuluaga1, Maider Apodaka-Biguri1, Francisco González-Romero1, Nerea Muñoz-Llanes1, Paul Gomez-Jauregui1, Natalia Sainz-Ramírez1, Kendal Alfaro-Jiménez2, Beatriz Gómez Santos3, Xabier Buque1, Igor Aurrekoetxea1,2, Igotz Delgado1, Idoia Fernández-Puertas1, Ainhoa Iglesias3, Pedro Miguel Rodrigues4,5,6, Diego Calvisi7, Pablo Gomez-Jauregui1, Natalia Sainz-Ramírez1, Kendal Alfaro-Jiménez2, Beatriz Gómez Santos3, Xabier Buque1, Igor Aurrekoetxea1,2, Igotz Delgado1, Idoia Fernández-Puertas1, Ainhoa Iglesias3, Pedro Miguel Rodrigues4,5,6, Diego Calvisi7, Manuel Calvió7, Ana Zubía1, Jesus María Banales1,2,5,6, Patricia Aspichueta1,2,5,1.

1University of the Basque Country (UPV/EHU), Faculty of Medicine and Nursing, Department of Physiology, Leioa, Spain, 2Biocruces Health Research Institute, Cruces University Hospital, Barakaldo, Spain, 3University of Basque Country (UPV/EHU), Faculty of Science and Technology, Department of Genetic, Physical Anthropology and Animal Physiology, Leioa, Spain, 4Department of Liver and Gastrointestinal Diseases, Biodonostia Health Research Institute, Donostia University Hospital, University of the Basque Country (UPV/EHU), San Sebastian, Spain, 5National Institute for the Study of Liver and Gastrointestinal Diseases (CIBERehd, Instituto de Salud Carlos III), Spain, 6IKERBASQUE, Basque Foundation for Science, Bilbao, Spain, 7Institute for Pathology, Regensburg University, Regensburg, Germany, 8Department of Biochemistry and Genetics, School of Sciences, University of Navarra, Pamplona, Spain

Email: patricia.aspichueta@ehu.eus

**Background and aims:** Cholangiocarcinoma (CCA) comprises a heterogeneous group of biliary cancers with dismal prognosis. E2F1 and E2F2, transcription factors that regulate cell cycle and metabolism, are upregulated in metabolic associated fatty liver disease (MAFILD), which is a risk factor of CCA. E2F1/2 drive MAFILD-related hepatocellular carcinoma (HCC) development, sustaining a pro-carcinogenic lipid-rich environment. Minichromosome maintenance (MCM) proteins, helicases involved in DNA replication and cell cycle, are recognized targets of E2Fs that have been linked to different cancers. Thus, the aims were: 1) to evaluate the involvement of the E2F/MCM axis in CCA, and 2) to investigate the potential therapeutic regulatory value of E2F/MCM axis in the rewiring of the cancer lipid metabolism.

**Method:** Akt1 and Yap or Taz were overexpressed in the liver of wild type (WT) or E2f1−− mice as models of CCA. CCA cancer associated fibroblasts (CAFs) were isolated from patients. Triglyceride (TG) concentration was measured in liver samples of the mouse models of CCA and in cell lines in vitro. Cell viability, proliferation, spheroïd growth and fatty acid oxidation (FAO) rate were measured in EG11 and HUCCT1 CCA cell lines in the presence or absence of ciprofloxacin (CPX), an antibiotic that inhibits the MCM2–7 helicase activity. The effect on CCA cell viability, proliferation and spheroïd growth of an inhibitor of E2F activity (HLM006474) was also tested. Data from human CCA tumours from the TCGA-CHOL cohort were analysed.

**Results:** Expression (mRNA) of E2F1 and E2F2 was upregulated in human CCA tumours, patient-derived CAFs, and in cellular and mouse models of CCA compared to controls; consequently, expression levels of MCM2–7 were also found elevated, and correlated positively with E2F1/2 expression. Experimental overexpression of Akt1 and Yap, or Akt1 and Taz, in E2F1−− mice resulted in significantly reduced tumour development compared to WT mice. The upregulation of E2F1/2 and MCM-2 in CCA cells and tumours in mice was accompanied by increased TG content. Inhibition of MCM activity in human CCA cells with CPX induced a dose-dependent decrease in tumour cell viability, proliferation and spheroïd growth. CPX also reduced the TG content and the FAO of CCA cells (EG11) in vitro, which we had previously shown to be highly dependent on FAO for proliferation, and incubation with HLM006474 also decreased CCA cell viability, proliferation and spheroïd size in vitro. Combination of CPX and HLM006474 induced a higher reduction of CCA cell viability in vitro than CPX or HLM006474 alone, suggesting that E2F activity promotes CCA progression not only by modulating MCM expression.

**Conclusion:** The E2F/MCM axis is upregulated in CCA and is required for tumour cell survival and proliferation, potentially by affecting, among other mechanisms, the increased TG content, FAO rate and the tumour microenvironment, arising as a novel target for therapy in this cancer.

**SAT-216**

MAP7 promotes an epithelial-mesenchymal-amoeboid transition in hepatocellular carcinoma by switching one-carbon metabolism

Claudia Gil-Pitarch1, Iker Uriarte2, Esther Bertran3, Natalia Herrmann-Sánchez4, José Manuel García-Heredia5,6,7, Rubén Rodríguez Agudo1, Naroa Goikoetxea1, Sofía Lachiondo-Ortega1, Maria Mercado-Gómez1, Irene González-Recio1, Teresa Cardoso Delgado1, Maria Vivanco1, Luis Alfonso Martínez-Cruz1, César Augusto Martín1, Rafael Artuch10, Mario Fernández12, Manuel Galeote Ortiz12, Isabel Fahregat3,13,14, Matías A Avila2,15, Amancio Cárdeno16, María Luz Martínez-Chantar1, 1CIC bioGUNE, Liver disease lab, DERIO, Spain, 2CIMA, University of Navarra, Spain, 3Belvitge Biomedical Research Institute (IDIBELL), Spain, 4Maimonides Institute for Biomedical Research of Cordoba (IMIBIC), Spain, 5University of Seville, Spain, 6Grupo del CIBER de cáncer (CIBERONC), agencia estatal consejo superior de investigaciones científicas, instituto de biomedicina de sevilla (IBIS), Spain, 7Instituto de Biomedicina de Sevilla (IBIS), Spain, 8CIC bioGUNE, basque research and technology alliance, Spain, 9Department of molecular biophysics, biofisika institute (university of basque country and consejo superior of investigaciones científicas (UPV/EHU, CSIC), Spain, 10Clinical biochemistry department, Instituto de Recerca Sant Joan de Déu, CIBERER and MetaerbN Hospital Sant Joan de Déu, Spain, 11Cancer Epigenetics and Nanomedicine Laboratory, Nanomaterials and Nanotechnology Research Center (CINN-CSIC), Spain, 12Department of Cell Biology, Physiology, and Immunology (University of Córdoba), Reina Sofia University Hospital and CIBERobn, Córdoba, Spain, 13CIBER Enfermedades hepáticas y digestivas (CIBERehd), Spain, 14Department of physiological sciences II, University of Barcelona, Spain, 15IdiSNA, Navarra institute for health research, Pamplona, Spain, 16Instituto de
Background and aims: Epithelial-mesenchymal transition (EMT), a key process during embryonic development, promotes cell migration and resistance to apoptosis during tumour invasion and metastasis. In hepatocellular carcinoma (HCC) an amoeboid behaviour tends to increase the aggressiveness and metastatic capacity of epithelial tumours. MAP17 is a 17 kDa membrane protein expressed during embryogenesis, absent in most adult organs. The presence of MAP17 correlates with an inflammatory environment, hypoxia and increased reactive oxygen species (ROS). MAP17 has been identified in several types of cancer, including HCC. Modulation of EMT and amoeboid behaviour via MAP17 offers an attractive approach to prevent metastasis.

Method: Two HCC patient cohorts were used to characterise MAP17 levels. In vitro, expression of MAP17 was measured in mesenchymal and epithelial hepatoma cells, and its levels were modulated to study cell proliferation, drug resistance, mitochondrial dynamics, metabolic rewiring, and proteome homeostasis. In vivo, the role of MAP17 in the metastatic capacity was evaluated using orthotopic HCC mouse models.

Results: A positive correlation between MAP17 and mesenchymal markers, RAC/RHO family genes and markers of amoeboid movement was established in 751 HCC patients by in silico studies and by mRNA expression analysis in 246 HCC patients. MAP17 overexpression in 3D epithelial cell experiments let to the formation of rosette invadopodia, proinvasive structures with high metastatic capacity. MAP17 overexpression in vitro induced a reprogramming of energy metabolism in hepatoma cells with epithelial phenotype, increasing mitochondrial dynamics and Warburg effect-mediated lactic acidosis, which support a tumour microenvironment conducive to cancer cell proliferation. ROS generation was increased as a protective mechanism to avoid apoptotic and senescence processes. Rewiring of the one-carbon metabolic pathway was identified, proving an accelerated metabolism of the cell. There was a faster methionine degradation fueling the folate cycle, which is the source of purines and pyrimidines, supporting a higher proliferative state. Thus, MAP17 could be involved in the methionine cycle, specially affecting the folate cycle. Accordingly, overexpression of MAP17 in PLC/PRF/5 cells led to the formation of multiple tumour foci when orthotopically implanted in the mouse liver. MAP17 silencing in hepatoma cells with mesenchymal phenotype led to the opposite results, regressing the tumour phenotype and slowing down the cell metabolism and proliferation.

Conclusion: Modulation of MAP17 in epithelial and mesenchymal HCC cells leads to the reprogramming of the transitional genes that define each phenotype. Our findings have identified the metastatic potential of MAP17 in liver cancer, as it triggers the mesenchymal phenotype and amoeboid behaviour in HCC.

SAT-217
Deciphering the cellular and molecular determinants of immunotherapy resistance in NASH-associated hepatocellular carcinoma by single-cell analysis
Lingyun Zhang1,2, Yiling Zhang1, Wenshu Tang1, Zhenwen Xiong1, Xiaoyu Liu1, Zhixian Liang1, Weiqin Yang1, Alfred Sze-Lok Cheng1.1The Chinese University of Hong Kong, School of Biomedical Sciences, Hong Kong, 2The Chinese University of Hong Kong, Hong Kong Email: alfredcheng@cuhk.edu.hk

Background and aims: Non-alcoholic steatohepatitis (NASH) has become a prominent risk and the fastest growing cause of hepatocellular carcinoma (HCC). Although immune checkpoint blockade (ICB) therapy, such as anti-programmed cell death-ligand 1 (anti-PD-L1) has exhibited effect in a subset of HCC patients, recent studies unveiled that NASH limited anti-tumor surveillance in ICB-treated HCC. Here we aimed to delineate the mechanisms underlying ICB resistance in NASH-HCC at single-cell resolution.

Method: Orthotopic NASH-HCC mouse models were established through intrahepatic inoculation of liver cancer cell line in NASH mouse induced by methionine-and choline-deficient diet (MCD) or choline-deficient, L- amino acid-defined, high-fat diet (CDAHFD). Multi-color flow cytometry and single-cell RNA-sequencing (scRNA-seq) were utilized to dissect the liver and tumor immune micro-environment upon anti-PD-L1 treatment.

Results: Both MCD-HCC and CDAHFD-HCC mouse models showed no response to anti-PD-L1 therapy. Compared to control liver, multi-color flow cytometry demonstrated that CD11b+F4/80+CD206+M2 macrophages accumulated in NASH and further increased in liver and tumor upon anti-PD-L1 treatment. Notably, significantly positive correlations were identified among hepatic, intratumoral M2 macrophages and tumor weight. Moreover, tumor-infiltrating PD-1-expressing CD8+ T cells positively correlated with tumor weight and intratumoral M2 macrophages. Furthermore, scRNA-seq analysis of tumor-infiltrating immune cells demonstrated remarkably distinct pattern of monocyte/macrophage subclusters compositions which enriched in NASH-HCC development and anti-PD-L1 resistance.

Conclusion: The results provide insights into the importance of monocyte/macrophage reprogramming in ICB-resistance in NASH-HCC. Further investigation is warranted to determine the molecular determinants of these subclusters and identify potential targeted strategy for immunotherapeutic enhancement.

Acknowledgements: This study is supported by the RGC GRF (14120621), CRF (C4045-18W) and Li Ka Shing Foundation.

SAT-218
Differential hepatoprotective effects of semaglutide and lanifibranor in the GAN diet-induced obese and biopsy-confirmed mouse model of NASH with advanced fibrosis and HCC
Malte H. Nielsen1, Susanne Pors1, Jacob Nehr-Meldgaard1, Andreas Nygaard Madsen1, Mathias Bølle Møllerhøj1, Denise Oró1, Mogens Vybberg2, Henrik B. Hansen1, Michael Feigh1, 1Gubra, Harsholm, Denmark, 2Center for RNA Medicine, Aalborg University, Department of Clinical Medicine, Aalborg, Denmark Email: mni@gubra.dk

Background and aims: Non-alcoholic steatohepatitis (NASH) increases the risk for the development of liver fibrosis which may progress to cirrhosis and hepatocellular carcinoma (HCC). Semaglutide (glucagon-like-receptor (GLP)-1 agonist) and lanifibranor (pan-peroxisome proliferator-activated receptor agonist) are currently in late-stage clinical development for NASH. The present study aimed to evaluate the efficacy of semaglutide and lanifibranor monotherapy on disease progression in the translational Gubra Amylin NASH (GAN) diet-induced obese (DIO) and biopsy-confirmed mouse model of advanced fibrosing NASH and HCC.

Method: Male C57BL/6J mice were fed the GAN diet high in fat, fructose, and cholesterol for 54 weeks prior to treatment intervention. Only animals with liver biopsy-confirmed NAFLD Activity Score (NAS ≥ 5) and advanced fibrosis (stage F3) were included and stratified into study groups. DIO-NASH-HCC mice received vehicle (SC, QD, n = 16), semaglutide (SC, QD, 30 nmol/kg, n = 15), or lanifibranor (PO, QD, 30 mg/kg, n = 15) for 14 weeks. Vehicle-dosed chow-fed C57BL/6J mice (SC, QD, n = 9) served as lean healthy controls. Untreated DIO-NASH-HCC mice (n = 10) were terminated at baseline. Tumor histopathological classification was performed by a clinical histopathologist. Within-subject (pre-to-post) change in non-alcoholic fatty liver disease (NAFLD) Activity Score (NAS), fibrosis stage, and collagen deposition (PSR % area) was evaluated using automated deep learning-based image analysis (GHOST). Other end points included terminal blood biochemistry and quantitative histomorphometry.

Results: DIO-NASH-HCC mice demonstrated progressive HCC burden over the 14-week study period. Tumors showed consistent
architectural and cytologic features of HCC with a marked loss of reticulin-stained fibers. Both semaglutide and lanifibranor significantly improved individual histopathological NAS ≥ 2 point, supported by beneficial changes in quantitative histological markers of steatosis (lipids and hepatocytes with lipid droplets) and inflammation (number of inflammatory foci, galectin-3). While both compounds did not improve fibrosis stage, lanifibranor significantly reduced individual pre-to-post quantitative fibrosis levels after 14 weeks. Notably, though, both compounds reduced histological marker of fibrogenesis (α-SMA). In contrast, semaglutide, but not lanifibranor, completely prevented progression in macroscopic tumor numbers, accompanied by reduced quantitative histological markers of proliferation (Ki67) and progenitor cell activation (CK19).

**Conclusion:** Consistent with recent clinical trials, lanifibranor and semaglutide improves NASH, while only lanifibranor promoted fibrosis regression in GAN DIO-NASH-HCC mice. Notably, semaglutide also improves HCC burden in the model. Deep learning-based persistent analysis is advantageous to assess within-subject changes in histopathological scores and quantitative fibrosis histology following drug treatment. Collectively, our data highlights the suitability of GAN DIO-NASH-HCC mice for profiling novel drug therapies targeting NASH with advanced fibrosis and HCC.

**SAT-220**

**Anti-CD122 antibody restores specific CD8+ T cell response in non-alcoholic steatohepatitis and prevents hepatocellular carcinoma growth**

Stéphanie Lacotte1, Florence Slits1, Beat Moechli2, Andrea Peloso2, Stéphane Konig2, Matthiew Thi2, Sofia El Hajji1, Laura Rubbia-Brandt1, Christian Tos1, 2University of Geneva, Surgery, Geneva, Switzerland, 3University of Geneva, Surgery, Geneva, Switzerland

**Background and aims:** Non-alcoholic steatohepatitis (NASH) can lead to hepatocellular carcinoma (HCC). Although immunotherapy is used as first-line treatment for advanced HCC, the impact of NASH on anticancer immunity is only partially characterized. We aimed at assessing the tumor-specific T cell immune response in the context of NASH in a mouse model of recurrent HCC.

**Method:** We engineered an HCC cell line (RIL-175) with cytoplasmic expression of ovalbumin (OVA). CS7BL/6N mice fed a high-fat (HFD) or a control diet (ND) for 35 weeks were injected with 1.5 × 105 RIL-175-LV-OVA-GFP cells into the portal vein. The immune cell subsets and their phenotype were assessed in the blood, in the liver and in the tumors. A dataset of human gene expression in healthy liver, NASH, NASH-adjacent to HCC and HCC was also analyzed.

**Results:** After 35 weeks of HFD, the mice were obese and developed severe steatosis with inflammation. We observed an increase of the CD8+ T cell subset in the livers of HFD-fed mice, which corresponded to an expansion of the population of CD44+ CCR6+ PD-1+ CD8+ T cells known to promote NASH lesions. 14 days after injection of RIL-175-LV-OVA-GFP cells, HFD-fed mice had a higher percentage of peripheral OVA-specific CD8+ T cells than ND-fed mice (3.81 vs 3.67%; p = 0.010), but these cells did not prevent HCC growth as the tumors were larger in HFD-fed mice (620 vs 1603 mm3, p = 0.051). In the liver, OVA-specific CD44+ CCR6+ CD8+ cells were present at similar levels in ND- and HFD-fed mice, but the expression of PD-1 was higher in HFD-fed mice suggesting lowered immune activity (MFI 12605 vs. 16083, p = 0.0159). Treating mice with an anti-CD122

**Conclusion:** Capillarization of tumor endothelial cells in HCC is not only present in our HCC model and human HCC samples. As our intravital imaging shows that the tumor-specific T cells infiltrate into the tumor from the surrounding LSEC, but not the capillarized TEC, it is critical to design a new strategy to delay or reverse the TEC development, which facilitates the T cell infiltration and improves immunotherapy response in HCC.

**Figure:**

**SAT-220**

**Capillarization of tumor endothelial cells within tumor associated with T cell exclusion in an autochthonous mouse HCC model**

Pin-Hung Lin1, Tai-Chung Tseng2, Hung-Chih Yang2, Ian Liu3.

**Background and aims:** Liver sinusoidal endothelial cells (LSEC) are featured by the presence of fenestrae and lack of basal lamina and tight junctions between cells, which is different from the capillary EC. Such unique characteristics make LSEC where the surveillance and infiltration of T cells occurs. Recent studies have shown that persistent inflammation in liver results in sinusoidal capillarization, which is featured by overexpression of CD31, CD34, plasmalemmal vesicle associated protein-1 (PLVAP), and collagen IV, a major component of basal lamina. However, little is known about whether sinusoidal capillarization is present in hepatocellular carcinoma (HCC) and how it affects the T cell infiltration.

**Method:** We generated a spontaneous HCC mouse model via transposon-based delivery of oncogenes and CRISPR/Cas9-mediated knockout of tumor suppressor genes to transform primary hepatocytes through hydrodynamic injection (HDl). In addition, the oncogene was conjugated with a tumor antigen (OVA257-264), a fluorescence protein for intravitral imaging, and a secretory HibiT for tumor marker.

**Results:** In our autochthonous mouse HCC model, the HibiT level was first shown to correlate well with the tumor cell number and size in vitro and in vivo, respectively. We then found that the serum HibiT level remained stable and the tumor size increased slowly within 3–5 weeks after HDl (early tumor, <100 μm in diameter) but increased rapidly after week 7 (advanced tumor). The IHC staining showed that T cells were present within the early tumor but were excluded at the border of advanced tumor. The transferred OT-1 T cells were shown to infiltrate into the tumor from the LSEC surrounding the early tumor using intravitral imaging. In contrast, these cells were shown to stay mostly at the peripheral part, but not the core of advanced tumor using clear tissue imaging (n = 8, p < 0.01). We then studied the difference between tumor endothelial cells (TEC) and LSEC, the key to affect T cell infiltration. We found that TEC expressed more CD31, CD34, and PLVAP than LSEC, and the specific component of basement membrane, collagen IV, was only present around the TEC in advanced tumor, but no LSEC via clear tissue imaging. In human HCC, we also found that the increased expression of CD34 and PLVAP was present in TEC, but not LSEC, of human HCC either using IHC of human samples or RNAseq data of TCGA database. All these data suggest that the capillarization of TEC in HCC, which may be the key to block T cell infiltration into advanced tumor.

**SAT-219**

**Autochthonous mouse HCC model**

**Human PLVAP**

**Human CD34**

**Early tumor**

**Advanced tumor**

**WT**

**POSTER PRESENTATIONS**
antibody, which reduced the number of CXCR6+ PD-1+ cells, we restored OVA-specific CD8 activity (MFI 16406 vs. 10516, p = 0.0571), and reduced HCC growth compared to untreated HFD-fed mice (p = 0.0286). The human dataset confirmed that NASH-affected livers, NASH tissues adjacent to HCC and HCC in patients with NASH exhibited similar expression of a panel of genes.

**Conclusion:** The immune system is altered and fails to prevent HCC growth in HFD-fed mice. This effect is primarily linked to a higher representation of CD44+ CXCR6+ PD-1+ CD8+ T cells. Treatment with anti-CD122 antibody reduces the number of these cells and prevents HCC growth.

**SAT-221**

**Metabolic rewiring by increased mitochondrial respiration drives immunosuppression in liver cancer**

Narna Gkolkoetxea1,2, Leire Egia-Mendikute3, Miren Bravo1, Marina Serrano-Macia1, Teresa Cardoso Delgado1, Iraia Ladero4, Elena Molina5, Sofía Lachiondo-Ortega1, Rubén Rodríguez Agudo1, Janire Castelo5, Diego Barriales5, Begoña Rodriguez Iruretagoyena1, Eva Santamaria6, Maria Mercado-Gómez1, Irene González-Recio1, Mercedes Rincón7, Matías A Avila6,8, Juan Anguita9, Natalia Elguezabal4, Asís Palazón3, María Luz Martínez-Chantar1,2, Janire Castelo5, Diego Barriales5, Begoña Rodriguez Iruretagoyena1, Eva Santamaria6, Maria Mercado-Gómez1, Irene González-Recio1, Mercedes Rincón7, Matías A Avila6,8, Juan Anguita9, Natalia Elguezabal4, Asís Palazón3, María Luz Martínez-Chantar1,2, Eva Santamaria6, Maria Mercado-Gómez1, Irene González-Recio1, Mercedes Rincón7, Matías A Avila6,8, Juan Anguita9, Natalia Elguezabal4, Asís Palazón3, María Luz Martínez-Chantar1,2.

**1Liver Disease Lab, Centre for Cooperative Research in Biosciences CIC bioGUNE, Basque Research and Technology Alliance, Derio, Spain, Spain, 2CIBEREHID, Spain, 3Cancer Immunology and Immunotherapy Lab, Centre for Cooperative Research in Biosciences CIC bioGUNE, Basque Research and Technology Alliance, Derio, Spain, Spain, 4Animal Health Department, NEIKER-Instituto Vasco de Investigación y Desarrollo Agrario, Derio, E-48160 Bizkaia, Spain, Spain, 5Immunocontracr and Macrophage Plasticity Lab, Centre for Cooperative Research in Biosciences CIC bioGUNE, Basque Research and Technology Alliance, Derio, Spain, Spain, 6Instituto de Investigaciones Sanitarias de Navarra-IdisNA, Pamplona, Spain, Spain, 7Department of Medicine, Immunobiology Division, University of Vermont, Burlington, VT, 05405, USA, United States, 8Hepatology Program, Cima-University of Navarra, Pamplona, Spain, Spain Email: ngoikoetxea@cicbiogune.es

**Background and aims:** Recent evidence supporting the need of a mitochondria-based metabolism for tumor growth prompted us to study the role of MCJ, an endogenous negative regulator of mitochondrial complex I, in the context of hepatocellular carcinoma (HCC). The tumor microenvironment imposes various metabolic regulations to hamper the antitumor immunity of infiltrating immune cells, therefore, modulating the metabolic rewiring may help recover the antitumor immune potential. This work aims to prove increased malignancy in mitochondria-based tumors and to analyze the differential immune response driven by metabolic changes.

**Method:** Two different experimental models of HCC were used. Firstly, Wt and whole-body Mcj−/− mice were treated with diethylnitrosamine (DEN) for 5, 8 or 12 months. Secondly, C57/B16 mice were injected with MYC-luc;sgp53 plasmid combination and injected with MYC-luc;sgp53 model, along with reduced inflammatory IFNg and TNF and increased PDL-1. Interestingly, 20% of Mcj-silenced mice developed brain metastases. Mechanistically, increased expression of ectoenzymes CD39 and CD73 was found in Mcj−/− mice, along with higher hepatic adenosine levels, which may promote immunosuppression in T cells via adenosine receptor signaling cascades.

**Conclusion:** Overall, decreased MCJ levels in the liver, which are also seen in advanced HCC patients, promote oxidative respiration and lead to metabolic rewiring that impedes antitumor immune potential via ATP-ectoenzymeme-adenosine signaling and promotes tumorigenesis and even metastasis. Therefore, measurement of MCJ levels along with characterization of glycolytic versus oxidative respiration could help determine the most appropriate treatment, such as blockade of the adenosine axis in combination with immunotherapy.

**SAT-222**

**Drug screening for hepatocellular carcinoma: automating and miniaturizing organoid assays for drug screening**

Tijmen Booij1, Sandro Nuñiforo2, David Keller1, Eva Riegler2, Diego Calabrese3, Markus Heim2, 1ETH Zurich, NEXUS Personalized Health Technologies, Zurich, Switzerland, 2University of Basel, Department of Biomedicine, Basel, Switzerland, 3University Hospital Basel, Histology Core Facility, Basel, Switzerland Email: booij@nexus.ethz.ch

**Background and aims:** The past decades have shown an enormous increase in the use of organoids for in vitro drug evaluation due to their improved physiological relevance. This is in turn expected to reduce the number, and size, of in vivo studies required to select drugs. Due to technological restraints and practical limitations, drug screens with patient-derived organoids have traditionally been performed on a small scale, and these experiments are often used to validate results from earlier in vitro drug screens. To enable large-scale drug screens with hepatocellular carcinoma (HCC) organoids derived from patient biopsies, we aimed to automate and miniaturize the drug screening methodology.

**Method:** The core facility NEXUS Personalized Health Technologies of ETH Zurich operates a lab-automation platform (HighRes Biosolutions). Using this platform, we optimized the liquid handling of organoids and eliminated the requirement for the use of animal-derived hydrogels for 3D culturing. Instead, we optimized the culture conditions with GrowDex and GrowDex-T (UPM Biomedicals), which could be pre-mixed with organoids and dispensed into 1536 well plates using a Certus Flex (Fritz Gyger AG). Using acoustic dispensing technology (Beckman), we could dispense test compounds in nanoliter range to eliminate the requirement for pipette tips. Drug efficacy was measured using cell viability measurement (CellTiterGlo).
3D, Promega) and the developed methodology was evaluated in two patient-derived HCC organoid lines.

**Results:** Here we report the development of a robust organoid high-throughput drug screening platform for hepatocellular carcinoma organoids that is compatible with 1536 well plates and uses the nanocellulose based hydrogel GrowDex-T rather than its animal-derived alternatives as a matrix. We used the newly developed methodology to screen a library of approximately 1,200 FDA-approved drugs in a technical duplicate, and additionally screened a panel of 1,250 novel chemicals in a biological duplicate (performed more than one year apart). For both screens we report high reproducibility and robustness. Furthermore, due to the miniaturization to 1536 well plate format and the elimination of animal-derived matrices, no pipette tips are required at any step in the screening procedure, thereby dramatically reducing the experimental cost and improving assay quality.

**Background and aims:** Cholangiocarcinoma (CCA) comprises a heterogeneous group of malignant tumors with dismal prognosis. Alterations in post-translational modifications (PTMs), including SUMOylation, result in abnormal protein dynamics, cell disturbances and disease. Here, we investigate the role of SUMOylation in CCA development and progression.

**Method:** Levels and function of SUMOylation, together with response to S-adenosylmethionine (SAMe) and ML792 (SUMOylation inhibitors) or CRISPR/Cas9 against UBE2I were evaluated in vitro, in vivo and/or in patients with CCA. The impact of SUMOylation in CCA cells on tumor-stroma crosstalk was assessed performing co-culture experiments with CCA-derived cancer-associated fibroblasts (CAFs), human endothelial cells and monocytes. Proteomic analyses were carried out by mass spectrometry.

**Results:** The SUMOylation machinery was found overexpressed and overactivated in human CCA cells and tumors, correlating with poor prognosis. Most SUMOylated proteins found upregulated in CCA cells, after SUMO1-immunoprecipitation and further proteomics, participate in cell proliferation, survival or cell homeostasis. Genetic (CRISPR/Cas9–UBE2I) and pharmacological (SAMe and ML792) inhibition of SUMOylation reduced CCA cell proliferation and impeded colony formation in vitro. Moreover, both SAMe and ML792 induced apoptotic cell death in CCA cells in vitro. SUMOylation depletion (SAMe, ML792 or CRISPR/Cas9–UBE2I) halted tumorigenesis in subcutaneous models of CCA in vivo. Furthermore, SUMOylation deficiency in CCA cells reduced cancer-associated fibroblast and endothelial cell proliferation and impaired macrophage polarization towards an anti-inflammatory M2-like phenotype.

**Conclusion:** Aberrant protein SUMOylation contributes to cholangiocarcinogenesis by promoting cell survival and proliferation. Moreover, SUMOylation impacts the CCA-stroma crosstalk. Impaired SUMOylation halts CCA growth and, thus, may represent a potential new therapeutic strategy for patients with CCA.

**SAT-224**

**Cytokine levels and circulating DNA profiling in plasma as biomarkers of response to immunotherapy in hepatocellular carcinoma**

Elena Vargas Accarino¹, Monica Higuera¹, María Bermúdez¹, Monica Pons³, Maria Torres¹, Ana Maria Aransay², José Ezequiel Martín³, Xavier Merino³, Beatriz Minguéz¹, Vall d’Hebron University Hospital, Liver Unit, Spain, ²CIC bioGUNE, Spain, ³Vall d’Hebron University Hospital, Radiology Department, Spain.

**Background and aims:** Immune checkpoint inhibitors (ICIs) have revolutionized the therapeutic landscape for advanced hepatocellular carcinoma (HCC). The combinations anti-PD-L1 antibody (atezolizumab and VEGF-neutralizing antibody (bevacizumab) and anti-PD-L1 antibody (durvalumab) and anti-CTLA-4 (tremelimumab) have become first line options. Our aim was to identify potential serological markers of response to ICIs.

**Method:** Prospective cohort of 25 patients treated with ICIs (Nivolumab (n = 14), Atezolizumab/Bevacizumab (n = 8), Durvalumab/Tremelimumab (n = 2) and Lenvatinib/Pembrolizumab
(n = 1). Plasma samples were collected at the beginning and after 3 months of ICI treatment. 24 inflammatory cytokine levels were analyzed by ELISA as well as the levels of circulating cell free DNA (cfDNA), circulating tumor DNA (ctDNA) and percentage of TERT mutation by ddPCR, at baseline and after 3 months of treatment. Basal cfDNA profiling from 21 of these patients was analyzed by Onco-500 TruSight.

Results: 84% of patients were male, median age was 71 years and 76% were BCLC-C at the beginning of ICIs treatment. 76% had underlying liver disease, being HCV infection the most frequent etiology (52%). Median follow-up was 17 months. 8% presented complete radiological response (CR), 20% partial radiological response (PR), 44% stable disease (SD) and 28% radiological progression (PD) as best radiological outcome (RECIST 1.1). Baseline CTLA-4 levels were significantly higher in patients presenting radiological progression [mean (SD)] [76.55 (150.84) pg/ml in PD and 0.15 (0.67) pg/ml in no PD] (p < 0.05). 3 months post-treatment, MCP-1 levels were significantly lower in patients presenting PD [49.25 (25.73)] than in patients presenting CR/PR/SD [73.73 (86.34) pg/ml] (p < 0.05) and TNF-α levels were significantly higher in those patients [110.4 (239.7) pg/9.9 (189.43) pg/ml] (p < 0.05). Baseline ctDNA levels were significantly different between patients presenting radiological response (CR/PR) [2.3 (0.58) ng/ul] vs patients (SD/PD) [8.95 (6.89) ng/ul]. These differences were also present after 3 months under therapy [CR/PR 2.12 (0.92) vs SD/PD 10.1 (10) ng/ul]. Higher levels of cfDNA than 3.04 ng/ul were associated with a poorer overall survival (p < 0.005). ctDNA levels after 3 months of treatment were also significantly different [0.55 (0.35) in CR/PR and 4.35 (5.5) ng/ul in SD/PD] (p < 0.005). Regarding sequencing of baseline cfDNA patients with radiological response (CR/PR) had significantly more copy number variation (CNV) than those without it [97 vs 1] (p < 0.05). Pathogenic mutations in CTNNB1 were present in 97% of patients showing PD, but only in 53% of those presenting stable disease or radiological response, and patients presenting PD had significantly more pathological mutations in CDKN2A (67% vs 7%) (p < 0.05).

Conclusion: Basal levels of cfDNA, CTLA-4, CDKN2A mutations and CNV are significantly different between patients with and without radiological response to ICIs treatment. Levels of MCP-1, TNF-α and total amount of cfDNA and ctDNA after three months of ICIs treatment are significantly different in patients presenting radiological response. Analysis of cfDNA and cytokines could help to identify HCC patients benefiting more of immunotherapies. Deeper molecular analysis are currently ongoing.

SAT-225 Fibroblast growth factor 19 cooperates with Myc to promote liver carcinogenesis
José Ursic Bedoya1,2, Guillaume Desandrè3, Carine Chavey2, Pauline Marie2, Benjamin Riviere1, Anthony Lozano1,2, Pedro Miguel Rodrigues1,2,3, Oihane Erice1, Ana Landá-Magdalena1, Nuno Paiva1, Maite G Fernandez-Barrena1,2,4, Paula Olaizola1,2, Ainhoa Lapitz2, Colm O Rourke4, Jesper Andersen5, Diego Calvisi6, Mikel Azkargorta2,7, Felix Elortza2,7, Ibai Goicoechea8, Charles Lawrie3,8, Luis Bujanda1,2, María Jesús Perugorria1,2,9, Jesus Maria Banáles1,2,3,10, Biodonostia Health Research Institute, Department of Liver and Gastrointestinal Diseases, San Sebastian, Spain, 2National Institute for the Study of Liver and Gastrointestinal Diseases (CIBERehd, “Instituto de Salud Carlos III”), Spain, 3Biodonostia, Basque Foundation for Science, Spain, 4CIMA-University of Navarra, Division of Hepatology, Spain, 5Biotech Research and Innovation Centre (BRIC), Department of Health and Medical Sciences, University of Copenhagen, Denmark, 6Institute of Pathology, University of Regensburg, Germany, 7CIC bioGUNE, CIBERehd, ProteoRed-I3CIII, Bizkaia Science and Technology Park, Proteomics Platform, Spain, 8Biodonostia Health Research Institute, Molecular Oncology group, Spain, 9University of the Basque Country UPV/EHU, Department of Medicine, Faculty of Medicine and Nursing, Spain, 10School of Sciences, University of Navarra, Department of Biochemistry and Genetics, Spain
Email: jose.ursicbedoya@chu-montpellier.fr

Background and aims: Increased expression of the fibroblast growth factor (FGF19), a hormone whose physiological function is the regulation of bile acids and glucose homeostasis, is a hallmark of a sub-group of aggressive hepatocellular carcinoma (HCC). Analogos have been developed to mimic the hepatoprotective metabolic effects of FGF19, while being theoretically devoid of its oncogenic effects. FGF19 analogs, as well as inhibitors of its signaling, are under investigation for treatment of metabolic disorders and HCC, respectively. Our work investigates oncogenic cooperation between FGF19, or its analogs, and pathways frequently mutated in HCC.

Method: We performed hydrodynamic gene transfer (HGT) in C57BL/6 mice to combine overexpression of FGF19, FGFR3, FGFR21, FGFR9 analog (aldafermin) or constitutively active FGFR4 mutant (FGFR4V545L) with oncogenic events commonly found in HCC (p53 inactivation, MYC overexpression, Wnt/ beta-catenin pathway activation). Sequential HGT experiments were used to transfect distinct sets of hepatocytes. Tumors were analyzed by RT-qPCR, RNA-seq, immunohistochemistry (IHC) and phospho-proteome assays. In addition, tumors were dissociated to establish cells lines, which were used for orthotopic xenografts. Transcriptomic datasets from patients with NASH and healthy controls were analyzed to detect Myc pathway activation.

Results: We report that while FGF19 is by itself a weak oncogene, it efficiently cooperates with several oncogenic events characteristic of HCC, such as activation of the Wnt/beta-catenin pathway or increased Myc expression. Sequential HGT experiments demonstrate that FGF19 cooperates with Myc in a non-cell autonomous, paracrine fashion. Transcriptomic and IHC analyses show that FGF19+ tumors display increased neoangiogenesis. Oncogenic cooperation was also observed when Myc was co-expressed with FGF15, FGFR21 or FGFR4V545L. Surprisingly, similar results were obtained with a plasmid coding for aldafermin, notwithstanding the reported lack of oncogenic activity of this analog. Human datasets from NASH patients display frequent Myc pathway activation compared to healthy controls.

Conclusion: Our findings indicate that FGF19/FGFR4 pathway activation cooperates with Myc to promote aggressive HCC. Moreover, we suggest that aldafermin might keep oncogenic properties in this context. Since Myc pathway is often deregulated in patients with NASH or cirrhosis, our results suggest a precautionary approach with regard to the potential adverse effects of FGF analogs in these patients.

SAT-226 KLFR5 upregulation is a common event in cholangiocarcinoma, acting as an oncogene and constituting a bad prognostic factor
Pedro Miguel Rodrigues1,2, Oihane Erice1, Ana Landá-Magdalena1, Nuno Paiva1, Maite G Fernandez-Barrena1,2,4, Paula Olaizola1,2, Ainhoa Lapitz2, Colm O Rourke4, Jesper Andersen5, Diego Calvisi6, Mikel Azkargorta2,7, Felix Elortza2,7, Ibai Goicoechea8, Charles Lawrie3,8, Luis Bujanda1,2, María Jesús Perugorria1,2,9, Jesus Maria Banáles1,2,3,10, Biodonostia Health Research Institute, Department of Liver and Gastrointestinal Diseases, San Sebastian, Spain, 2National Institute for the Study of Liver and Gastrointestinal Diseases (CIBERehd, “Instituto de Salud Carlos III”), Spain, 3Biodonostia, Basque Foundation for Science, Spain, 4CIMA-University of Navarra, Division of Hepatology, Spain, 5Biotech Research and Innovation Centre (BRIC), Department of Health and Medical Sciences, University of Copenhagen, Denmark, 6Institute of Pathology, University of Regensburg, Germany, 7CIC bioGUNE, CIBERehd, ProteoRed-I3CIII, Bizkaia Science and Technology Park, Proteomics Platform, Spain, 8Biodonostia Health Research Institute, Molecular Oncology group, Spain, 9University of the Basque Country UPV/EHU, Department of Medicine, Faculty of Medicine and Nursing, Spain, 10School of Sciences, University of Navarra, Department of Biochemistry and Genetics, Spain
Email: pedro.rodrigues@biodonostia.org

Background and aims: Cholangiocarcinoma (CCA) comprises a heterogeneous group of malignant tumors with poor prognosis. Krüppel-like factors (KLF) are a family of transcription factors involved in large variety of biological processes, including organogenesis, differentiation and cellular homeostasis. Here, we investigated the role of KLFR5 in cholangiocarcinogenesis and evaluated the therapeutic potential of its inhibition during CCA tumorigenesis.

Method: KLFR5 expression was determined in human CCA tissues [Copenhagen (n = 210), TCGA (n = 36), Job (n = 78), TIGER-LC (n = 90) and San Sebastian cohorts (n = 12)] and cell lines. KLFR5+/− CCA cells were generated by CRISPR/Cas9. Proteomic analyses were carried out by mass spectrometry and the functional effects of KLFR5 genetic ablation or chemical inhibition with ML264 were evaluated in vitro and in vivo.
Results: KLF5 expression was upregulated in human CCA tissues from 5 different patient cohorts compared to surrounding normal liver tissue. High KLF5 levels correlated with lymph node invasion and worse overall survival. In vitro, KLF5 protein and mRNA levels were found upregulated in human CCA cells compared to normal human cholangiocytes. Proteomic analysis of KLF5-/- CCA cells revealed that most of the altered pathways are related with the modulation of cell cycle, proliferation, survival and migration. In agreement, KLF5-/- CCA cells displayed decreased cell proliferation, colony formation and migration while promoting cell cycle arrest at G1/S and apoptosis in vitro, when compared with CCA control cells. Instead, no signs of tumor development were evident after subcutaneous or orthotopic injection in a xenograft animal model of CCA. Likewise, pharmacological inhibition of KLF5 with ML264 hampered CCA cells proliferation and migration in vitro and blocked tumor growth in vivo in distinct animal models. Lastly, both genetic and pharmacological inhibition of KLF5 sensitized CCA cells to chemotherapy-induced apoptosis in vitro, and the combination of the standard of care chemotherapy (gemcitabine + cisplatin) and ML264 completely halted CCA tumor growth in mice.

Conclusion: Increased KLF5 is a general event in CCA, contributing to cancer progression by promoting cell survival and proliferation, as well as, chemoresistance. KLF5 inhibition with ML264 may represent a potential therapeutic strategy for CCA.

SAT-227
NLRP3 and IL-1, but not IL-18, are drivers of hepatocellular carcinoma in two independent murine models
Mona Peltzer1, Antje Mohs1, Jan G. Hengstler2, Serena Pelusi3, Luca Valenti3,4, Carolin V. Schneider1, Kai Markus Schneider1, Mona Peltzer1, Antje Mohs1, Jan G. Hengstler2, Serena Pelusi3, Luca Valenti3,4, Carolin V. Schneider1, Kai Markus Schneider1, Christian Trautwein1, University Hospital RWTH Aachen, Department of Internal Medicine III, Aachen, Germany, 2Leibniz Research Centre for murine tumor models (DEN/CCl4 and genetic modified mice). To study PSC related carcinogenesis, results: KLF5 expression was upregulated in their tissue. When compared to surrounding normal liver tissue, KLF5 expression was significantly increased in tumor tissue. KLF5 overexpression was significantly correlated with lymph node invasion and worse overall survival.

Conclusion: Increased KLF5 is a general event in CCA, contributing to cancer progression by promoting cell survival and proliferation, as well as, chemoresistance. KLF5 inhibition with ML264 may represent a potential therapeutic strategy for CCA.

SAT-228
Infiltrating suppressive myeloid cells dominate the pediatric hepatoblastoma tumor immune microenvironment
Danielle Krijgsman1, Lianne Kraaei12, Meggy Verdonschot1, Jeanette Leusen2, Weng Chuan Peng3, Yvonne Vercoolen1, 1UMC Utrecht, Center for Molecular Medicine, Utrecht, Netherlands, 2Princess Máxima Center for Pediatric Oncology, Utrecht, Netherlands, 3UMC Utrecht, Center for Translational Immunology, Utrecht, Netherlands.

Background and aims: Pediatric hepatoblastoma is a rare disease, affecting approximately 1/ million children. Pediatric liver tumors likely originate from immature hepatocyte precursors and show low mutational burden. Until now, the pathobiology of pediatric liver cancer is poorly understood due to their low incidence. Currently, pediatric hepatoblastoma patients are treated with chemotherapy followed by tumor resection. Although this treatment results in a clinical response in most patients, it associates with high toxicity.

Method: Tissue samples of pediatric hepatoblastoma were included from pre-treatment biopsies, and post-chemotherapeutic resections containing both tumor tissue and adjacent normal tissue. A custom developed antibody panel was used for high-plex imaging mass cytometry (Hyperion). Data analysis for single-cell spatial profiling was performed, using the ‘MATISSE’ pipeline which identified both immune cell subsets, and tumor cells. Spatial neighborhood analysis was performed using CytoMap.

Results: Principal Component Analysis revealed that while lymphocyte markers associate with normal tissue, myeloid markers associate with tumor, regardless of treatment. T cell markers CD8a and CD4, and pro-inflammatory proteins IL1 and IFNβ were predominantly found in normal tissue compared to tumor. Moreover, chemotherapy induced an increased expression of CD68 (macrophages) and HLA-DR (MHC-II) in the tumor. We identified diverse myeloid populations: The abundance of macrophage cluster 1, and a cluster of cytotoxic (CD8+) T cells and Macrophages was increased in the tumor upon chemotherapy. Detailed characterization revealed that these macrophages were suppressive, reflected by high expression of CD163, iNOS, and arginase. Moreover, chemotherapy reduced CD3 expression reflecting maturation of infiltrating macrophages upon treatment. Finally, neighborhood analysis revealed that overall, the immune cells avoided tumor and stromal cells, while lymphocytes...
and myeloid cells clearly interacted, suggesting immune cell exclusion.

**Conclusion:** We demonstrate here the first in-depth immune infiltrate characterization of pediatric hepatoblastoma and reveal that the myeloid compartment dominates the immune infiltrate in the tumor compared to normal tissue. Moreover, the infiltrating macrophages numbers increased upon chemotherapy and showed a suppressive phenotype upon chemotherapy, indicating that the chemotherapy itself modulates the immune microenvironment in the tumor. The low numbers of infiltrating lymphocytes and reduced expression of pro-inflammatory proteins, and low interaction between immune cells and tumor indicate an immune-cold tumor microenvironment in hepatoblastoma. Our results suggests that these tumors will likely not benefit from T-cell directed therapeutic strategies and that the myeloid compartment would serve as a more relevant target for alternative treatments to chemotherapy.

**SAT-229**

**Fatty Acid Synthase expression promotes the malignant features of cholangiocarcinoma cells and predicts shorter survival in patients**

Giulia Lori1, Chiara Raggi1, Benedetta Piombanti1, Mirella Pastore1, Elisabetta Rovida1, Jesper Andersen2, Monika Lewinska2, Amalia Gastaldelli1, Fabio Marra1.

1University of Florence, Italy, 2University of Copenhagen, Denmark, 3CNR, Italy

**Background and aims:** Cancer cells are exposed to a metabolically challenging environment with scarce availability of nutrients, and alterations in lipid metabolism may affect the cellular response to drugs. We hypothesize that fatty acids (FA) modulate the biology of cholangiocarcinoma (CCA) cells and the development of stemness features.

**Method:** CCA cells (HuCCT-1 or CCLP1) were treated with monounsaturated FAs (132 μM oleic or 100 μM palmitoleic acid). Self-renewal ability was tested with a colony formation assay. Cancer stem cell (CSC)-enriched spheres were obtained growing cells in anchorage-independent conditions and selective medium. Five-year overall survival (OS) was analyzed in 34 patients with CCA sub-grouped based on fatty acid synthase (FASN) expression. Desaturation index and triglyceride de novo synthesis were performed by lipidomic analysis. NSG mice were injected with CCLP1 spheres and treated with the FASN inhibitor orlistat. Tumor volume was measured using Vevo LAZR-X imaging station. RTPCR array on tumor masses was performed using the QuantNova LNA PCR Panel.

**Results:** Exposure of CCA cell lines to FAs increased cell proliferation and activated growth and survival pathways, including AKT and ERK1/2. Exposure to FA made CCA cells less sensitive to the toxic effects of chemotherapeutic agents, and modulated the expression of ABC transporters involved in drug resistance. The colony forming ability of CCA cells was increased by FAs, and was associated with upregulation of genes controlling epithelial-mesenchymal transition and stemness. Expression levels of genes involved in lipid metabolism were upregulated in CSC-enriched spheres as well as the percentage of desaturated TGs. FASN inhibition by orlistat decreased cell proliferation and CSC or EMT markers. In a xenograft model of CCA, tumor volume was significantly lower in mice treated with orlistat. Accordingly, expression of genes involved in cell proliferation was downregulated while the one of tumor suppressor genes increased. In a series of CCA patients, the expression of FASN correlated with OS.

**Conclusion:** FA promote malignant features of CCA and increase CSC markers. FASN expression levels correlate with survival in patients with CCA and promote CCA growth in mice. Lipid metabolism could be a new target to block CCA progression.

**SAT-230**

**Positive effects of PARP-1 inhibition in KRAS-mutated intrahepatic cholangiocarcinoma is mediated by CHK1 kinase**

Danko Castven1, Friederike Keggenhoff2, Stojan Stojkovic1, Diana Becker2, Jovana Castven1, Carolin Zippe1, Beate Straub2, Harald Langer1, Patrizia Hähnel2, Thomas Kindler2, Jörg Fahrer3, Colm O’Rourke4, Lichun Ma5, Xin W. Wang5, Timo Gaiser6, Matthias Matter7, Christian Sina7, Stefanie Derer7, Stephanie Roessler8, Bernd Kaina9, Jesper Andersen4, Peter Galle2, Jens Marquardt7, 1Universitätsklinikum Schleswig-Holstein, Campus Lübeck, Lübeck, Germany, 2University medicine at the Johannes Gutenberg University in Mainz, Mainz, Germany, 3Technical University of Kaiserslautern, Kaiserslautern, Germany, 4Biotech Research and Innovation Centre, København, Denmark, 5National Cancer Institute, NIH, Bethesda, United States, 6UNIVERSITÄTSMEDIZIN MANNHEIM, Mannheim, Germany, 7Universitätsspital Basel, Basel, Switzerland, 8Heidelberg University, Heidelberg, Germany

**Email:** castvendarko@gmail.com

**Background and aims:** Intrahepatic cholangiocarcinoma (iCCA) is the second most common primary liver cancer with an increasing incidence over recent years. Due to the complexity of iCCA pathogenesis and the pronounced genetic heterogeneity treatment options are still limited. Activating KRAS mutations are among the most abundant genetic alterations in iCCA and are associated with early recurrence, poor response to chemotherapy, and reduced overall survival, highlighting the need for novel therapeutic approaches. Poly (ADP-ribose)polymerase-1 (PARP-1) is frequently observed to be upregulated in iCCA. Evidence indicate potential therapeutic relevance for PARP-1 inhibition in iCCA that preferentially affects KRAS-mutated cancers, but exact mechanisms remain unknown.

**Method:** PARP-1 depletion was generated by siRNA and CRISPR/Cas9-mediated knockdown/knockout in KRAS-mutated and non-mutated iCCA cell lines. Functional assessment of PARP-1 knockout and inhibition of tumorigenic potential was analyzed by viability assay and colony and sphere formation. RNA sequencing was employed to further decipher PARP-1 regulation. To investigate the impact of PARP-1 deficiency in KRAS-driven tumorigenesis, PARP-1 knockout mice were combined with an inducible KRAS-driven mouse model using hydrodynamic tail vein injection. Molecular analyses including transcriptome profiling were employed to further investigate molecular mechanisms.

**Results:** Significant upregulation of PARP-1, as well as enrichment of genes related to PARP-1 activation, was observed in iCCA tissue and KRAS-mutated cell lines. Knockout of PARP-1 in KRAS-mutated cells led to a reduction in colony and sphere formation. Moreover, KRAS-mutated cell lines showed higher sensitivity to PARP-1 inhibition. In vivo PARP-1 deficiency considerably impaired biliary carcinogenesis and induced a shift from dominant iCCA towards HCC phenotype in a KRAS-dependent manner. Transcriptional analyses of CRISPR/Cas9 PARP-1 knockout clones and in vivo tumors revealed differential expression of DNA damage response pathways (e.g. CHK1) as well as cellular pathways affected by PARP-1, (inflammation, oxidative stress,
Conclusion: Together, these findings suggest an unrecognized prognostic and therapeutic role of PARP-1 in iCCA patients with oncogenic KRAS signaling and unveil the potential mechanism of PARP-1 regulation by CHK1 kinase.

SAT-231
Sortilin-driven cancer secretome enhances self-renewal and metastasis of hepatocellular carcinoma via de novo lipogenesis
Kwan Shuen Chan¹, Kwan Yung Au¹, Bernice Leung¹, Cheuk Yan Wong², Clive Yik Sham Chung², Regina Cheuk Lam Lo³.
¹The University of Hong Kong, Pathology, School of Clinical Medicine, LKS Faculty of Medicine, Hong Kong, ²The University of Hong Kong, School of Biomedical Sciences, LKS Faculty of Medicine, Hong Kong, ³The University of Hong Kong, Pathology, School of Clinical Medicine, LKS Faculty of Medicine; State Key Laboratory of Liver Research (The University of Hong Kong), Hong Kong.
Email: krisytkc@hku.hk

Background and aims: De novo lipogenesis (DNL) is a key metabolic pathway to fuel tumorigenesis. Increased free fatty acid uptake and DNL is consistently observed in chronic liver disease and genes related to DNL are universally upregulated in hepatocellular carcinoma (HCC). Yet, the upstream regulatory events triggering DNL in HCC remains to be delineated. Sortilin (SORT1) is reported as a regulator to transport a wide range of proteins intra/extracellularly. Association between sortilin and lipid metabolism has been established as reported by genome-wide association studies and animal models. In the present study, we aimed at investigating the functional roles of sortilin-driven cancer secretome in HCC.

Method: Sortilin expression in HCC and paired non-tumoral liver tissues was compared using The Cancer Genome Atlas Liver Hepatocellular Carcinoma dataset and public dataset (GSE89377). Conditioned medium collected from stable sortilin-overexpressing HCC cells was deployed to study the effect of sortilin-driven secretome in HCC using in vitro and in vivo assays. Proteomic profiling of sortilin-driven secretome was analyzed using liquid chromatography-tandem mass spectrometry.

Results: Sortilin was overexpressed in HCC. Overexpression of sortilin was correlated with poorer survival outcome. Functional studies showed that sortilin-driven secretome conferred self-renewal ability and metastatic potential in HCC cells. Fatty acid metabolism was highlighted as a potential molecular pathway associated with sortilin-driven secretome by proteomic profiling. Lipid content and fatty acid synthase (FASN) was increased in HCC cells treated with sortilin-driven secretome. The enhanced tumorigenic phenotypes endowed by sortilin-driven secretome were partially abrogated by co-administration of FASN inhibitor C75. Stabilization of FASN upon treatment with sortilin-driven secretome might be mediated through O-GlcNAcylation.

Conclusion: Our study uncovered the role of sortilin in contributing to hepatocarcinogenesis via modulation of cancer secretome and deregulated lipid metabolism.

SAT-232
Identification and experimental validation of druggable epigenetic targets in hepatoblastoma
Alex Claveria-Cabello¹, José María Herranz², Elena Adan-Villaescusa³, María U Latasa², María Arechreda²,³, Iker Uriarte⁴, Antonio A Pineda⁴,⁵, Pedro Berraondo⁴,⁵, Bruno Sangro²,³,⁷, Jose Marín²,³, María Luz Martínez-Chantar⁵,⁶, Sergio Córdia⁵, Fernando Corrales²,⁵, Jessica Zucman-Rossi¹,¹¹, Emilie Indersie¹², Stefano Cairo¹³,¹⁴, Montserrat Domingo-Sábat¹⁵, Carmen Berasain¹,¹², Maite G Fernandez-Barrena¹,², Matías A Avila¹,²,³,¹¹, Program of Hepatology, CIMA, University of Navarra, Hepatology Program, Spain, ²Centro de Investigación Biomédica en Red. CIBERehd, Instituto de Salud Carlos III, Madrid, Spain, ³Instituto de Investigaciones Sanitarias de Navarra. IdaSNA, Pamplona, Spain, ⁴Molecular Therapies Program, CIMA, Universidad de Navarra, Pamplona, Spain, ⁵Centro de Investigación Biomedica en Red de Cancer (CIBERONC), Spain, ⁶Program of Immunology and Immunotherapy, CIMA-University of Navarra, Pamplona, Spain, ⁷Liver Unit. Clínica Universidad de Navarra, Pamplona, Spain, ⁸Experimental Hepatology and Drug Targeting (HEVEPHARM) Group, University of Salamanca, IBSAL, Salamanca, Spain, ⁹Liver Disease Laboratory, Center for Cooperative Research in Biosciences (CIC biogUNE), Basque Research and Technology Alliance, Spain, ¹⁰Centro Nacional de Biotecnología (CNB), CSIC, Madrid, Spain, ¹¹Centre de Recherche des Cordeliers, Sorbonne Université, Inserm, Université de Paris; Functional Genomics of Solid Tumors laboratory, Equipe labellisée Ligue Nationale contre le Cancer, Labex OncolImmunology; Hôpital Européen Georges Pompidou, APHP Paris, France, ¹²Kentech, Evry, France, ¹³Champions Oncology, Inc., United States, ¹⁴Kentech, France, ¹⁵Program for Predictive and Personalized Medicine of Cancer, Germans Trias i Pujol Research Institute (PMPPC-IGTP), Badalona, Spain.
Email: maavila@unav.es

Background and aims: Hepatoblastoma (HB) is the most frequent childhood liver cancer. Surgical resection is the mainstay treatment which frequently is preceded by neoadjuvant chemotherapy (cisplatin or doxorubicin). However, patients with aggressive tumors have limited therapeutic options; therefore, a better understanding of HB pathogenesis is needed to improve treatment. HB have a very low mutational burden; however, epigenetic alterations are increasingly recognized. We aimed to identify epigenetic regulators consistently dysregulated in HB and to evaluate the therapeutic efficacy of their targeting in clinically relevant models.

Method: We performed a comprehensive transcriptional analysis of 180 epigenetic genes. Data from fetal, pediatric, adult, peritumoral (n = 72) and tumoral (n = 91) tissues were integrated. Selected epigenetic drugs were tested in HB cells. The most relevant epigenetic target identified was validated in primary HB cells, HB organoids, a PDX model, and a genetic mouse model. Transcriptomic, proteomic and metabolicomic mechanistic analyses were implemented.

Results: Altered expression of genes regulating DNA methylation and histones modifications was consistently observed in association with molecular and clinical features of poor prognosis. The histone methyl-transferase G9a was markedly upregulated in tumors with epigenetic and transcriptional traits of increased malignancy. Pharmacological targeting of G9a significantly inhibited HB cells, organoids and PDX’s growth. Development of HB induced by oncogenic forms of β-catenin and YAP1 was ablated in mice with hepatocyte-specific deletion of G9a. We observed that HB undergo significant transcriptional rewiring in genes involved in amino acids metabolism and ribosomal biogenesis. G9a inhibition counteracted these pro-tumorigenic adaptations. Mechanistically, G9a targeting potently repressed the expression of c-MYC and ATF4, master regulators of HB metabolic reprogramming.
SAT-233
Tumor-extrinsic Axl expression shapes an inflammatory microenvironment independent of tumor-cell promoting Axl signaling
Kristina Breitenecker1, Denise Heiden1, Gerhard Weber1, Iros Barozzi1, Thomas Grünberger2, Patrick Starlinger2,4, Wolfgang Mikulits1.
1Center for Cancer Research, Comprehensive Cancer Center, Medical University of Vienna, Vienna, Austria, 2Department of Surgery, HPB Center, Viennese Health Network, Clinic Favoriten and Sigmund Freud Private University, Vienna, Austria, 3Department of General Surgery, Division of Visceral Surgery, Medical University of Vienna, Vienna, Austria, 4Department of Surgery, Division of Hepatobiliary and Pancreatic Surgery, Mayo Clinic, Rochester, United States
Email: kristina.breitenecker@meduniwien.ac.at

Background and aims: Signaling of the receptor tyrosine kinase Axl activated by its ligand Gas6 is a major driver of cancer progression. In hepatocellular carcinoma (HCC), patients show upregulation of Axl expression correlating with vascular invasion and poor prognosis. In pre-malignant stages of HCC, Gas6/Axl is crucially involved in developing hepatic fibrosis. Although recent insights into the role of Gas6/Axl in liver disease, a deep understanding of tumor-intrinsic and tumor-extrinsic functions of Axl in HCC is lacking. In this study, we focused on Axl in HCC development by employing novel mouse models and translating experimental data into the HCC patient situation.

Method: Liver tumors were induced by diethylnitrosamine (DEN) and carbon tetrachloride (CCl4) in systemic Axl−/− mice was enhanced showing higher proliferation rates including tumor-intrinsic Axl expression. Invasive abilities of cells were examined in vitro and in vivo. Mouse tumors were subjected to immune cell profiling by FACS and immunohistochemistry. HCC patient samples (n = 47) were analyzed by multiplex immunohistochemistry.

Results: DEN/CCl4-induced liver tumor burden of systemic Axl−/− mice was enhanced showing higher proliferation rates including lower infiltration of cytotoxic CD8+ T cells and granzyne B+ cells. PD-L1 levels did not vary between Axl−/− and Axl+/+ tumors indicating alternative escape mechanisms. Interestingly, livers of CCl4−treated Axl−/− mice were increasingly infiltrated with pro-inflammatory monocytes and neutrophils prior to tumor formation, potentially fostering tumor-promoting inflammation and therefore enhancing tumorigenesis. Most notably, tumor burden and infiltration of CD8+ T cells did not differ between Axldelta hep/delta hep and Axldelta+/− mice suggesting that hepatocyte-intrinsic Axl expression does not alter proliferation and cytotoxic immune cell infiltration. However, we observed that tumor-intrinsic Axl expression augments invasive abilities in vitro and decreases overall survival of mice by increasing pulmonary metastasis. The Axl-driven invasive phenotype was accompanied by upregulation of Snai1/Sna12 and downregulation of E-Cadherin indicating changes in epithelial plasticity.

Conclusion: In an inflammatory setting, tumor-extrinsic Axl expression shapes the liver immune environment which curbs cancer development. Tumor-intrinsic Axl expression promotes the cancer-progressive phenotype of HCC by fostering cell invasion and reprogramming of epithelial organization. These findings highlight the versatile functions of Axl in tumor-stroma interaction which are highly relevant for anti-cancer strategies.

SAT-234
Immunotherapy resistance in NASH-HCC is driven by the dysfunctional liver microenvironment of NASH
Daniel Geh1, Erik Ramon Gil2, Maja Lasczewska1, Amy Collins3, Salmin Lu1, Rainie Cameron1, Fiona Oakley1, Jack Leslie1, Helen Louise Reeves2,3, Derek A Mann1. 1Newcastle University- Newcastle Fibrosis Research Group, Biosciences Institute, Faculty of Medical Sciences, United Kingdom, 2Newcastle University-Translational and Clinical Research Institute, Faculty of Medical Sciences, United Kingdom, 3Freeman Hospital- Hepatopancreatobiliary Multidisciplinary Team, Newcastle upon Tyne Hospitals NHS Foundation Trust, United Kingdom
Email: daniel.geh@newcastle.ac.uk

Background and aims: There is growing evidence suggesting that anti-programmed death ligand 1 (PD-L1)/anti-vascular endothelial growth factor (VEGF) combination therapy in hepatocellular carcinoma (HCC) with underlying non-alcoholic steatohepatitis (NASH) is less effective compared to other aetiologies. Previous work suggests that a subgroup of exhausted CD8+PD1+EOMES+CXCR6+ T cells is responsible in the context of anti-PD1 monotherapy. We aim to explore this further in the context of anti-PDL1/VEGF combination therapy.

Method: C57BL/6J mice were fed either a western diet to induce NASH or fed control diet (lean mice) followed by either intrahepatic or subcutaneous implantation of tumours (Hep 53.4 line). After 2 weeks of tumour growth mice were treated with either anti-PDL1/VEGF or IgG isotype control. Tumour burden was measured and immune characterisation conducted using flow cytometry.

Results: NASH mice with intrahepatic tumours had a poor response to anti-PDL1/VEGF therapy compared to lean mice (figure 1a–c). Analysis showed an influx of CD8T cells into anti-PDL1/VEGF treated intrahepatic tumours but with a preferential recruitment of CD8+PD1+EOMES+CXCR6+ T cells in NASH intrahepatic tumours (figure 1d–e). On the other hand, both NASH and lean mice with subcutaneous tumours had a good response to anti-PDL1/VEGF therapy (figure 2a–c). Analysis demonstrated an influx of CD8T cells into the subcutaneous tumours of anti-PDL1/VEGF treated mice. Unlike in the intrahepatic tumours, the proportion of recruited CD8+PD1+ cells were similar in NASH and lean mice (figure 2 d–e).

Conclusion: In our model of NASH-HCC intrahepatic tumours have a poor response to anti-PDL1/VEGF therapy whereas subcutaneous tumours have a good response. This was likely due to a higher proportion of exhausted CD8+PD1+EOMES+CXCR6+ T cells being recruited into intrahepatic tumours due to their expansion in the pre-cancerous NASH hepatic microenvironment. This suggests that the NASH hepatic microenvironment is the key determinant to treatment response in NASH–HCC.
Figure: (abstract: FRI-234).
SAT-235
PSMP inhibits HCC progression by regulating the polarization of tumor-associated macrophages via the PI3K/Akt pathway
Shaoping She1, Lijing Ren1, Dongbo Chen1, Hongsong Chen1. 1Peking University People’s Hospital, Peking University Hepatology Institute, Beijing Key Laboratory of Hepatitis C and Immunotherapy for Liver Diseases, China
Email: chenhongsong@bjmu.edu.cn

Background and aims: Hepatocellular carcinoma (HCC) is one of the malignant tumors with high morbidity and high mortality, which is prone to metastasis and recurrence and has a poor prognosis. PC3 secreted microprotein (PSMP) or microprotamine (MSMP) is a novel chemotactic cytokine discovered through genome-wide bioinformatics analysis and chemoattractant platform screening, which can act as a CCR2 ligand to recruit peripheral blood monocytes and lymphocytes. Our previous study found that PSMP was significantly highly expressed in human and mouse liver fibrosis/cirrhosis tissues induced by different causes. PSMP can promote the progression of liver fibrosis by regulating the infiltration, activation and polarization of macrophages. However, the relationship between PSMP and the development and prognosis of HCC remains unclear.

Method: The expression of PSMP was detected in two independent HCC patients cohorts and its correlation with patients’ prognosis was analyzed. In vivo: In PSMP knockout and wild-type mice, two mouse HCC cell lines (Hepa1-6, H22) were used to construct the subcutaneous tumorigenesis models and the liver orthotopic tumorigenesis models; In nude mice, two human HCC cell lines (BEL-7402, BEL-7405) were used to construct the subcutaneous tumorigenesis models. The direct effects of PSMP on the polarization of macrophages (human THP-1 cell line and mouse bone marrow-derived macrophages (BMDMs) were studied in vitro. In addition, we performed RNA sequencing of BMDMs from WT and PSMP gene knockout mice.

Results: Through the detection of clinical HCC patient samples, we found that PSMP is downregulated in human HCC tissues, and its expression level is positively correlated with the prognosis of HCC patients. In vivo, we found that knockout of PSMP promotes subcutaneous and liver orthotopic tumor growth in mice; overexpression of PSMP inhibits the formation of subcutaneous tumors in nude mice. Further, knockout of PSMP significantly inhibits the infiltration of CD8+ tumor-infiltrating lymphocytes (TILs) and promotes the infiltration and polarization of M2-type tumor-associated macrophages (TAMs) in mice. In vitro, we found that PSMP could directly promote M1-polarization and inhibit M2-polarization of human THP-1 cells and mouse BMDMs. In addition, analysis of RNA sequencing results showed that PSMP may mediate the polarization of macrophages by regulating the PI3K/Akt signaling pathway.

Conclusion: Taken together, PSMP may inhibit the M2 polarization of tumor-associated macrophages through the PI3K/Akt signaling pathway, and then promote the anti-tumor immune response of CD8+ T cells, and ultimately inhibit the progression of HCC. The results are expected to clarify the role and mechanism of PSMP in the liver tumor microenvironment for the first time, which has important theoretical significance, and may also provide new targets for the treatment of HCC, with potential application value.

SAT-236
Macrophage STING signaling promotes NK cell to suppress colorectal cancer liver metastasis via 4-1BBL/4-1BB co-stimulation
Haoming Zhou1, Yu Sun1, Haoran Hu1, Jian Xu1, Yiyun Gao1, Xinyu Zhan1, Shun Zhou1, Weizhe Zhong1, Dongming Wu1, Ping Wang1, Lianbao Kong1, Zhuqing Rao1. 1The First Affiliated Hospital of Nanjing Medical University, China
Email: zhuqingrao_njmu@163.com

Background and aims: Macrophage innate immune response plays an important role in tumorigenesis. However, the role and mechanism of macrophage STING signaling in modulating tumor microenvironment to suppress tumor growth at secondary sites remains largely unclear.

Method: STING expression was assessed in liver samples from patients with colorectal cancer (CRC) liver metastasis. Global or myeloid STING-deficient mice, myeloid NLCP3-deficient mice, and wild-type mice were subjected to a mouse model of CRC liver metastasis by intrasplenic injection of murine colon carcinoma cells (MC38). Liver non-parenchymal cells including macrophages and NK cells were isolated for flow cytometry analysis. Bone marrow-derived macrophages pretreated with MC38 were co-cultured with splenic NK cells for in vitro studies.

Results: Significant activation of STING signaling were detected in adjacent and tumor tissues and intrahepatic macrophages. Global or
myeloid STING-deficient mice had exacerbated CRC liver metastasis and shorten survival, with decreased intrahepatic infiltration and impaired antitumor function of NK cells. Depletion of NK cells in WT animals increased their metastatic burden, while no significant effects were observed in myeloid STING-deficient mice. STING activation contributed to the secretion of IL-18 and IL-1 effects were observed in myeloid STING-deficient mice. STING and shorten survival, with decreased intrahepatic infiltration and myeloid STING-deficient mice had exacerbated CRC liver metastasis in myeloid-STING deficient mice.

Conclusion: We demonstrated that STING signaling promoted NLRP3-mediated IL-18 and IL-1 production of macrophages to optimize the anti-tumor function of NK cells via the co-stimulation signaling of 4-1BBL/4-1BB.

SAT-237
A patient-derived hepatocellular carcinoma multicellular spheroid system modeling the tumor microenvironment for drug development and precision medicine
Emilie Crouchet1, Nuno Almeida1, Sarah Durand1, Sara Cherradi1, Antonio Saviano1,2, Fabio Giannone1,2,3, Emanuela Felli1,2,3, Patrick Pessaux1,2,3, François H.T. Duong1, Thomas Baumann1,2, Catherine Schuster1, Université de Strasbourg, Inserm, Institut de Recherche sur les Maladies Virales et Hépatiques UMR_S1110, Strasbourg, France, Hôpitaux Universitaires de Strasbourg, Service d’hépato-gastroentérologie, Strasbourg, France, Institut hospitalo-universitaire (IHU), Institute for Minimally Invasive Hybrid Image-Guided Surgery, Strasbourg, France
Email: ecrouchet@unistra.fr

Background and aims: Hepatocellular carcinoma (HCC) is the third leading and fastest rising cause of cancer-related death worldwide. Despite recently approved therapies, the response to treatments remains limited and prognosis of patients with advanced HCC is poor. Preclinical and high-throughput screening of approved drugs or candidate compounds for treatment of HCC is hampered by the absence of tractable model systems recapitulating heterogeneity of HCC tumors and tumor microenvironment.

Method: We established a patient-derived multicellular spheroid model based on liver tumor resections following enzymatic and mechanical dissociation. Cells were grown in 3D in presence of growth factors and autologous patient-derived serum to maintain cell phenotypes. Characterization of the tumorspheroid cellular populations was performed by flow cytometry. As a proof of concept, we treated patient-derived spheroids with FDA approved anti-HCC compounds and assessed treatment response by measuring cell viability and by assessing the effect of drugs on the key signaling pathways by single cell RNA-Seq (scRNA-Seq) and Western blot analysis. Moreover, the 3D tumorspheroid system was used in preclinical proof-of-concept studies to understand the mechanism of action of approved and investigational therapeutics.

Results: The model was successfully established in a highly reproducible manner, independently from the donors and from cancer etiology. The spheroids maintained a high cellular viability during at least 8 days and include epithelial cancer cells as well as all major cell populations that are present in the tumor microenvironment (TME), such as myofibroblasts, immune cells (macrophages and T cells) and endothelial cells. Cell type proportions were variable between spheroids representing the different HCC existing subtypes and patient heterogeneity. We observed differential responses to FDA HCC approved drugs (targeted- and immune-based treatments) between donors. Moreover, treatment response could be correlated to the proportion of the different cell types present in the patient derived spheroids. Finally, using scRNA-Seq we show that the 3D tumorspheroid system enables to study the effect of therapeutics on TME including T cell responses, which offers new perspectives for preclinical drug evaluation compared to the liver organoid model based on epithelial cell differentiation.

Conclusion: Our patient-derived spheroid model may be used to predict clinical treatment response in patients enabling precision medicine. The 3D tumorspheroid system is a powerful tool to monitor anti-tumor treatment responses and uncover the mechanism of action of novel compounds in research and development. Collectively, this model will accelerate clinical translation of personalized liver cancer therapies based on functional screening including the TME.

SAT-238
Liquid biopsy protein biomarkers of cholangiocarcinoma risk, early diagnosis and survival mirroring tumor cells
Ainhoa Lapitz1, Mikel Azkargorta2,3, Piotr Milkiewicz4, Paula Olazolo1, Ekaterina Zhuravleva5, Marit M. Grimsrud6, Christoph Schramm7, Ander Arbelaitz1, Colm O Rourke1, Adelaida La Casta1, Małgorzata Milkiewicz2, Tania Pastor1, Mette Vesterhus6, Raúl Jiménez-Aguero1, Michael Dill9, Angela Lamara10, Juan Valle10, Rocío IR Macías3,11, Laura Izquierdo-Sánchez1, Ylenia Pérez Cañado1,12, Francisco J. Caballero1,12, Ioana Riaño1, Marcin Krawczyk13, Cesar Ibarra14, Javier Bustamante14, Luis Miguel Nova-Camacho15, Juan Falcon-Perez1,2, Felix Ertorta1,2, María Jesús Perugorria1,12, Jesper Andersen1, Luis Bujanda1,3, Tom Hemming Karlsen1, Trine Folsneraas1, Pedro Miguel Rodrigues1,3, Jesús María Banales1,3, Biodonostia Health Research Institute, Spain, 2CIC biGUNE, Spain, 3National Institute for the Study of Liver and Gastrointestinal Diseases (CIBERehd), Spain, 4Medical University of Warsaw, Poland, 5Biotech Research and Innovation Centre, Denmark, 6Oslo University Hospital, Norway, 7European Reference Network Hepatological Diseases (ERN RARE-LIVER), Germany, 8Pomeranian Medical University in Szczecin, Poland, 9Heidelberg University Hospital, Germany, 10The Christie NHS Foundation, United Kingdom, 11University of Salamanca, Spain, 12University of the Basque Country, Medicine, Spain, 13Saarland University Medical Centre, Germany, 14Cruces University Hospital, Spain, 15Donostia University Hospital, Spain
Email: ainhoa.lapitz@biodonostia.org

Background and aims: Cholangiocarcinoma (CCA), heterogeneous biliary tumors with dismal prognosis, lacks accurate early-diagnostic methods, especially important for individuals at high-risk (i.e., primary sclerosing cholangitis (PSC)). Here, we searched for protein biomarkers in serum extracellular vesicles (EVs).

Method: EVs from patients with isolated PSC (n = 45), concomitant PSC-CCA (n = 44), PSC who developed CCA during follow-up (PSC to CCA; n = 25), CCAs from non-PSC etiology (n = 56), hepatocellular carcinoma (n = 34) and healthy individuals (n = 56) were characterized by mass-spectrometry. Diagnostic biomarkers for PSC-CCA, non-PSC CCA or CCAs regardless etiology (pan-CCAs) were defined and validated by ELISA. Their expression was evaluated in CCA tumors at single-cell level. Prognostic EV-biomarkers for CCA were investigated.

Results: High-throughput proteomics of EVs identified diagnostic biomarkers for PSC-CCA, non-PSC CCA or pan-CCA, and for the differential diagnosis of intrahepatic CCA and HCC, that were cross-validated by ELISA using total serum. Machine learning-based algorithms disclosed CRP/FIBRINOGEN/FRIL for the diagnosis of PSC-CCA (local disease (LD)) vs isolated PSC (AUC = 0.947; OR = 36.9), and when combined with CA19-9, overpowers CA19-9 alone. CRP/PIGR/VVF combination allowed the diagnosis of LD non-PSC CCAs vs healthy individuals (AUC = 0.992; OR = 387.5). Noteworthy, CRP/FRIL accurately diagnosed LD pan-CCA (AUC = 0.941; OR = 89.4). Levels of CRP/FIBRINOGEN/FRIL/PIGR showed predictive capacity for CCA development in PSC before clinical evidences of malignancy. Multi-organ transcriptomic analysis revealed that serum EV-biomarkers were mostly expressed in hepatobiliary tissues, and scRNA-seq and immunofluorescence analysis of CCA tumors showed their presence mainly in malignant cholangiocytes. Multivariable analysis
unveiled EV-prognostic biomarkers, with COMP/GNAI2/CFA1 and ACTN1/MYC/T1/PIW4 associated negatively or positively to patients’ survival, respectively.

**Conclusion:** Serum EVs contain protein biomarkers for the prediction, early diagnosis and prognosis estimation of CCA detectable using total serum, representing a tumor cell-derived liquid biopsy tool for personalized medicine.

**SAT-239**

**Neutrophil degranulation and ageing as potential therapeutic targets in hepatocellular carcinoma?**

Daniel Geh1, Erik Ramon Gil1, Maja Laszczewska1, Amy Collins1, Saimir Luu1, Rainie Cameron1, Fiona Oakley1, Helen Louise Reeves2,3, Derek A Mann1, Jack Leslie1, 1Newcastle University-Newcastle Fibrosis Research Group, Biosciences Institute, Faculty of Medical Sciences, Newcastle upon Tyne, United Kingdom, 2Newcastle University-Translational and Clinical Research Institute, Faculty of Medical Sciences, Newcastle upon Tyne, United Kingdom, 3Fremian Hospitals, Newcastle upon Tyne Hospitals NHS Foundation Trust, Newcastle upon Tyne, United Kingdom

**Email:** daniel.geh@newcastle.ac.uk

**Background and aims:** Neutrophils are recognised to play a vital role in hepatocellular carcinoma (HCC) progression through pro-tumour functions such as creating an immunosuppressive tumour microenvironment. This makes them potential therapeutic targets. Aims: 1. To characterise neutrophil phenotype and heterogenicity in HCC using patient samples and an in vivo model. 2. Manipulate HCC specific neutrophil changes in our in vivo model in order to develop novel neutrophil directed therapies for HCC.

**Method:** Patient study. Circulating neutrophils were isolated from HCC and chronic liver disease patients using density centrifugation. In vivo model. C57BL/6j mice underwent orthotopic tumour implantation. Both patient and mouse neutrophils were characterised using flow cytometry and functional assays.

**Results:** HCC patient blood samples were identified as having an increase in low density (LD) CD16hi neutrophils compared to healthy controls. Flow cytometry analysis revealed LD CD16hi neutrophils as being more activated, degranulated and aged compared to normal density (ND) neutrophils as demonstrated by differing expression of CXCR2, CXCR4, CD11b, CD62L, CD10 and CD66b. In addition, LD CD16hi neutrophils expressed markers associated with pro-tumour neutrophils such as CD36 and LOX-1. Tumour bearing mice also developed an increase in LD neutrophil frequency compared to controls with their phenotypic features being highly conserved compared to human. Functionally LD neutrophils were less phagocytic, had reduced migration to CXCL2 and had increased basal reactive oxygen species (ROS) production but a blunted stimulated ROS response further supporting them as being aged and degranulated neutrophils. This highlights circulating LD neutrophils and neutrophil ageing and degranulation as potential therapeutic targets. We used TGF-β and JAK2/STAT3 inhibition in our in vivo model in order to test this. ALK5 (TGF-β receptor 1) inhibition failed to significantly impact tumour burden however did significantly reduce the frequency of circulating LD neutrophils, increase the frequency of tumour associated neutrophils and increase CD62L expression indicating reduced ageing/degranulation (figure 1a-f). JAK2 inhibition significantly reduced tumour burden and altered neutrophil phenotype with an increase in neutrophil CD62L expression (figure 2a-d).

**Conclusion:** We have identified an increase in frequency of circulating LD neutrophils with a degranulated, aged and pro-tumour phenotype in HCC that are highly conserved between HCC patients and tumour bearing mice. Inhibition of the TGF-β and JAK2/STAT3 pathway using ALK5 and JAK2 inhibitors resulted in alterations of neutrophil phenotype suggesting reduced degranulation and ageing. Further studies investigating these therapeutic agents in combination with immune checkpoint inhibitors is warranted.

**SAT-240**

**Carbohydrate restriction inhibits tumor progression in a hepatocellular carcinoma mouse model**

Merve Erdein1, Sraddha Bharadwaj2, Ana Izcue2, Frank Schaap3, Eray Sahin4, Thorsten Cramer1, 1University Hospital RWTH Aachen, Molecular Tumor Biology, Department of General, Visceral and Transplantation Surgery, Aachen, Germany, 2University Hospital RWTH Aachen, Institute of Molecular Medicine, Aachen, Germany, 3Maastricht University, Department of Surgery, NUTRIM School of Nutrition and Translational Research in Metabolism, Netherlands, 4Acibadem Mehmet Ali Aydinlar University, Department of Biostatistics and Medical Informatics, School of Medicine, Turkey

**Email:** merdem@uaachen.de

**Background and aims:** Hepatocellular carcinoma (HCC) is characterized by robust therapy resistance and poor prognosis. Dietary approaches and modifications are actively investigated regarding their impact on tumor metabolism and potential inhibitory effects on cancer progression. Dietary carbohydrate restriction (DCR) is considered to have an anti-tumor effect, conceivably due to the reduced glucose supply to cancer cells. We investigated different DCR approaches in a therapy-resistant HCC mouse model to analyze the effect of dietary carbohydrate restriction on tumor growth.

**Method:** We used a transgenic mouse model of hepatocellular carcinoma (HCC), termed ASV-B. These mice develop HCC via the T oncogene of SV40. In this study, ASV-B mice were placed under two different DCR regimens, precisely a “low carb high fat” (LCHF, ketogenic diet) and a “low carb high protein” (LCHP) chow. The consequences of the different DCR approaches on the composition of the tumor immune microenvironment, bile acids in blood and the gut microbiome were analyzed.

**Results:** Both DCR approaches significantly reduced tumor growth in ASV-B mice. However, the effect of LCHF and LCHP diets were variable in subsequent analyses, suggesting different underlying molecular mechanisms for the tumor-inhibiting effects. In the tumor microenvironment, the ketogenic diet resulted in significant accumulation of interleukin-17-producing lymphocytes, while no such observation was made in the LCHP diet group. In this group, on the other hand, enhanced oxidative stress was observed in tumor cells, contrary to LCHF diet feeding. In line, the anti-oxidant N-acetyl cysteine reversed the tumor-inhibiting effect of LCHP diet but not of LCHF diet. The
systemic effects of diet application were further investigated at different levels. In the gut microbiome, carbohydrate restricted-diet highly modified the bacterial composition, where fat and protein content had modest impact. Additionally, bile acid composition also changed upon diet even though total bile acid amount was not significantly affected.

**Conclusion:** The effect of dietary intervention is especially intriguing due to the fact that ASV-B mice demonstrate resistance to various therapeutic approaches, e.g. sorafenib and conventional chemotherapy drugs such as etoposide and doxorubicin. These results also suggest that macronutrient composition, especially carbohydrate availability, is crucial for murine HCC progression. With the safe use of diets in the clinical application, dietary interventions may provide a promising approach especially in the adjuvant setting.

**SAT-241**

**Efficacy of HBV-TCR T cell therapy to eliminate circulating HBV-HCC cells in immunosuppressed whole blood**

Meiyin Lin1,2, Sebastian Chakrit Bhakdi3,4, Damien Tan2, Andrea Pavese2,5, Jocelyn Lee6,7, David Tai6,7, Antonio Bertolletti1,8, Anthony Tan1, 1Duke-NUS Medical School, Emerging Infectious Diseases, Singapore, Singapore, 2Institute of Molecular and Cell Biology (IMCB), Singapore, Singapore, 3Mahidol University, Department of Pathobiology, Faculty of Science, Bangkok, Thailand, 4X-ZELL Biotech Pte Ltd., Singapore, Singapore, 5National University of Singapore, Mechanobiology Institute, Singapore, 6National Cancer Centre Singapore, Division of Medical Oncology, Singapore, Singapore, 7Duke-NUS Medical School, Oncology Academic Programme, Singapore, Singapore, 8Agency for Science, Technology and Research (A*STAR), Singapore Immunology Network, Singapore, Singapore

**Background and aims:** Recurrence of Hepatitis B virus-related hepatocellular carcinoma (HBV-HCC) after liver transplant (LT) is mediated by circulating tumour cells (CTCs) and exacerbated by the immunosuppression required to prevent graft rejection. In a murine model of HBV-HCC, we have shown the ability of HBV-TCR T cells to prevent HCC cell seeding and subsequent tumour development, demonstrating its potential use in a prophylactic setting. However, it is unclear whether HBV-targeting T cell therapy can eliminate HBV-HCC CTCs in the blood of immunosuppressed liver-transplanted patients.

**Method:** Here we first developed a microscopy-based assay to quantify CTCs in whole blood. The assay was then utilised to evaluate the cytolytic ability of our previously developed immunosuppressive drug-resistant HBV-TCR T cells (IDRA HBV-TCR) against HBV-HCC CTCs by quantifying the number of spiked HepG2.215 (an HCC cell line) targets recovered after an overnight culture with whole blood containing autologous IDRA HBV-TCR T cells in the presence of Tacrolimus and MMF to mimic the immunosuppressive peripheral blood of LT patients.

**Results:** Using 6 HCC cell lines (HepG2.2.15, Hep3B, SNU354, SNU398, SNU387 and SNU475) and the peripheral blood of patients with advanced metastatic liver cancer (n = 5), we optimised and validated an immunofluorescence panel containing seven markers: pan-Cytokeratin, vimentin, glycian-3, alpha-fetoprotein, CD34, CD45 and DRAQ5, that can effectively differentiate HCC-CTCs from immune cells. In the presence of immunosuppresants, conventional HBV-TCR T cells had reduced effector function while IDRA HBV-TCR T cells were robustly activated by the spiked HCC cells to produce TNFα and IFNγ. More importantly, we observed a dose-dependent clearance of spiked HepG2.215 targets with a reduction of 60–80% of the targets using 20,000 IDRA HBV-TCRT cells/ml of blood.

**Conclusion:** Our results demonstrate the ability of IDRA HBV-TCR T cells to effectively eliminate HBV-HCC CTCs in the presence of immunosuppressive drugs and support their use as prophylaxis against HCC relapse after LT.

**SAT-242**

**RBCK1 promotes cancer stemness and sorafenib resistance by restoring Numb/Notch1 axis independently of its ubiquitin ligase activity in hepatocellular carcinoma**

Peng Chen1, Zheyu Dong1, Jian Ruan2, Junling Chen1, Yuxin Zhou1, Xinxin Liao1, Yongfa Tan3, Chuanjiang Li4, Yuhao Wang1, Huanjin Pang5, Chunhua Wen1, Yuchuan Jiang6, Xiaoqing Li7, Bo Li8, Aihetaimu Aimaier7, Li Lin9, Jian sun1, Jiajie Hou10,11, Libo Tang1, Jinlin Hou1, Yongyin Li1. 1State Key Laboratory of Organ Failure Research, Guangdong Provincial Key Laboratory of Viral Hepatitis Research, Department of Infectious Diseases, Nanfang Hospital, Southern Medical University, Guangzhou, China, 2Department of Medical Oncology, The First Affiliated Hospital, Zhejiang University School of Medicine, and Key Laboratory of Cancer Prevention and Intervention, Ministry of Education, Hangzhou, China, China, 3Department of Anesthesiology, Nanfang Hospital, Southern Medical University, Guangzhou, China, China, 4Department of Hepatobiliary Surgery, Nanfang Hospital, Southern Medical University, Guangzhou, China, China, 5Division of Vascular and Interventional Radiology, Department of General Surgery, Nanfang Hospital, Southern Medical University, Guangzhou, China, China, 6Department of Pathology, Nanfang Hospital and School of Basic Medical Sciences, Southern Medical University, Guangzhou, China, China, 7Department of Hepatobiliary Surgery, The Affiliated Hospital of Guizhou Medical University, Guiyang, Guizhou, China, China, 8Department of Oncology, Nanfang Hospital, Southern Medical University, Guangzhou, China, China, 9Cancer Centre, Faculty of Health Sciences, University of Macau, Macau SAR, China, China, 10MOE Frontier Science Centre for Precision Oncology, University of Macau, Macau SAR, China, China

**Email:** yongyinli@foxmail.com

**Background and aims:** Drug resistance of hepatocellular carcinoma (HCC) is primarily attributed to cancer stem cells (CSCs). RBCK1, a component of linear ubiquitin chain assembly complex, has been reported to participate in the progression of HCC; however, its role and the underlying mechanisms in regulating the therapeutic response of HCC remain poorly understood. Herein, we investigated the role of RBCK1 in regulating sorafenib resistance and the CSC properties of HCC.

**Method:** The association between RBCK1 expression and the therapeutic response of HCC patients and mouse models. Functional studies revealed that RBCK1 promoted sorafenib resistance of HCC cells independently of its ubiquitin ligase activity, and acted as an oncogene that sustained the CSC properties of HCC. Gene set enrichment analysis and serials of assays confirmed that Notch1 signaling was necessary for RBCK1-mediated sorafenib resistance and CSC properties of HCC. Notably, RBCK1 competed with Notch1 for Numb binding, thereby impairing Numb-mediated Notch1 lysosomal degradation, but exerted no significant effects on Numb ubiquitin degradation. Further study indicated that the A64 and Q65 residues of RBCK1 were proven as the key pockets for the oncogenic effects by forming hydrogen bonds with K78 residue of Numb.

**Results:** Upregulated RBCK1 expression was associated with sorafenib resistance in HCC patients and mouse models. Functional studies revealed that RBCK1 promoted sorafenib resistance of HCC cells independently of its ubiquitin ligase activity, and acted as an oncogene that sustained the CSC properties of HCC. Gene set enrichment analysis and serials of assays confirmed that Notch1 signaling was necessary for RBCK1-mediated sorafenib resistance and CSC properties of HCC. Notably, RBCK1 competed with Notch1 for Numb binding, thereby impairing Numb-mediated Notch1 lysosomal degradation, but exerted no significant effects on Numb ubiquitin degradation. Further study indicated that the A64 and Q65 residues of RBCK1 were proven as the key pockets for the oncogenic effects by forming hydrogen bonds with K78 residue of Numb.
**POSTER PRESENTATIONS**

**SAT-243**

Pegozafermin inhibits NASH-induced hepatocellular carcinoma in the STAM™ mouse model

Maya Margalit¹, Moti Rosenstock¹, Leo Tseng², Taishi Hashiguchi¹, Yuka Shirakata³, Hank Mansbach², 89Bio Inc., Rehovot, Israel, ²89Bio Inc., San Francisco, CA, United States, ³SMC Laboratories Inc., Japan

Email: mayamargalitm@gmail.com

**Background and aims:** Pegozafermin (PGZ), a long-acting glycoPEGylated recombinant human FGF21 analog, led to marked histological and other liver-related benefits, as well as cardiometabolic benefits, with favorable safety and tolerability, in a Phase 1b/2a study in NASH. PGZ does not activate FGFR4, and is not mitogenic. NASH-associated HCC, previously viewed as a complication of cirrhotic NASH, is increasingly diagnosed in pre-cirrhotic NASH. In the STAM™ model, which recapitulates the human NASH-HCC sequence; HCC appears at ∼16 weeks of age and develops universally at ∼20 weeks of age. In HCC prevention studies in this model, treatment typically begins between 6 and 12 weeks of age. PGZ led to significant improvements in features of NASH, including liver histology, liver transaminases and various metabolic parameters in STAM™ mice. The objective of this study was to evaluate its effect on development of HCC in this model.

**Method:** STAM™ mice (12 or 13 weeks old, male, N = 20 per group) were treated by vehicle, pegozafermin (previous name BIO89-100), (0.3 mg/kg, 1.0 mg/kg or 3.0 mg/kg) 3 times a week or a positive control, sorafenib (30 mg/kg once daily) for 9 weeks, starting at Week 12 (N = 16 per group) or Week 13 (N = 4 per group). Sorafenib slows tumor progression and decreases tumor burden in HCC mouse models. All surviving animals were sacrificed at 20 or 21 weeks of age. At time of sacrifice, number of surviving animals, liver weight, liver/body weight ratio and the number of visible tumor nodules on the surface of the liver in surviving mice were assessed.

**Results:** PGZ led to a dose-dependent decrease in the number of macroscopic tumor nodules; the mean (± SD) number of visible tumor nodules per mouse was 9 ± 7.10 ± 4.7 ± 4, 2 ± 2 and 5 ± 4 in the vehicle, PGZ 0.3 mg/kg, PGZ 1.0 mg/kg and sorafenib groups, respectively (Figure 1; p < 0.05 for PGZ 3 mg/kg). A decrease in liver weight and liver/body weight ratio was observed in PGZ-treated animals; mean liver weight and liver/body weight ratios were 2391 ± 473 mg and 9.6 ± 2.2; 2498 ± 1120 mg and 11.0 ± 4.6; 1802 ± 391 mg and 7.8 ± 1.7; 1252 ± 210 mg and 6.2 ± 1.1; and 2013 ± 916 mg and 8.4 ± 3.8 for the vehicle, PGZ 0.3 mg/kg, PGZ 1.0 mg/kg and sorafenib groups, respectively (p < 0.05 for liver weight and liver/body weight ratio for PGZ 3 mg/kg). Survival was 4/20, 4/20, 9/20, 8/20 and 12/20 in the vehicle, PGZ 0.3 mg/kg, PGZ 1.0 mg/kg and sorafenib groups, respectively; effect on survival was not statistically significant with either PGZ or sorafenib treatment.

**Conclusion:** RBCK1 is critical in promoting CSC properties of HCC to drive sorafenib resistance through Notch1 signaling, independently of its ubiquitin ligase activity. Our study highlights that RBCK1 is a potential target to reverse sorafenib resistance of HCC, and pave the way for RBCK1-targeted drugs development.

**SAT-244**

Silencing CNNM4 in cholangiocarcinoma inhibits tumoral progression by means of non-canonical ferroptosis

María Mercado-Gómez¹, Alvaro Eguiero Gine², Miren Bravo¹, Mikel Azkargorta³, Marina Serrano-Macia¹, Naroa Goikoetxea¹, Irene González-Recio¹, Sofía Lachiondo-Ortega¹, Claudia Gil-Pitarch¹, Marta Romero³,⁴, Judit Domenech Omella¹, Rubén Rodríguez Agudo¹, Leidy Estefanía Zapata-Pavas¹, Patricia Peña-San Félix¹, Paula Olazíola³,⁶, Pedro Miguel Rodríguez³,⁶,⁷, Luis Alfonso Martinez-Cruz¹, Angela Lamarc³³,⁹, Victor Moreno¹⁰, Jesus María Bañales³,⁶,⁷,¹¹, Teresa Cardoso Delgado¹, Felix Elortza²,³, Matías A Avila¹,¹², Francisco Javier Cubero³,¹³,¹⁴, Cesar Augusto Martín¹⁵, Miguel Angel Merlos Rodrigo¹⁶, Diego Calvisi¹⁷, Jose Marin³,⁶, Maria Luz Martínez-Chantar¹,³, ¹CIC bioGUNE, Basque Research and Technology Alliance (BRTA), Liver Disease Lab, Derio, Spain, ²CIC bioGUNE, Basque Research and Technology Alliance (BRTA), Proteomics Platform, Derio, Spain, ³Centro de Investigación Biomédica en Red de Enfermedades Hepáticas y Digestivas (CIBERehd), Carlos III National Institute of Health, Madrid, Spain, ⁴University of Salamanca, IBSAM, Experimental Hepatology and Drug Targeting (HEVEPHARM) Group, Salamanca, Spain, ⁵KU Leuven, Laboratory of Protein Phosphorylation and Proteomics, Dept. Cellular and Molecular Medicine, Leuven, Belgium, ⁶Biodonostia Health Research Institute-Donostia University Hospital, University of the Basque Country (UPV/EHU), San Sebastian, Spain, ⁷IKERBASQUE, Basque Foundation for...
Background and aims: Cholangiocarcinoma (CCA) is a heterogeneous neoplasm of biliary ducts that represents the second most common primary hepatic cancer, after hepatocellular carcinoma. Due to its aggressiveness, late diagnosis and immunoregulatory capacity of the disease, CCA outcomes are poor, with a median overall survival of less than 12 months. Currently, the only curative treatment is surgical resection, but this only applies to 25% of cases and despite this tumoral recurrence is frequent. For that reason, the study of new therapies is of utmost importance. Recent studies show that the isocitrate dehydrogenase 1 (IDH1) inhibitor, used to treat patients with irresectable iCCA harboring IDH1 mutations, reduces cell proliferation, invasion and metastasis by promoting, ferroptosis, a programmed cell death caused by iron-dependent lipid peroxidation.

**Method:** In this study, we analyze the role of CNNM4 (Cyclin and CBS Domain Divalent Metal Cation Transport Mediator 4), a Mg2+ effluxer, that is overexpressed in CCA in *in silico*, at transcriptional levels and also in human biopsies.

**Results:** Silencing CNNM4 in CCA human cell lines, EGI-1 and TFK-1, which show high expression of CNNM4, not only increases intracellular Mg2+ but also reduces cellular proliferation and sensitizes cells to chemotherapeutic drugs. Key metastasis steps (invasion, extravasation and invasion in other organs) were also slowed down when CNNM4 is silenced, as seen by 3D spheroid experiments and in *ex vivo* and *in vivo* chicken embryo chorioallantoic membrane assay. Proteomic analysis reveals a metabolic shift into a less glycolytic phenotype in CNNM4-silenced cells, also indicating a role of this transporter in the Warburg effect. Alteration of iron metabolism after CNNM4 modulation in both cell lines is associated with a decrease of NUPR-1 levels, a ferroptosis inhibitor, that can be a possible mechanism of those effects. In a CCA murine model (myr-AKT/YapS127A), silencing CNNM4 after tumoral development, via a retroviral vector driven by a doxycycline-inducible cassette, reduced NASH development by histology at 12 weeks of age. Metabolic and inflammatory markers were evaluated by qPCR and IHC. mTOR pathway was analysed by WB of liver lysates. PPARalpha transcriptional activity was evaluated by luciferase reporter assay. The identification of RuVB1L-protein interactions was achieved by MS proteomics analysis of RuVB1L immunoprecipitation. The impact of RuVB1L targeting on HCC development was assessed by multiplicity evaluation of macroscopic tumours and by histological classification by Edmondson-Steiner grading system at 15 months of age.

**Conclusion:** RuVB1L targeting reduces mTOR pathway hyperactivation hampering NASH-HCC progression in *Pten*−/− mice, likely promoting the switch from mTOR-driven lipogenesis to AMPK-induced fatty acid catabolism.
**Method:** Whole-slide images of haematoxylin and eosin (HE) staining were captured by a digital slide scanner and divided into small non-overlapping patches for analysis. The ploidy status of 49 HCCs that underwent hepatectomy at our institution between 2017 and 2021 was determined by multicolored FISH for chromosomes, and their HE images were used for training. EfficientNetB0, a convolutional neural network model of deep learning, to determine HCC ploidy was trained, and its usefulness was examined on images derived from 192 HCCs that were not used for training.

**Results:** We constructed a model to diagnose HCC ploidy, and its area under the receiver operating characteristic curve was 0.931 in cross-validation with training data. In the test dataset, the model identified 76 polyploid HCCs, accounting for 39.6% of cases. Consistent with our previous finding that macrotrabecular-massive (MTM) architectures were significantly more common in polyploid HCCs than diploid HCCs, the prevalence of MTM architecture was significantly higher (p < 0.05) in the polyploid HCCs determined by our model than their counterparts. Moreover, polyploid HCCs determined by our model had significantly higher serum alpha-fetoprotein levels, suggesting that this model can efficiently determine polyploid HCCs with aggressive features. Importantly, the polyploid HCCs showed a significantly poorer prognosis than their counterparts, indicating the possible utility of AI-based ploidy classification in the prediction of HCC prognosis.

**Conclusion:** An AI-based model diagnosing pathological images could determine HCC ploidy and predict a subset of HCC with poor prognosis. Classification of HCC ploidy utilizing AI-based pathological image diagnosis would be a useful new method for HCC practice.

**SAT-247**

**Pediatric liver cancer: Hepatoblastoma and Neddylation post-translational modification**

Leidy Estefania Zapata-Pavas1, Marina Serrano-Macía1, Miguel Ángel Merlos Rodríguez2, Patricia Peña-San Félix1, Claudia Gil-Pitarach1, Noara Goikoetxea1, Hana Michalkova2, Zbynek Heger2, Alvaro del Rio3, Montserrat Domingo-Sàbat3, Laura Royo3, Jon Ander Barrenchea- Barrenechea1, Maria Mercado-Gómez1, Sofia Lachiondo-Ortega1, Teresa Cardoso Delgado1, Dimitris Xirodimas4, Jose Marín5,6, Maite G Fernandez-Barrena7,7, Matias A Avila8,8, Carolina Armengol7, Maria Luz Martinez-Chantar9,10,11, Center for Cooperative Research in Biosciences (CIC bioGUNE), Basque Research and Technology Alliance (BRTA), Liver Disease Lab, Spain; 12Mendel University in Brno, Department of Chemistry and Biochemistry, Czech Republic; 3Germans Trias i Pujol Research Institute (IGTP), Program for Predictive and Personalized Medicine of Cancer (PMPPC), Childhood Liver Oncology Group, Badalona, Spain; 4Univ. Montpellier, CRBM (Cell Biology Research Centre of Montpellier), CNRS, Montpellier, France; 5University of Salamanca, IBSAL, Experimental Hepatology and Drug Targeting (HEVEFARM), Salamanca, Spain; 6Carlos III National Health Institute, Centro de Investigación Biomédica en Red de Enfermedades Hepáticas y Digestivas (CIBERehd), Spain; 7University of Navarra, Hepatology Program, CIMA, Spain

**Background and aims:** Hepatoblastoma (HB), although a rare disease, is the most common form of childhood primary liver cancer. Current therapeutic options are limited or inadequate and involve significant side effects; they include surgical resection with chemotherapeutic agents such as cisplatin or doxorubicin. Ongoing research has uncovered molecular, genetic, and epigenetic mechanisms that have expanded the understanding of HB, but it is an open field with many unknowns. The identification of neddylation, a post-translational modification regulated by NEDD8, widely involved in several signalling pathways and in modulation of protein homeostasis, as a mechanism associated with the development of HB, has opened the doors to new therapeutic strategies. In this sense, the implications of this post-translational modification in the tumour context of HB and its modulation as a potential therapy was evaluated.

**Method:** A cohort of HB patients, preclinical animal model and in vitro model in tumour cells were used to characterise NEDDylation pathway in HB. Besides the modulation of NEDP1 levels using an in vitro approach was made to study cell proliferation, cell cycle, drug resistance, proteome homeostasis, and metabolic status. In vivo, the implications of NEDP1 overexpression in metastatic capability and its tumour suppressor capacity was evaluated.

**Results:** Transcriptomic analysis of HB patient samples has demonstrated modulation of the neddylation cycle, and NEDD8 levels correlate with the degree of tumour stratification. The preclinical models of HB, as well as the vitro models in tumour cells, shows an increase in NEDD8 and NAE1, related to an increase in global neddylation, in addition to a significant reduction of NEDP1, demonstrating the importance of this process in the development and progression of this pathology. Moreover, the silencing of NEDP1 in human hepatocytes results in a proliferative phenotype. In contrast, its overexpression in HB tumour lines (HepT1 and HepG2) results in the induction of apoptosis, modulation of migratory and proliferative capacity, metabolic reprogramming, sensitization to chemotherapeutic treatments, and regulation of cellular stress mechanisms and immune and inflammatory responses, with an important modulation of proteins such as LIN28. Similarly, its overexpression in patient-derived xenografts (PDX) from a distal metastasis showed modulation of proliferation and migration, in addition to the metabolic reprogramming like the observed in HB tumour lines. In vivo, in Ovo and ex Ovo experiments showed reduced tumorigenicity and decreased metastatic phenotype, and animal models of HB in mice in which NEDP1 overexpression has been carried out showed a reduction in proliferation and tumorgenesis at the histological level, with modulation of some key proteins like HOOK2.

**Conclusion:** Therefore, it is noteworthy that the effect observed with NEDP1 overexpression points to the importance of post-translational modifications in pathologies such as HB and highlights the relevance of neddylation, not only in the molecular characterization of HB, but also in the development of new specific treatments.

Made with BioRender.com
SAT-248
Chromosome engineering and CRISPR-Cas9 viability screening reveals increased metastatic capacity targetable by patient-specific synthetic lethality
Thorben Huth1, Emely Dreher1, Steffen Lemke2, Sarah Fritzschke1, Raisatum Sugiyanto1, Darko Castven2, David Liberson3, Carsten Sticht3, Eva Eiteneuer1, Anna Jauch1, Stefan Pusch2, Thomas Albrecht1, Benjamin Goepert1, Jens Marquardt1, Sven Nahnnsen2, Peter Schirmacher1, Stephanie Roessler1, Institute of Pathology, University Hospital Heidelberg, Germany, 2Quantitative Biology Center (QBIC), University of Tübingen, Germany, 3Department of Medicine I, University Medical Center Schleswig Holstein, Germany.

Background and aims: Chromosomal aberrations are a frequent event in a majority of tumor entities and a hallmark of cancer. In hepatocellular carcinoma (HCC), chromosome 8p (chr8pLOH) can be found in over 50% of tumors and is correlated with poor overall patient survival. However, no single chr8p tumor suppressor gene reveals strong pro-tumorigenic effects and can account for the increased mortality alone. Given the extent and complexity of chr8pLOH, this suggests that co-suppression of multiple genes can concomitantly promote tumor growth.

Method: In this study, we use chromosomal engineering and CRISPR-Cas9 viability screens to investigate the effects of concurrent loss of multiple chr8p genes. Chromosomal deletions were introduced by a dual guide CRISPR-Cas9 approach. Single cell clones with chr8pLOH were obtained by FACS sorting. PCR, Sanger Sequencing, fluorescence in situ hybridization (FISH) and RNA sequencing (RNAseq) were used to validate effective chr8p deletions. Functional effects were analyzed by viability, proliferation, migration and invasion assays. Gene dependencies were investigated by genome-wide CRISPR-Cas9 screens in chr8pLOH clones and validated by RNAi-mediated knockdown.

Results: Chromosomal deletions were introduced into different HCC cell lines and stable single clones with chr8pLOH were obtained. PCR, FISH and sequencing confirmed loss of heterozygosity in single cell clones. Genome-wide mRNA abundance was significantly altered and gene set enrichment revealed deregulations in migration and tumor microenvironment. Metastasizing potential of chr8pLOH cells was further investigated in vitro and in vivo and goes in line with increased patient mortality. Subsequently, several metastasis suppressor genes were identified on chr8p in an RNAi migration screen. In addition, by performing a genome-wide knockout screen, we discovered and independently validated dependencies specific for chr8pLOH patients with decreased survival. These include novel synthetic lethality of the Nudix hydrolase NUDT17.

Conclusion: We developed a new approach and cell model to study large scale genomic aberrations and chr8pLOH in cancer. State-of-the-art genomic technologies were integrated to explain increased patient mortality by the loss of cooperating metastasis suppressors. Extending the view to patient treatment, we identified novel synthetic lethalities as potential targets and therapeutic options in patients with chr8pLOH.

SAT-249
Expression and role of the metabotropic glutamate receptor type 3 in hepatocarcinoma
Isabel Méndez1, Andy Hernández-Abrego1, Ana Cristina Garcia-Gaytán1, Dalia De Ica-Pérez1, Ericka de los Rios-Arellano1, Isaias Turrubiate1, Emanuel Gámez2, Mauricio Diaz-Muñoz1, UANM Institute of Neurobiology, Querétaro, Mexico, 2Centro Médico Nacional de Occidente, Instituto Mexicano del Seguro Social, Mexico.

Background and aims: Glutamate acts on metabotropic glutamate receptors (mGluRs) to exert a variety of regulatory effects through the recruitment of second messengers. It has been demonstrated that mGLURs are expressed in various types of cancer cells and contribute to cancer development, such as increased proliferation and metastasis. mGluR type 3 (mGluR3) is a seven-transmembrane G protein-coupled receptor that inhibits cAMP, and it could positively regulate the pro-inflammatory cytokine interleukin 6 via the transcription factor NF-kappa B. We aim to evaluate the expression of mGluR3 and the glutamate transporter xCT, which exports glutamate from the cell, in hepatocarcinoma (HCC) induced by DEN in rats and the role of the mGluR3 on survival through cAMP and NF-kappa B in the HCC-derived cell line HepG2.

Method: Male Wistar rats received weekly intraperitoneal injections of diethylnitrosamine (DEN– 50 mg/kg body weight) to induce the progressive pathologies fibrosis, cirrhosis, and HCC. Control rats received saline solution at the same intervals. Histopathological and biochemical analyses were achieved to corroborate the establishment of each pathology. Intrahepatic glutamate concentrations were evaluated using a commercial kit. Expression of mGluR3 and xCT mRNA was analyzed in tissue samples by RT-qPCR. Expression of mGluR3 protein was analyzed on cells HepG2 and C9 normal hepatocytes cell line) by Western Blot and immunocytochemistry. The effect of the activation of mGluR3 was analyzed under the treatment with glutamate or the selective agonist LY347440, in the presence or the absence of the selective antagonist LY341495 in HepG2. Live and dead cells were quantified by tripan blue assay. cAMP generation and translocation of NF-kappa B to the nucleus were analyzed by immunocytochemistry. Activation of NF-kappa B was evaluated using the inhibitor BAY 11-7082.

Results: Overexpression of mGluR3 was observed according to the progression from normal condition to HCC in rats. This observation was corroborated in HepG2 compared to C9 normal hepatocytes. Both, intrahepatic glutamate and xCT expression increased in HCC. The activation of mGluR3 by glutamate and by the mGluR3 agonist inhibited intracellular cAMP induced by forskolin. Glutamate and the mGluR3 agonist increased live cells in a dose-dependent manner and did not affect cellular death. This effect over the live cells was reverted by the mGluR3 antagonist and by the NF-kappa B inhibitor. Cell death was increased in the presence of the mGluR3 antagonist and the NF-kappa B inhibitor.
Figure: A suggested mechanism in which mGluR3 could contribute to hepatocarcinoma cell survival

Conclusion: Our data demonstrate that mGluR3 and the transporter xCT are overexpressed in HCC. Moreover, mGluR3 has a role in the survival of HCC cells by inhibiting cAMP and activating the NF-kappa B pathway. This study suggests that the overexpressed mGluR3 could be activated by the enhanced glutamate exported to the extracellular milieu by xCT and may contribute to the survival of HCC. As well, mGluR3 could serve as a possible biomarker and therapeutic target in this pathology. This research was supported by DGAPA-PAPIIT, UNAM (IN206418 and N222821), and CONACYT (239250).

SAT-250
The rs72613567: TA polymorphism in hydroxysteroid 17-beta dehydrogenase 13 (HSD17B13) is associated with survival benefit after development of hepatocellular carcinoma
Hamish Innes1, Marsha Morgan2, Felix Stickel3, Jochen Hampe4, Stephan Buch4, Glasgow Caledonian University, School of Health and Life Sciences, Glasgow, United Kingdom, 2University College London, UCL Institute for Liver and Digestive Health, London, United Kingdom, 3University Hospital of Zurich, Department of Gastroenterology and Hepatology, Zurich, Switzerland, 4University Hospital Dresden, TU Dresden, Medical Department I, Dresden, Germany
Email: stephan.buch@uniklinikum-dresden.de

Background and aims: Genetic risk factors play an important role in determining the susceptibility to develop hepatocellular carcinoma (HCC) in people with chronic liver disease. It is unclear whether these same genetic risk factors influence survival following diagnosis. This study aimed to determine whether genetic polymorphisms influencing susceptibility to HCC are also associated with HCC prognosis.

Method: United Kingdom (UK) Biobank participants diagnosed with HCC after study enrolment were included. The primary outcome event was all-cause mortality. Patients were followed from the date of HCC diagnosis to death or the registry completion date. Five HCC case-control sets were performed. The primary outcome was all-cause mortality. Patients were followed from the date of HCC diagnosis to death or the registry completion date. Five HCC case-control sets were performed.

Results: The final sample included 439 participants (mean ±1SD age 69.2 ± 6.9 years; men 77.5%; white British ancestry 84.3%); non-alcohol-related fatty liver disease (NAFLD) was the most common underlying liver disease (41%) followed by alcohol-related liver disease (33%) and chronic viral hepatitis (11%). Patients were followed for a median of 1.9 years; a total of 321 patients died. Of the 321 deaths, 295 (92%) were ‘liver-related’ deaths, of which 235 were attributed to HCC and 60 to liver-disease per se. The median time to death from all-causes was 1.30 years (95%CI: 0.89–1.59). Kaplan Meier survival estimates at 1, 3 and 5 years were 53.2%, 31.2%, and 22.6%, respectively. In multivariate analysis, rs72613567:TA (HSD17B13) was associated with a significant reduction in both overall mortality (aHR: 0.75; 95%CI: 0.63–0.92; p = 0.005) and liver-related mortality risk (aHR: 0.76; 95%CI: 0.63–0.93; p = 0.009); no other genetic associations with mortality risk were identified (Figure 1). Treatment of HCC with curative intent was associated with a survival benefit in HCC patients (aHR: 0.25; 95%CI: 0.17–0.37; p < 0.001) while Baveno 3–4 staging was associated with an increased risk (aHR: 1.65; 95%CI: 1.06–2.59; p = 0.03).

Figure 1. association between genetic variants and mortality risk.

Conclusion: The rs72613567 polymorphism in HSD17B13 is not only associated with a reduction in the risk of developing HCC but is associated with survival benefit in HCC once established. HSD17B13 might be a potential therapeutic target for HCC prevention and outcome.

SAT-251
Selective inhibition of human β-catenin DNA transactivation activity using splice switching oligonucleotides for an improved therapeutic window in treating hepatocellular carcinoma
Jin Hong1, Vera Huang1, Laxman Eltepu1, Hua Tan1, Vivek Rajwanshi1, Aneerban Bhattacharya1, Elen Rosler1, Kang Hyunsoon1, Min Luo1, Saul Montero1, John Cortez2, Dana Cho1, David Smith1, Lawrence Blatt1, Julian Symons1, Leonid Beigelman1,1Aligos Therapeutics, South San Francisco, United States
Email: jhong@aligos.com

Background and aims: Wnt/β-catenin plays a critical role in embryonic development, tissue homeostasis and repair after injury. Alterations in this pathway are implicated in many human diseases including cancers. Dysregulation of the Wnt/β-catenin pathway may play a key role in the pathogenesis of HCC. Reducing β-catenin by siRNAs or ASOs in an HCC mouse model has shown significant inhibition of liver tumor growth. Due to the importance of Wnt/β-catenin in normal cellular function, many drugs targeting this pathway have failed due to toxicity. We designed splice switching oligonucleotides (SSO) targeting the DNA transactivation domain of β-catenin to reduce the downstream proteins responsible for HCC

Conclusion: The rs72613567:TA polymorphism in HSD17B13 is not only associated with a reduction in the risk of developing HCC but is associated with survival benefit in HCC once established. HSD17B13 might be a potential therapeutic target for HCC prevention and outcome.
Ductular reaction is mediated by CD24 and regulated by miR-122

Ductular Reaction (DR) is associated with chronic liver inflammations, liver fibrosis and presides liver cancer development. DR is characterized by cholangiocytes and hepatic progenitor cells (HPCs) proliferation. CD24, (a marker of HPC) is expressed on cholangiocytes in DR and is overexpressed in HCC and in combined-mixed HCC-Cholangiocarcinoma (CCA). CD24 is essential for self-renewal, proliferation, migration, invasion, and drug resistance of HCC and HCC-CCA tumors through activation of pSTAT3. However, the mechanism of DR is still unknown. We aimed to determine the molecular mechanism regulating DR.

Method: We analyzed bioinformatic data of clinical samples from human with chronic liver diseases as well as samples from mice with acute and chronic liver diseases. We performed transcriptomic investigations including single cell analysis. We have generated numerous genetically modified cell lines and we generated a miR-122 KO mice and we also used the CD24 KO mice model.

Results: Our bioinformatic analysis revealed that CD24 is a target gene of the liver-specific miR-122, which we have also proven by numerous in vitro studies both for the human and mouse miR-122 and CD24. A significant negative correlation was found between CD24 and miR-122 in livers of four human clinical diseases manifesting DR, including CAH, PBC, NASH and PSC. In addition, we identified a strong negative correlation between CD24 and miR-122 in a set of human HCC samples. Similarly, we observed a negative correlation between miR-122 and CD24 in a mouse model of acute and chronic liver inflammation. Our in-vitro studies showed that over-expression of CD24 resulted with increased cell proliferation via pSTAT3 protein. In vitro, HCC cell proliferation was attenuated upon miR-122 supplementation only in cells with CD24 bearing an authentic miR-122 seed at its 3′-UTR but was not attenuated when the miR-122 seed was mutated. In miR-122 KO mice, CD24 expression increases significantly, and DR is enhanced.

Conclusion: DR is mediated by CD24 expression and regulated by miR-122.

SAT-253

Hepatitis B surface antigen impairs endoplasmic reticulum stress-related autophagic flux via down-regulation of LAMP2, thereby participating in hepatocarcinogenesis

Yaojie Liang, Stefan Schefczyk, Xufeng Luo, Lorraine Muugangi, Baoju Wang, Hui Deng, Hideo Baba, Mengji Lu, Heiner Wedemeyer, Hartmut Schmidt, Ruth Broering, University of Duisburg-Essen, Dept of Gastroenterology, Hepatology and Transplant Medicine, Germany, The Affiliated Cancer Hospital of Zhengzhou University, Institute for Lymphoma Research, China, Huazhong University of Science and Technology, Union Hospital, Tongji Medical College, China, University Duisburg-Essen, Institute of Pathology, Germany, University Duisburg-Essen, Institute for Virology, Germany, Hannover Medical School, Dept. of Gastroenterology, Hepatology and Endocrinology, Germany.

Background and aims: Hepatitis B virus surface antigen (HBsAg) drives hepatocarcinogenesis. Factors and mechanisms being involved in this progress remain poorly defined, thus hindering the development of effective therapeutic strategies. Therefore, mechanisms involved in HBsAg-induced transformation of normal liver into hepatocellular carcinoma were explored.

Method: Hemizygous Tg (Alb1HBV)44Bri/mice were investigated for this HBsAg-driven carcinogenic events by data mining, western blotting, immunohistochemical and immunocytochemical staining. Findings were verified in HBsAg-overexpressing Hepa1-6 cells and validated in human liver specimens.

Results: Gene set enrichment analysis identified significant signatures in HBsAg-transgenic mice correlating with endoplasmic reticulum (ER) stress, unfolded protein response (UPR), autophagy, and proliferation. These events were further investigated in 2-, 8- and 12-month-old HBsAg-transgenic mice. Increased BiP expression in HBsAg-transgenic mice indicated induction of UPR. Furthermore, in HBsAg-transgenic mice, autophagy was enhanced at the early stage (increased BECN1 and LC3B) and blocked at the late stage (increased p62). Finally, HBsAg changed lysosomal acidification by downregulating LAMP2 expression. In patients, HBV-related HCC and adjacent tissue showed increased BiP, p62 and down-regulated LAMP2, compared to uninfected controls. In vitro, use of ER stress inhibitors reversed the HBsAg-related suppression of LAMP2. Furthermore, HBsAg promoted hepatocellular proliferation, indicated by I) Ki67, APEX and cleaved caspase 3 staining in paraffin-embedded HBsAg-transgenic mice liver sections and II) colony formation assay in HBsAg-expressing Hepa1-6 cells. Interestingly, ER stress inhibition in HBsAg-overexpressing Hepa1-6 cells suppressed HBsAg-mediated cell proliferation.

Conclusion: These findings revealed that HBsAg directly induces ER stress, impairs autophagy and promotes proliferation thereby driving hepatocarcinogenesis. Moreover, this study expanded the understanding of HBsAg-mediated intracellular events in carcinogenesis.
RuvBL1 is required for mitochondrial integrity and supports the metabolic reprogramming of HCC cells

Irene Simeone, Alice Guida, Simone Polvan, Elisabetta Ceni, Daniele Bani, Patrizia Nardini, Daniele Guasti, Massimo Bonora, Alice Santi, Andrea Galli, Tommaso Mello

University of Florence, Experimental and Clinical Biomedical Sciences, Italy

University of Siena, GenOМeC Doctorate, Italy

University of Florence, Clinical and Experimental Medicine, Italy

University of Ferrara, Department of Medical Sciences, Italy

Email: tommaso.mello@unifi.it

Background and aims: RuvBL1 is a AAA+ ATPase involved in multiple cellular activities, including proliferation, chromatin remodeling, DNA repair, transcription/translation and mTOR pathway activity. High RuvBL1 expression in hepatocellular carcinoma (HCC) correlates with poor prognosis. We have previously shown that hepatic RuvBL1 haploinsufficiency impairs mTORC1 signaling thereby altering liver metabolism and glucose homeostasis, suggesting that RuvBL1 overexpression may support the metabolic rewiring of HCC. We therefore aimed at dissecting RuvBL1 role in HCC cell metabolism.

Method: Experiments were performed in human HCC cell lines (HepG2, Hep3B, Huh7), mouse HCC cell line (Hepa1-6) and mouse normal hepatocytes (AML-12 and freshly isolated hepatocytes). RuvBL1 was targeted either by RNAi or by inhibiting its ATPase activity with CB-6644. Metabolomics analysis was performed by untargeted GC/MS or by 13C-glucose and 13C-glutamine metabolic tracing. OXPHOS was evaluated by Seahorse analyzer. Mitochondria morphology and potential were evaluated by fluorescence microscopy/HCS and TEM. RuvBL1 localization was assessed via STEM microscopy and immunogold labelling. RuvBL1 mitochondrial interactome was evaluated by co-immunoprecipitation coupled with MS. Correlative analysis in human HCC samples was performed on the TCGA-LIHC dataset.

Results: RuvBL1 silencing in Huh7 cells altered many mitochondrial metabolites central to glucose, TCA and aminoacid metabolism, and significantly associated with processes such as cancer metabolic reprogramming by pathway enrichment analysis. Metabolic tracing with 13C-glucose and 13C-glutamine in CB-6644 treated Huh7 revealed alterations in glycolysis and TCA. Targeting RuvBL1 by RNAi or by inhibition with CB-6644 significantly impaired mitochondrial respiration in normal hepatocytes and HCC cell lines. ATP production by OXPHOS and glycolysis was inhibited by CB-6644 treatment in a dose- and time-dependent manner. Interestingly, CB-6644 treatment increased mitochondrial membrane potential, as assessed by JC-1 and by TMRM staining in high content microscopy. RuvBL1 was targeted either by RNAi or by inhibiting its ATPase activity with CB-6644 significantly impaired mitochondrial membrane potential, as assessed by JC-1 and by TMRM staining in high content microscopy. RuvBL1 mitochondrial interactome was evaluated by co-immunoprecipitation coupled with MS. Correlative analysis in human HCC samples was performed on the TCGA-LIHC dataset.

Conclusion: Our data uncover a novel localization and function of RuvBL1 in mitochondria, suggesting that RuvBL1 overexpression is exploited in HCC to support mitochondria-related metabolic processes.

SAT-254
Combining non-selective beta-blockers with sorafenib in HCC: targeting the culprits of metastasis

Tasnim Mahmoud, Olfat Hammam, Mahmoud Khattab, Aiman El-Khatib, Yasmeen Atta

Faculty of Pharmacy, The British University in Egypt, Department of Pharmacology and Biochemistry, Cairo, Egypt

Theodor Bilharz Research Institute, Department of Pathology, Egypt

Faculty of pharmacy, Cairo University, Department of Pharmacology and Toxicology, Cairo, Egypt

Email: Tasnim120764@bue.edu.eg

Background and aims: Hepatocellular carcinoma (HCC) is the most prevalent type of liver cancer and the fifth most common cancer worldwide. For unresectable HCC, sorafenib (SOR), an oral multitargeted tyrosine kinase inhibitor, is used as first-line therapy, however, acquired resistance towards SOR develops leading to treatment failure. The underlying mechanisms of SOR resistance are not clearly understood, yet strong evidence suggests a role of epithelial-to-mesenchymal transition (EMT), the main culprit of metastasis, in its development. Meanwhile, non-selective beta-blockers (NSBB) were shown to improve outcomes and responsiveness in HCC. The detailed mechanism remains elusive though. This study aims at deciphering whether using carvedilol (CAR), as a NSBB, can enhance HCC responsiveness to SOR. Further, it unravels the potential interception of CAR with EMT at the glycogen synthase kinase (GSK)-3 beta/Wnt signaling.

Method: Male Sprague Dawley rats were injected intraperitoneally with diethyl nitrosamine (DEN) at a dose of 50 mg/kg, once a week. After a 16 -week period of DEN treatment, the rats underwent a one-week washout period followed by a 4-week period of oral treatment with SOR at a dose of 30 mg/kg/day, CAR at a dose of 10 mg/kg/day, each alone and combined. The end of week 20, the rats were sacrificed and livers were collected for further analyses which included histopathological examination, gene expression analysis of Axin-1 by qRT-PCR along with estimating protein levels of GSK-3 beta, snail-1 and twist-1 by ELISA. One-way ANOVA followed by Tukey Kramer’s for multiple comparisons was used for statistical analysis. p values less than 0.05 were considered statistically significant.

Results: In hematoxylin and eosin (H&E)-stained sections, histopathological examination revealed fewer sheets of malignant cells with areas of necrosis and fewer cells showing high nucleocytoplasmic ratios in the SOR+CAR-treated group compared to SOR alone. The combination group also showed lower levels of the EMT markers, snail-1 and twist-1 as compared to the HCC group. The latter was also significantly lower with SOR+CAR than with SOR alone (Fig 1A). Axin-1, the negative regulator of the Wnt signaling, was noticeably upregulated in the combination group compared to the positive control group. This was paralleled with an increase in GSK-3 beta levels in the SOR+CAR group relative to both control and SOR groups (Fig 1B).

Conclusion: Our data uncover a novel localization and function of RuvBL1 in mitochondria, suggesting that RuvBL1 overexpression is exploited in HCC to support mitochondria-related metabolic processes.
SAT-256
Investigation of novel hepatoblastoma chemosensitizers based on the inhibition of ABC pumps-mediated drug efflux
Candela Cives-Losada1, Oscar Briñez1,2, Stefano Cairo1, Emilie Inderst4, Thomas Effert5, María Luz Martínez-Chantada1,6, Matías A Avila1,2, Carolina Armgengol1,8, Elisa Lozano1,2, Jose Marin1,2, Rocio Ir Macías1,2, 1University of Salamanca, IBsal, Spain, 2National Institute for the Study of Liver and Gastrointestinal Diseases (CIBErEd), Spain, 3Champions Oncology, United States, 4XenTech, France, 5Johannes Gutenberg University, Germany, 6Center for Cooperative Research in Biosciences (CIC bioGUNE), Spain, 7Cima-University of Navarra, Spain, 8Germans Trias i Pujol Health Sciences Research Institute (IGTP), Spain
Email: rociorm@usal.es

Background and aims: The poor prognosis of about one-third of patients with hepatoblastoma (HB) is mainly due to the refractoriness of this cancer to neoadjuvant chemotherapy, which is commonly based on cisplatin and doxorubicin. In previous studies, we have demonstrated that the high expression of drug export pumps belonging to the ABC superfamily of proteins, mainly MDR1, MRPI, and MRP2, plays a primary role in HB chemoresistance. The aim of this study was to search for non-toxic inhibitors of these transporters and to evaluate in vitro their ability to sensitize HB cells to antitumor chemotherapy.

Method: Cell lines with endogenous or chemically induced high expression of MDR1 (HepG2/DR) or MRPI/MRP2 (HB-282) were used. Gene expression was determined by RT-qPCR, Western blot, and immunofluorescence. ABC-mediated transport activity was determined by flow cytometry using fluorescent substrates and specific inhibitors. Known inhibitors of ABC pumps were used as controls. In silico analysis by molecular docking was performed to look for potential ABC inhibitors using homology models for these proteins and a library of 40,000 natural or semi-synthetic compounds. Potentially harmful compounds were discarded based on toxicity prediction using the online tool ProTox-II. Cell viability was measured by MTT-formazan and sulfurhodamine B assays. SynergyFinder 3.0 was used to assess drug combination synergy.

Results: Besides known MDR1 inhibitors (verapamil, elacridar, and tariquidar), 11 novel compounds, among 40 potential inhibitors studied, significantly reduced rhodamine-123 efflux from HepG2/DR cells. Among these with no cytotoxic effect, only CCL-40 was able to slightly increase the sensitivity of cells to doxorubicin. However, CCL-17 and CCL-24, both tyrosine kinase inhibitors, markedly enhanced the cytostatic effect of doxorubicin, which was due to a synergistic mechanism. Regarding MRPI and MRP2, the molecular docking study identified 1,000 compounds with potential interaction with these pumps. Among them, the best eight compounds, based on low binding energy to both proteins, low predicted toxicity, and commercial availability, were further studied. The results revealed that two of them, CCL-45 and CCL-46, significantly reduced MRPI/MRP2-mediated calcein efflux in HB-282 cells. The chemosensitizing potency of CCL-45 was even stronger than the typical MRPI/MRP2 inhibitor MK-571.

Conclusion: Inhibition of ABC drug export pumps, such as MDR1, MRPI, and MRP2, by several non-toxic natural compounds and drugs commonly used in the clinic for other purposes, could be a helpful strategy to overcome the lack of response to chemotherapy in HB patients.

SAT-257
Dual effects of brown-fat activation limit hepatocellular carcinoma (HCC) progress in steatotic liver
Juan Gao1,2, 1Karolinska Institute, Sweden, 2Third Affiliated Hospital of Sun Yat-sen University, China
Email: gaoj59@mail2.sysu.edu.cn

Background and aims: Obesity, a metabolism abnormal disease with increasing incidence, also is a high-risk factor for various tumors. It is often associated with Non-alcoholic fatty liver disease (NAFLD), which could show steatosis, hepatitis, cirrhosis, and finally lead to cancer. Accumulating free fatty acids (FFAs) may contribute to cancerogenesis due to lipid metabolic disorders. Our previous studies suggested that cancer lipid metabolism confers antiangiogenic drug resistance (Iwamoto et al., 2018, Cell Metabolism 28, 104–117), and cold exposure suppresses tumor growth by brown fat activation alters global metabolism (Seki et al., 2022, Nature 608). We are interested in how the host metabolism reshapes the hepatocellular carcinoma (HCC) microenvironment and affects their response to drugs. We also gain insight into the potential mechanisms of the combination of metabolic stimulators and existing drug therapies.

Method: To establish metabolic abnormalities in animal models, adult male C57BL/6N mice were fed with high-fat diet (HFD) for more than 3 months to induce obesity and liver steatosis. Hepa1-6 hepatocarcinoma cells were implanted in the mice's liver under inhaling anesthetization as the orthotopic HCC model. Approximately 1 week after tumor implantation, mice were randomly grouped and treated with different temperatures exposure for the next three weeks. 4 degree celsius (4 °C) environmental temperature as the cold exposure group, and 30 degree celsius (30 °C) environmental temperature as the control group. Glucose tolerance test (GTT) and insulin tolerance test (ITT) were performed during the treatment. Then mice were sacrificed, blood, liver with tumor and fat tissue were collected for histological and biochemistry analysis. Data presented as mean determinants ± SEM. Statistical computations were performed using the standard two-tailed Student t-test, p<0.05, **p<0.01, and ***p<0.001 were considered statistically significant.

Results: The body weight of obese mice showed a decrease in the 4 °C group in the first week, with noticeable differences between the two groups after three weeks of treatment (p<0.001, Figure A). Both GTT and ITT suggested host metabolic disorders were improved in the 4 °C group (AUC, p<0.05). The tumor volumes of the orthotopically implanted HCC were limited in the 4°C group than in the 30 °C group (p<0.001, Figure B). Furthermore, qPCR indicated that metabolic-related genes were downregulated in the tumors of the 4°C group, such as cd36, fabp4, plin2 and glut1 (both p<0.01, Figure C). Besides, histopathology showed that the liver steatosis was relieved in the 4°C group compared to the 30 °C group (p<0.05). And both proliferation and metabolism of the tumor were limited in the 4°C group, showed by IHC staining of Ki67 and COX4 (both p<0.01, Figure D).

Conclusion: The dual effect of activating brown-fat relieves liver steatosis and HCC progress in the steatotic liver. The combination of brown-fat activators and drug therapies may contribute to better outcomes in HCC patients with metabolic disorders.
SAT-258
Development of new personalized therapies targeting VDAC1 in intrahepatic cholangiocarcinoma using patient-derived liver organoids
Silvia De Siervi1, Stefano Conti Nibali1, Stefania Mantovani2, Barbara Oliviero2, Mario Mondelli2,3, Laura Giuseppina Di Pasqua1, Davide Ronchi4, Marco Gaetano Lolicato1, Cristian Turato1.
1University of Pavia, Molecular Medicine, Pavia, Italy, 2Division of Clinical Immunology and Infectious Diseases, Fondazione IRCCS Policlinico San Matteo, Pavia, Italy, 3University of Pavia, Department of Internal Medicine and Therapeutics, Pavia, Italy, 4University of Pavia, Department of Electrical, Computer and Biomedical Engineering, Pavia, Italy
Email: cristianturato@gmail.com

Background and aims: Intrahepatic cholangiocarcinoma (iCCA) is characterized by a very poor outcome, and reliable biomarkers as well as new therapeutic strategies are urgently needed. Voltage Dependence Anion Selective Channel isoform 1 (VDAC1) has emerged as a prominent drug target because it plays a key role in the regulation of mitochondria-mediated cell death and survival signalling pathways. There have been several compounds developed, but none of them have been widely employed to treat patients due to promiscuity and side effects. The aim of this study was to test a new class of small molecules targeting VDAC1 to induce activation of the apoptotic pathway in iCCA patient-derived liver cells and organoids.

Method: We minced tumour and paired non-tumour samples, shortly digested in small cell clusters, and then seeded into Matrigel in order to develop organoids. Following immunofluorescence and qPCR analysis, we treated primary cell cultures and organoids with different concentrations of small molecules targeting VDAC1, detecting cell viability and ROS levels release, to verify the in vitro effects and the efficiency of these compounds on cells.

Results: We generated and characterized a biobank of human iCCA-derived organoids, analyzing the morphological characteristics and performing a mathematical tool that allow to simulate tumour progression. We also examined the presence of specific CCA markers, such as CK19, CK7, EpCAM, E-Cadherin, Ki67. In addition, we highlighted the increased levels of VDAC1 expression in iCCA cells compared to non-tumor cells (p < 0.005). The impact of novel small compounds targeting VDAC1 was then investigated at different times points and concentrations, both in patient-derived cell cultures and organoids. In particular, we showed a significant decrease of viability in tumor cells and a modulation in ROS production.

Conclusion: We established and characterized a reliable in vitro iCCA model that allowed us to study the impact of small molecules targeting VDAC1 as a new personalized treatment.

SAT-259
Morphological architectures of patient-derived hepatocellular carcinoma organoids with GSK3-beta expression dependent variability according to lenvatinib resistance
Kyung Joo Cho1, Jun Yong Park1,2,3,4, Hye Won Lee1,3,4, Hye Jung Park1, Eun Kong Lee1, Sang Hyun Seo1,2, Jae Seung Lee1,3,4, Beom Kyung Kim1,3,4, Seung Up Kim1,3,4, Do Young Kim1,3,4, Sang Hoon Ahn1,3,4, 1Yonsei Liver Center, Severance Hospital, Seoul, Korea, Rep. of South, 2Brain Korea 21 PLUS Project for Medical Science, Yonsei University, Seoul, Korea, Rep. of South, 3Department of Internal Medicine, Yonsei University College of Medicine, Seoul, Korea, Rep. of South, 4Institute of Gastroenterology, Yonsei University College of Medicine, Seoul, Korea, Rep. of South
Email: drpjy@yuhs.ac

Background and aims: Intrahepatic cholangiocarcinoma (iCCA) is characterized by a very poor outcome, and reliable biomarkers as well as new therapeutic strategies are urgently needed. Voltage Dependence Anion Selective Channel isoform 1 (VDAC1) has emerged as a prominent drug target because it plays a key role in the regulation of mitochondria-mediated cell death and survival signalling pathways. There have been several compounds developed, but none of them have been widely employed to treat patients due to promiscuity and side effects. The aim of this study was to test a new class of small molecules targeting VDAC1 to induce activation of the apoptotic pathway in iCCA patient-derived liver cells and organoids.

Method: We minced tumour and paired non-tumour samples, shortly digested in small cell clusters, and then seeded into Matrigel in order to develop organoids. Following immunofluorescence and qPCR analysis, we treated primary cell cultures and organoids with different concentrations of small molecules targeting VDAC1, detecting cell viability and ROS levels release, to verify the in vitro effects and the efficiency of these compounds on cells.

Results: We generated and characterized a biobank of human iCCA-derived organoids, analyzing the morphological characteristics and performing a mathematical tool that allow to simulate tumour progression. We also examined the presence of specific CCA markers, such as CK19, CK7, EpCAM, E-Cadherin, Ki67. In addition, we highlighted the increased levels of VDAC1 expression in iCCA cells compared to non-tumor cells (p < 0.005). The impact of novel small compounds targeting VDAC1 was then investigated at different times points and concentrations, both in patient-derived cell cultures and organoids. In particular, we showed a significant decrease of viability in tumor cells and a modulation in ROS production.

Conclusion: We established and characterized a reliable in vitro iCCA model that allowed us to study the impact of small molecules targeting VDAC1 as a new personalized treatment.
Method: Patient-derived tumor tissue was digested at 37 °C and mixed with Matrigel. After polymerization of Matrigel, medium was added and changed twice a week. To evaluate whether HCO exhibit different sensitivity to drugs, we tested its sensitivity and analyzed the sensitivity in HCO lines with the difference in gene expression.

Results: We successfully established HCO lines at a 76% success rate, presenting as two different morphological types: solid-type and mixed-type. Heterogeneous morphological features of HCOs exhibited differential gene expression and response to lenvatinib, showing highly expressed EGFR, GSK3-β and FOXO3 with lower sensitivity to lenvatinib in solid-type HCOs, compared to mixed-type HCOs. To confirm the association of morphological classification with GSK3-β activation and lenvatinib sensitivity, we generated a rHCO from re-biopsied tissue from a patient with advanced HCC progression after lenvatinib treatment and compared it with a HCO from first biopsied tissue. Specifically, the lenvatinib-resistant rHCO expressed much lower levels of the inactive form of GSK3-β and higher levels of the active form of GSK3β compared with the original HCO, suggesting higher GSK3-β activity and Ki-67 levels in resistant cells. Knockdown of GSK3-β with selective GSK3-β inhibitor and siRNA restores sensitivity to lenvatinib in association with GSK3-β activity and morphological features.

Background and aims: Extracellular vesicles (EVs) are cell-derived nano- and micro-sized vesicles that are abundantly present in body fluids emphasizing their potential utility in liquid biopsies. EVs have great potential as early hepatocellular carcinoma biomarkers since tumor-derived EVs are found at an early stage, and their inherent stability guarantees the integrity of biomolecular cargos. Unfortunately, conventional EV isolation techniques including ultracentrifugation and/or size exclusion chromatography are based on EVs’ density or size respectively, and are incapable of separating tumor-derived EVs from total EVs. Here, we present an unique approach of isolating hepatocellular derived EVs by immunomagnetic enrichment using surface antibodies, magnetic beads and click chemistry.

Method: We developed an EV enrichment system whereby magnetic beads (1–5 µm) were functionalized with tetrazine (Tz). Antibodies [EpCAM (epithelial-specific), CD9 (EV specific) and ASGPRI1 (hepatocyte specific)] used to capture EVs was functionalized with trans-cyclooctene (TCO). EVs isolated from the conditioned medium obtained from serum-starved HepG2 cells were captured using antibody-TCO conjugate and the EV-antibody-TCO conjugate was incubated with the magnetic beads-Tz, creating a click reaction between the Tz and the TCO, leading to capture of the hepatocyte specific EVs to the magnetic beads. Magnetic beads were enriched using magnets; and EV release from the magnetic beads was achieved using 1,4-dithiothreitol (DTT), by cleavage of disulfide bonds incorporated during Tz conjugation. Characterization of efficiency of conjugation, click reaction and EV release was performed using flow cytometric analysis.

Results: To validate the efficiency of the EV isolation, EVs were fluorescently labelled with Calcein-AM prior to conjugation, and the EVs captured using magnetic beads were analyzed through a flow cytometer. We confirmed a successful enrichment of the EVs using magnetic beads. Similar results were obtained with EpCAM or ASGP1 antibodies suggesting antibody-specific EV-capture can be achieved using different antibodies. Hepatocyte-specific EVs (bound to magnetic beads) were separated from other particles in suspension using magnetic enrichment. Finally, DTT treatment released the captured EVs from the magnetic beads for downstream analysis.

Conclusion: We confirm the successful immunomagnetic enrichment of specific hepatocyte-derived EVs by combining cell specific antibodies, magnetic beads and click chemistry. We present an attractive and unique approach for the isolation and analysis of cell-specific EVs. This approach can be extended to other cell types i.e., HSCs, endothelial cells, immune cells based on the availability of the antibodies. We believe this approach will pave the way to the identification of early circulating biomarkers for HCC.

SAT-261
Circular RNA hsa_circ_0062682 promotes oncogenesis in hepatocellular carcinoma and binds to YBX1
Rok Razpotnik1, Hana Trček1, Martin Zaplotnik2, Blaž Trotovšek3, Mihajlo Djokić4, Miha Petrič5, Boštjan Plešnik6, Irena Plahuta6, Arpad Ivanecz7, Linda Cellner2, Rado Janša1, Petra Hudler8, Robert Vidmar6, Marko Fonović8, Ursula Prosenc Zrnčič9, Damjana Rozman1, Tadeja Rezen1, 1University of Ljubljana, Faculty of Medicine, CFGBC, IBKMG, Slovenia, 2University Medical Centre Ljubljana, Department of Gastroenterology, Slovenia, 3University Medical Center Ljubljana, Department of Abdominal Surgery, Slovenia, 4University Medical Center Maribor, Department of Abdominal and General Surgery, Slovenia, 5University of Ljubljana, Faculty of Medicine, MCMB, IBKMG, Slovenia, 6Jožef Stefan Institute, Department of Biochemistry and Molecular and Structural Biology, Slovenia, 7BIA Separations CRO, Labena d.o.o, Slovenia Email: tadeja.rezen@mf.uni-lj.si

Background and aims: Circular RNAs (circRNAs) have gained increasing interest in recent years and have been shown to play an important role in cancer. Although increased efforts have been made to identify their role and differential expression in cancer, the role of most dysregulated circRNAs is unknown, and their function in cancer pathogenesis remains to be assessed. Here, we report the characterization of a circRNA hsa_circ_0062682 with oncogenic properties in hepatocellular carcinoma (HCC) and evaluate its expression and diagnostic potential in HCC patients.

Method: We identified differentially expressed circRNAs in HCC tumors by reanalyzing published microarray datasets. We
investigated the oncogenic potential of circRNA hsa_circ_0062682 in cell lines using various functional cell-based assays, including proliferation, migration, invasion, and colony formation assays. We used microarrays to analyze systemic changes in the transcriptome after modulation of circRNA expression in HCC cell lines. In addition, biotinylated oligonucleotide pulldown coupled with mass spectrometry was used to identify binding partners and RNA immunoprecipitation to confirm binding partners. We analyzed circRNA expression in paired liver tumor and paratumor samples from the Slovenian HCC cohort with metabolism-associated and alcohol-related etiologies. We measured the presence of circRNA in plasma from the same patients by RT-qPCR and ddPCR to evaluate its diagnostic potential.

**Results:** By analyzing available microarray datasets, published at the time of analysis, we identified 32 upregulated and 6 downregulated circRNAs in HCC tumors. We overexpressed and knocked down the expression of hsa_circ_0062682 in various HCC cell lines and confirmed its oncogenic potential using several functional assays. By integrating pathway enrichment analysis and gene set enrichment analysis, we uncovered systemic changes triggered by perturbations of hsa_circ_0062682 expression and we identified enriched transcription factors (E2F1, Sp1, HIF-1α, and NFκB), known to be oncogenic regulators in HCC, as well as signaling pathways previously associated with HCC that could explain the observed phenotype. Using the proteomics approach, we uncovered protein binding partners of hsa_circ_0062682 and confirmed an interaction with YBX1, a known oncogene, by RNA immunoprecipitation. A cell type-specific role of hsa_circ_0062682 was detected based on differential sorafenib sensitivity, migratory ability and differential localization of the studied proteins in stably transduced cell lines. Interestingly, the expression of this circRNA was downregulated in our cohort, which has a metabolic and alcohol-associated etiology. In our opinion, this discrepancy could be due to different etiologies and molecular subtypes of the HCC cohorts used in the microarray datasets. Furthermore, we evaluated the diagnostic potential of hsa_circ_0062682 as a non-invasive biomarker in plasma by measuring its expression in plasma and comparing it with its expression in liver.

**Conclusion:** Our data suggest that hsa_circ_0062682 promotes oncogenesis in HCC, binds to YBX1, affects multiple signaling pathways involved in oncogenesis, and may act in a cell type specific context.

**SAT-262**

The mutated ENTPD6 as neoantigen in hepatocellular carcinoma

Dongbo Chen1, Pu Chen1, Hongsong Chen1, 2 Peking University People’s Hospital, Peking University Hepatology Institute, Beijing Key Laboratory of Hepatitis C and Immunotherapy for Liver Disease, Beijing International Cooperation Base for Science and Technology on NAFLD Diagnosis, China

Email: chenhongsong2999@163.com

**Background and aims:** Tumor neoantigens, new peptides generated by somatic mutations from tumor tissues but not normal tissues, have good tumor specificity and strong immunogenicity. Though Clinical trials testing neoantigen immunotherapy have yielded encouraging results in patients with hepatocellular carcinoma (HCC) worldwide, it’s hard to know which neoantigens are dominant in determining the responsiveness to immunotherapy treatment. In this study, we used the Co-HA system, a single-plasmid system co-expressing patient HLA and antigen, to detect the immunogenicity of neoantigens and identify new dominant hepatocellular carcinoma (HCC) neoantigens.

**Method:** First, we enrolled 14 HCC patients for next-generation sequencing for variation calling and predicting potential neoantigens. Then, the specific cytotoxicity generated by this neoantigen was shown using the Co-HA system. Finally, potential HCC-dominant neoantigens were screened out by tetramer staining and validated by the Co-HA system using methods including flow cytometry, ELISPOT, ELISA and sequencing.

**Results:** First, 2875 somatic mutations were identified in 14 HCC patients. The main base substitutions were C > T/G > A transitions, and the main mutational signatures were 4, 1 and 16. The high-frequency mutated genes included HMCN1, TTN and TP53. Then, 541 potential neoantigens were predicted. Moreover, 37 predicted neoantigens restricted by HLA-A*11:01, HLA-A*24:02 or HLA-A*02:01 were assayed by tetramer staining to screen out potential HCC-dominant neoantigens. Furthermore, the Co-HA system identified that the HLA-A*24:02-restricted epitope 5′-FYAFSCYDL-3′, produced by the mutated ectonucleoside triphosphate diphosphohydrolase 6 (ENTPD6) had strong immunogenicity in HCC. Finally, Huh-7 cells co-expressing HLA-A*24:02 and ENTPD6 neoantigen were selected as the target cells and implanted into the B-NDG-B2m+/+/Fcrntm1/mB2m/Bcgen mouse model. When tumor size was approximately 150 ± 50 mm³, they were treated with the neoantigen-specific T cells through intratumor injection every 2 days. After 3 times of treatment, the volume and weight of tumors with neoantigens were both smaller than those of WT type.

**SAT-263**

Relevance of hypoxia-inducible factor 1 alpha in hepatocellular carcinoma: clinical and pre-clinical analysis

Tania Payo-Serafin1,2, Paula Fernández-Palanca1,2, Carolina Méndez-Blanco1,2, Jennifer Martínez-Geijo1,2, Beatriz San Miguel de Vega1,2, Andrés García-Palomo1,2, Juan José Ortiz de Urbina1, Javier González-Gállego1,2, María Jesús, Tufón González1,2, José Luis Mauriz1,2, 1Institute of biomedicine (IBIOMED), University of León, León, Spain, 2Centro de investigación biomédica en red de enfermedades hepáticas y digestivas (CIBERheD), Instituto de Health Carlos III, Madrid, Spain, 3Service of Medical Oncology, Complejo Asistencial Universitario de León (CAULE), Hospital of León, León, Spain, 4Pharmacy Service, Complejo Asistencial Universitario de León (CAULE), Hospital of León, León, Spain

Email: jlmauriz@unileon.es

**Background and aims:** Hepatocellular carcinoma (HCC), the main type of liver cancer, stands as one of the deadliest type of cancer with an increasing prevalence worldwide. Hypoxia plays a major role in tumorigenesis and in the development of chemotherapy-resistant tumor cells. The adaptive cell response to this condition is mainly mediated by the hypoxia-inducible factors 1 and 2 alpha (HIF-1alpha and HIF-2alpha, respectively), which triggers the activation of several cellular pathways contributing to cell survival and the loss of sensitivity to chemotherapy, and leading to tumor progression.
Therefore, our aim was to assess the role of HIF-1alpha on HCC patients’ outcome and tumor cell survival.

Method: We analyzed HIF-1alpha gene expression and RNA-seq data in several HCC repositories such as The Cancer Genome Atlas (TCGA), the European Genome-Phenome Archive (EGA), Genotype-Tissue Expression (GTEx) and GSE14520. Data were obtained from UALCAN, Gene Expression Profiling Interactive Analysis (GEPIA) and Gene Expression Omnibus (GEO) databases. We performed a screening of HIF-1alpha expression in eight different human HCC cell lines, employing CoCl2 to simulate a cell response to hypoxia. Western blot and immunofluorescence with laser confocal imaging were used to analyze protein expression, while qRT-PCR was used to assess gene expression. Moreover, HIF-1alpha gene knockdown was performed using siRNA transfection. MTT assay and nuclear Ki67 protein levels assessment were used to determine cell viability and proliferation, respectively. Image-iT Red Hypoxia Reagent was employed to monitor hypoxia in the 3D models of HCC. GraphPad Prism 8 software was used to conduct statistical analysis, considering significant differences when p < 0.05.

Results: HIF-1alpha was found to be overexpressed in HCC tissues, being also associated with higher tumor grades and a poor survival rate in HCC patients. Huh-7 and PLC/PRF/5 cell lines showed a higher expression of HIF-1alpha under hypoxia conditions. For this reason, these cell lines were selected to perform HIF-1alpha gene silencing and to generate two spheroid models of HCC showing a physiological hypoxia. A decrease in viability and Ki67 protein levels was detected after gene knockdown, suggesting a pro-survival ability associated with HIF-1alpha. Moreover, HIF-1alpha-silenced cells showed higher levels of pro-apoptotic proteins under hypoxic conditions, revealing the potential effect of HIF-1alpha in HCC cell survival through apoptosis evasion.

Conclusion: Altogether, these findings suggest that HIF-1alpha expression and stabilization plays a key role in HCC progression and patients’ outcome, leading to tumor cell survival through apoptosis evasion under a hypoxic environment, highlighting HIF-1alpha activity blockage as a potential therapeutic strategy to restrain HCC progression.

SAT-264
Therapeutic targets associated with conserved subtypes of hepatocellular carcinoma
Ju-Seog Lee1, Yun Seong Jeong1, Sun Young Yim2, Sung-Hwan Lee3, Sang Hee Kang4. 1The University of Texas MD Anderson Cancer Center, Systems Biology, Houston, United States, 2Korea University College of Medicine, Korea, Rep. of South, 3Cha University Bundang medical center, Korea, Rep. of South
Email: jlee@mdanderson.org

Background and aims: While many studies revealed clinically relevant conserved subtypes of hepatocellular carcinoma (HCC), their discovery is not translated to the clinic yet due to lack of associated therapeutic intervention for subtypes. We aim to examine consensus of discovered subtypes and uncover their clinical significance and to identify potential therapeutic targets for each subtype.

Method: We integrated 16 previously established transcriptomic signatures for HCC to uncover consensus subtypes. We also developed and validated a robust predictor of consensus subtype with 100 genes (PICS100). Informatics and statistics approaches were applied to find clinical relevant association of genomic features. Patient derived xenograft (PDX) models were used for testing hypothesis from analysis of transcriptomic data.

Results: Integrative analysis of genomic and proteomic data uncovered five subtypes of HCC with substantial difference in clinical outcomes. STM (Stem) is characterized by high stem cell features, vascular invasion, and poor prognosis. CIN (Chromosomal Instability) has moderate stem cell features but high genomic instability and low immune activity. High expression of IGFB2 is another unique feature of CIN subtype, suggesting that CIN subtype might have benefit of treatment targeting IGFB2/IGFR pathway. IMH (Immune High) is best characterized by its high TCR diversity and high baseline immune activity. BCM (Beta-Catenin with high Male predominance) is characterized by prominent beta-catenin activation, low miRNA expression, hypomethylation, and high sensitivity to sorafenib. Interestingly, subtype BCM had a significantly higher male-to-female ratio than the other subtypes. Another unique molecular characteristic of subtype D was miRNA downregulation. DLP (Differentiated and Low Proliferation) is differentiated with high HNF4A activity. We also identified potential serum biomarkers that can stratify patients into 5 subtypes. Our PICS100 predictor is available in the website (https://kasaha1.shinyapps.io/pics100/) with test data set for those who wish to run genomic predictor. Multistep analysis of genomic and proteomic data identified therapeutic targets for poorest prognostic STM subtype and their therapeutic potential was further validated in cell line and mouse models.

Conclusion: Newly discovered subtypes are associated with response to standard and experimental treatments and highly conserved in pre-clinical models such as cell lines and PDX tumors. Therefore, our study may provide a framework for selecting the most appropriate models for preclinical studies of new drugs and potentially for future clinical trials.

SAT-269
In vivo MRI characterization of pathological changes in liver microstructures
Xiaoyu Jiang1, Manhal Izzy2, Kay Washington2, John Gore2, Junzhong Xu2. 1Vanderbilt University Medical Center, Radiology, United States, 2Vanderbilt University Medical Center, United States
Email: xiaoyu.jiang@vumc.org

Background and aims: Cell volume, cell density, and their variations are fundamental concepts in liver pathology. Currently, cell volume and cell density measurements are possible via assessing liver biopsies, which are subject to sampling bias and may not reliably reflect the spatial heterogeneity in the liver as a whole. In vivo MRI cytomtery may provide means to overcome this limitation. This study aims to 1) prove the feasibility of in vivo mapping of non-fat cell volume (or equivalent cell size) and cell density in the liver using clinical 3T scanners 2) histologically validate MRI measurements using human liver specimens.

Method: MRI cytomtery combines measurements of water diffusion rates over different time scales corresponding to probing cellular microstructure over different distances. The range of sizes of most interest in liver tissues is from 5 um to 25 µm (e.g., hepatocytes ~ 15–25 µm, inflammatory cells ~ 5–10 µm, cancer cells ~ 10–50 µm). These correspond to diffusion times of order 5–70 ms which can be achieved using a combination of OGS (oscillating gradient spin echo) and PGSE (pulsed gradient spin echo) measurements on clinical scanners. Microstructural properties are derived by fitting multi-b value-multi-diffusion time fat-suppressed diffusion-weighted MRI signals to a three-compartment (blood, intra- and extracellular water) signal model. Details of the signal model and imaging protocol have been published previously. ex vivo validation: Microstructures of fixed human liver specimens, including normal liver tissues, cirrhosis, steatosis, hepatocellular carcinoma (HCC), cirrhotic regenerative nodules (CRN), and intrahepatic cholangiocarcinoma (iCCA), were quantified using MRI ex vivo and histology, in vivo feasibility: MRI cytomtery was performed in a healthy subject and an HCC patient using a Phillips 3T scanner.

Results: For ex vivo experiments, MRI-based assessment of HCC and iCCA showed that tissues have significantly smaller cell volumes and higher cell densities than normal liver and CRN without steatosis. Cell sizes for fatty areas and CRN with steatosis are smaller than those for normal liver and CRN without steatosis (note that our MRI-derived cell sizes are converted from non-fat cell volumes). These
observations matched histological assessment of microstructures. For in vivo experiments, MRI cytometry demonstrated that the HCC tumor has decreased cell sizes and -~2 higher cell densities than the healthy subject.

Conclusion: This study demonstrates that the novel MRI cytometry patient. The in-plane resolution is 4 × 4 mm² and the slice thickness is analysis of variance (ANOVA) with Bonferroni correction. B. in vivo MR inside the box are the mean values, and the whiskers mark the SD. *P < 0.05. **P < 0.01, ***P < 0.001, and ****P < 0.0001 as measured by one-way analysis of variance (ANOVA) with Bonferroni correction. B. in vivo MR cell size and cell density imaging for a healthy subject and an HCC patient. The in-plane resolution is 4 × 4 mm² and the slice thickness is 10 mm.

Conclusion: This study demonstrates that the novel MRI cytometry can characterize pathological changes in liver microstructures using clinical 3T scanners in <12 minutes. These findings provide a solid foundation for future investigation of the role of non-invasive evaluation of liver cellular characteristics in diagnosing liver disease aiming to further decrease the need for liver biopsy.

**SAT-267**

Prognostic and genomic portrait of hepatocellular carcinomas with bi-allelic inactivation of RB1 gene

Jihyun An¹, Bora Oh², Jin-Sung Ju², Ju Hyun Shin². ¹Hanyang University College of Medicine, Korea, Rep. of South, ²Asan Medical Center, Korea, Rep. of South

Email: starl1t@naver.com

Background and aims: Although RB1 gene loss have been correlated with progression of HCC, its molecular and pathogenic makeups are poorly defined. We comprehensively characterized a genomic subtype of HCC with true loss-of-function alteration of RB1.

Method: We performed integrative analysis of DNA and RNA sequencing data from 561 HCCs included in our hospital and TCGA projects. We classified the tumors according to the presence of RB1 bi-allelic inactivation (Bi) such as deep deletion and copy-loss/neutral loss-of-heterozygosity: RB1-Bi and RB1-nonBi groups. Their impacts on clinical and genomic features of HCC were investigated.

Results: Among the entire samples, 82 (14.6%) corresponded to the RB1-Bi group, with deep deletion in 58 and copy-loss or copy-neutral loss-of-heterozygosity in 24. RB1-Bi tumors were independently associated with poorer disease-free survival and overall survival after hepatectomy, irrespective of RB1 alteration type, poorly differentiated tumors were more frequently observed in the RB1-Bi group (48.8% vs. 34.6%, P < 0.05). The RB1-Bi group was enriched for cell cycle-regulated, replication stress, and DNA damage repair-associated genes, while downregulated for CD8+ T cell markers. RB1 alteration events occurring in the RB1-Bi group were mostly clonal, and completely arose before whole genome doubling that was more frequent in the subset.

Conclusion: Bi-allelic RB1 loss in the HCC confers worse prognosis through relevant functional and genomic aberrations. Tailored therapies for the disease that might be resistant to immunotherapy should be developed and tested.

**SAT-267**

Bacterial exosomes cargo vaccine with EpCAM aptamers for targeting hepatocellular carcinoma

Pushpa Yadav¹, Preedia Babu E¹, Nuno Viegas², Anupama Parasar³, Riddhi Sharma¹, Gayatri Ramakrishna¹, Nirupma Trehanpati¹, Shiv Kumar Sarin¹. ¹Institute of Liver and Biliary Sciences, Molecular and Cellular Medicine, New Delhi, India, ²Mantis Pharmaceuticals, Leiden, Netherlands, ³Institute of Liver and Biliary Sciences, Hepatology, New Delhi, India

Email: shivsarin@gmail.com

Background and aims: Hepatocellular carcinoma (HCC) is the fourth most cause of cancer-associated mortality and leads to approximately 700,000 deaths worldwide annually and is expected to increase over 1 million by 2030. HCC is a highly heterogenous tumor with extensively proliferating and differentiating EpCAM or CD133 positive cancer stem cells. Despite existing chemo, radiation, and immune therapies for non-resectable tumours, 5-year survival rate is quite low with high recurrence rate. Therefore, our aim was to develop anti-EpCAM aptamer equipped bacterial outer membrane vesicles (OMVs) loaded with the chemotherapeutic drug, doxorubicin (DOX) as vaccine for specific targeting of cancer stem cells.

Method: We have designed EpCAM specific DNA (EP166 and Syl3C) and RNA-DNA hybrid aptamers and analysed their in vitro binding efficiency in HepG2, HuH7 cell lines as well as their spheroids and toxicity using MTT assay at 24, 48 and 72 hours of treatment. Salmonella typhimurium has the potential to kill tumor cells, therefore isolated and purified outer membrane vesicles (OMVs) were used to load DOX by incubating them together at an appropriate mass ratio for 4 hours at 37°C. As the aptamer cannot bind to the OMVs on its own, carbodiimide (EDC/NHS) coupling chemistry was applied for conjugating the carboxylic group of DSPE-PEG-COOH linker to the amine group of anti-EpCAM aptamer. The linker conjugated aptamer was then mixed with the bacterial exosomes cargo to develop anti-EpCAM aptamer equipped DOX loaded OMVs. These novel OMVs were then used for testing in vivo efficacy in HepG2 cells derived subcutaneous xenograft model. Apt- conjugated DOX or DOX alone was used as control treatment.

Results: All the aptamers analysed for binding with HepG2 cells with flow cytometry showed maximum binding at 150 nM with Syl3C showing 47.3% binding (Fig1A). In vivo experiments showed decreased tumor burden as compared to tumor control after treatment with DOX alone, Apt-DOX and Apt-DOX-OMVs (Average tumor volume: 448.26, 307.58, 168.29, 112.85 mm³) after 12 days of treatment. Apt-DOX conjugate also showed increased specific DOX toxicity and reduced tumor burden in comparison to DOX alone (Average tumor size: 4.8 g and 2.7 g respectively).

Conclusion: Apt-DOX-OMVs and Apt-DOX conjugate and are more efficient in specifically targeting cancer cells in comparison to DOX alone or tumor control.
SAT-268
Poor sorafenib response in hepatocellular carcinoma patients is mediated by hypoxia-related 14-3-3 scaffolding proteins and induces a shift in tumor immune micromilieu
Jovana Castven1, Diana Becker2, Sophia Heinrich3, Carolin Zimpel1, Darko Castven1, Beate Straub2, Peter Grimminger2, Peter Galle2, Arndt Weinmann2, Jens Marquardt1. 1Universitätsklinikum Schleswig-Holstein, Campus Lübeck, Germany, 2Universitätsmedizin Mainz, Germany, 3Medizinische Hochschule Hannover, Germany

Background and aims: Advanced stage of hepatocellular carcinoma (HCC) is frequently accompanied by poor response to the drug treatment or relapse quickly after initial remission. Therefore, identification of molecular drivers of poor response to sorafenib with large focus on novel prognostic markers associated with observed distinct tumor immune landscapes was our ultimate goal.

Method: From a cohort of 91 patients treated with sorafenib, we identified 17 HCC patients with particularly good or bad response. Integrative RNA sequencing and whole-exome sequencing analyses were performed to identify predictive markers of sorafenib resistance.

In vitro validation of defined targets were performed in a model of sorafenib resistance, followed by subsequent functional and mechanistic validation.

Results: Patients with worst response (n = 7) were characterized by significantly shorter treatment duration and poor overall survival than good responders (n = 10). Molecular analyses revealed that acquisition of drug resistance observed in poor responder group was associated with upregulation of hypoxia-related targets from 14-3-3 scaffolding protein family. WST-1 viability assay displayed that hypoxia contributes to sorafenib resistance. Specific peptide inhibition of this protein family, in combination with sorafenib, showed synergistic effects and efficiently reduced cell proliferation and viability. Dual inhibition consequently reversed sorafenib resistance under both conditions, normoxia and hypoxia, with predominant effects noticed in normoxia. Furthermore, a shift in immune-cell composition with predominant enrichment of M2-immunosuppressive macrophages in worst responders was observed.

Conclusion: Defining the actionable targets of resistance and their subsequent inhibition might greatly help delineate molecular alterations driving drug resistance. In our model, specific peptide inhibition of 14-3-3 scaffolding proteins, when combined with sorafenib, showed a positive correlation in reversing sorafenib resistance. Importantly, synergistic effects of this dual inhibition influenced sorafenib resistance in normoxic and hypoxic microenvironments, but with different potency. This highlights the significance of the tumor microenvironment in modulating the therapy response. Further, characterization of the immune micromilieu in different subgroups of patients could be of particular importance to depict treatment resistance and warrants further investigations.

SAT-269
RBCK1 promotes the stabilization of HBx by linear ubiquitination to drive the progression of HBV-associated hepatocellular carcinoma
Zheyu Dong1, Peng Chen1, Yuxin Zhou1, Qiuyue Ye1, Junling Chen1, Jianzhong Cai1,2, Yijian Huang1,2,2, Jiayue Yang1,2, Yaoting Feng1,2, Liangxing Chen1,2, Libo Tang1, Yongyin Li1. 1State Key Laboratory of Organ Failure Research, Guangdong Provincial Key Laboratory of Viral Hepatitis Research, Department of Infectious Diseases, Nanfang Hospital, Southern Medical University, Guangzhou, China, 2The First School of Clinical Medicine, Southern Medical University, Guangzhou, 510515, China, China

Background and aims: Linear ubiquitin chain assembly complex (LUBAC) has been reported to participate in cancer progression, but its role in hepatocellular carcinoma (HCC) remains unknown. This study aimed to investigate the functions and potential tumorigenic mechanisms of LUBAC components in HBV-associated HCC.
Method: The expression of LUBAC components (RBCK1, RNF31, and Sharpin) and Met1-linked ubiquitination (M1-UBi) and their correlation with prognosis were detected. The biological functions of RBCK1 in HBV-associated HCC were investigated in vitro and in vivo. The regulation of RBCK1 on the HBx protein expression was analyzed by cycloheximide chase assays, coimmunoprecipitation, and ubiquitin assays.

Results: We found that the expression of LUBAC components and M1-UBi was significantly upregulated in HCC and correlated with poor prognosis. Interestingly, subgroup analysis revealed that RBCK1, not RNF31 or Sharpin, was exclusively overexpressed in HBV-associated HCC compared to non-HBV-associated HCC. Uregulated RBCK1 expression was associated with larger tumor size, higher AFP level, and poor prognosis in HBV-associated HCC cohort. Functionally, RBCK1-knockdown suppressed cell growth and migration, and also inhibited the progression of xenografted tumors in HBV-associated HCC mouse model. Mechanistically, RBCK1 interacted with HBx to promote its stabilization by increasing M1-Ubi ubiquitination and reducing K48-linked ubiquitination. Furthermore, clinical analysis confirmed a positive correlation between RBCK1 and HBx, and the coexpression of which predicted poor prognosis for HCC patients.

Conclusion: RBCK1 is an oncogenic gene to promote tumor progression and may serve as a potential target for HBV-associated HCC.

SAT-270
Molecular determinants of period-specific recurrences in patients with surgically resected hepatocellular carcinoma
Jihyun An1, Bora Oh2, Jin-Sung Ju1, Ju Hyun Shim2.1Asan Medical Center, Korea, Rep. of South, 2Asan Medical College, Korea, Rep. of South
Email: starlit1@naver.com

Background and aims: Postsurgical early-phase recurrence is associated with poorer clinical outcomes of patients with hepatocellular carcinoma (HCC). We hypothesized that the immune environments of the early- and late-recurrent HCCs differ, and investigated whether molecular changes differed according to the time of cancer recurrence by a cut-off of 5 years after resection.

Method: We included 253 patients who had HCCs initially without any gross vascular invasion or metastatic lesion, and received curative hepatectomy at the Asan Medical Center. RNA sequencing data and postsurgical early-phase recurrence (2015–2018) were used to investigate the gene sets in the Molecular Signatures Database (MSigDB) and the published literature. Immune phenotypes were classified based on previously defined immune and stromal classifiers.

Results: Among the entire 253 patients, 134 cases (53.0%) experienced recurrence episodes, with 109 and 25 within (early) and beyond 5 years (late) after resection, respectively. The proportions of the three mRNA expression-based HCC subclasses according to Hoshida et al. (termed S1, S2, and S3) were significantly different in the two recurrence groups: the S2 subclass was enriched in the early recurrence group, and S1 in the late recurrence group (S1, 24.8% vs. 52.0%; S2, 30.3% vs. 8.0%; and S3, 45.0% vs. 40.0%, P < 0.05). The G2 subtype of Boyault et al. was exclusively observed in the early recurrence cases (19.3% vs. 0%, P < 0.05). In terms of immune and stromal classification, the immune-desert types were more abundant in the former (50.5% vs. 32.0%) and the exhausted types in the latter (32.1% vs. 52.0%). These findings are in agreement with the disproportionate enrichment of PD-L1 determined by combined positive score in the late recurrence group (5.5% vs. 24.0%, P < 0.05). Gene set enrichment analyses revealed that most of the gene expression signatures associated with immune responses were down-regulated in the early-period recurrence group (all Ps < 0.001).

Conclusion: We found that early-period recurrence events after resection are strongly associated with immune-silent HCCs and the scarcity of PD-L1 expression of the disease. Together with closer surveillance, adjuvant therapies should be tested in combination with immune system boosters in selective patients with such tumors.

SAT-271
Monitoring the local HCC immune landscape by fine needle aspiration
Gioyamne Aidoo-Micah1,2, Stephanie Kucykowicz1, Natalie Schmidt1, Amy Trinh1, Laura J Pallett1, Daniel Brown Romero1, Vishnu Naidu4, Rushabh Shah4, Upkar Gill5, Edward Green4, Tim Meyer2,3, Mala Maini1.1University College London, Institute of Immunology and Transplantation, London, United Kingdom, 2UCL, Cancer Institute, United Kingdom, 3Royal Free Hospital London, Oncology, London, United Kingdom, 4Royal Free London, Radiology, London, United Kingdom, 5Queen Mary University of London, United Kingdom
Email: m.maini@ucl.ac.uk

Background and aims: Accumulating data underscore the importance of harnessing local tissue-resident immunity in tumour immunotherapy. Sampling immune responses sequenced in tumours that cannot be sampled in blood could provide vital insights to improve immunotherapy. Diagnostic biopsies contain a mixture of immune cells from HCC and surrounding liver and their invasive nature precludes longitudinal monitoring. We postulated that fine needle aspiration (FNA) would provide a minimally invasive approach suitable for repetitive sampling of the tissue-resident HCC immune landscape.

Method: Patients with HCC undergoing systemic therapy with anti-PD-L1 and anti-VEGF consented to provide matched blood, FNA and biopsy samples for ex vivo multiparameter flow cytometric analysis of effector and regulatory immune populations.

Results: FNA reproducibly yielded viable leukocytes with all the major myeloid and lymphocyte populations detectable and an immune landscape distinct from blood. In the myeloid compartment, granulocytic myeloid suppressor cells (gMDSC/PMN-MDSC) were strikingly enriched in tumour FNA compared to blood, whereas dendritic cells were reduced. Amongst lymphocytes, FNA contained a majority of T cells and a mix of CD4+, CD8+ and PD-1+CD8+ T cells. Crucially FNA were able to detect tissue-resident T cells (Tres), CD69+CD103+CD8 and CD69+PD-1+CD8+ and liver-resident NK cells (CXCR6+CD69+) in HCC that cannot be sampled in blood, albeit at lower frequencies than were detected in matched core biopsies. The majority of tumour CD8+ Tres sampled by FNA or biopsy before PD-L1 and anti-VEGF consented to provide matched blood, FNA and biopsy samples for ex vivo multiparameter flow cytometric analysis of effector and regulatory immune populations.
SAT-272
Clinicopathological analysis of polyploidization in human hepatocellular carcinoma and the development of an evaluation methodology
Takanori Matsuura1, Yoshihide Ueda1, Yoshiyuki Harada1, Kazuki Haashi2, Kisara Horisaka2, Yoshihiko Yano1, Shinichiro So3, Masahiro Kido3, Takumi Fukumoto3, Yuzo Kodama1, Eiji Hara2, Tomonori Matsumoto2,1 Kobe University Graduate School of Medicine, School of Medicine, Division of Gastroenterology, Department of Internal Medicine, Kobe, Japan, 2Research Institute for Microbial Diseases, Osaka University, Department of Molecular Microbiology, Osaka, Japan, 3Kobe University Graduate School of Medicine, School of Medicine, Department of Surgery, Division of Hepato-Biliary-Pancreatic Surgery, Kobe, Japan
Email: tomomatsumoto@biken.osaka-u.ac.jp

Background and aims: The cross-organ examination of cancer genomes has revealed that polyploidization, the acquisition of multiple sets of chromosomes, is a prevalent phenomenon in various neoplasms, including hepatocellular carcinoma (HCC). This suggests that polyploidization plays a significant role in carcinogenesis and tumor progression. However, the significance of polyploidization in HCC remains largely unknown. To address this, we aimed to establish a methodology for evaluating polyploidization in HCC using pathological specimens and to ascertain the clinicopathological characteristics of polyploid HCC.

Method: We performed multicolored fluorescence in situ hybridization (FISH) on paraffin-embedded, formalin-fixed pathology specimens from 56 HCC patients who underwent hepatectomy between 2017 and 2021 at our institution and determined the ploidy of HCC. Polyploid and diploid HCCs were compared to investigate the clinicopathological characteristics of polyploid HCC. We also explored a surrogate marker for polyploid HCC based on the transcriptome data of human hepatoma cell line Huh7 and verified its overexpression in polyploid HCC by immunostaining.

Results: Determination of tumor ploidy by FISH for three chromosomes revealed that 35.7% of HCCs (20/56 cases) were polyploid. There was no significant difference between polyploid and diploid HCCs in terms of tumor size and fibrosis of the non-tumor region. Notably, however, polyploid HCCs exhibited high serum alpha-fetoprotein levels (p < 0.026), poor differentiation (p = 0.013), and poor overall survival rates (p = 0.013). Moreover, polyploid HCCs contained polyploid giant cancer cells within the tumor at a significantly higher frequency than diploid HCCs. Among some genes that were significantly highly expressed in polyploid Huh7 cells compared to their diploid counterparts, we identified that ubiquitin-conjugating enzymes 2C (UBE2C) was significantly overexpressed in human polyploid HCCs. The abundance of polyploid giant cancer cells and overexpression of UBE2C could efficiently indicate polyploid HCC and predict their poor prognosis in combination.

Conclusion: Polyploidy in HCC was associated with tumor aggressiveness and exhibited a poor prognosis compared to diploid HCC. The assessment of ploidy in HCC utilizing FFPE tissue samples may serve as a novel prognostic marker of HCC.
**Background and aims:** The complex interplay between ROS-molecular signaling governs proliferation, adaptation, and death. To date, how cancer cells modulate PIP5K levels to control proliferative and adaptive signaling is not known.

**Method:** Firstly, we investigated the protein expression of PIP5K isoforms, Beclin-1 (autophagy marker), and Nrf2 inhibitor in 36 HCC patients and immortalized cells viz PRF5, SNU-387, Skhep-1 and HepG2. Further, effect on cell viability, mitochondrial superoxide, lysosome turnover, expression of PIP5K isoforms, autophagy and antioxidant enzymes through MTT, MitoSOX, lysotracker was evaluated. The effect of PIP5K inhibition on the cancer cells sensitization was investigated with novel investigational molecules NG-TZ-17 and IITZ01. Also, the Autophagy inhibition of NG-TZ-17 and IITZ01 investigated with novel investigational molecules NG-TZ-17 and IITZ01 in Hepatic cancer. Conclusion: HCC clinical and in vitro data showed that PIP5K isoforms involved switching of cancer cells from adaptive to proliferative state vice-versa in response to ROS levels. PIP5K inhibitors sensitized cancer cells to mild ROS. Thus, targeting PIP5K will overcome limitations of standard RTK, autophagy and Nrf2 inhibitors. This study also confers the therapeutic efficacy of novel PIP5K inhibitor viz NG-TZ-17 and IITZ01 in Hepatic cancer.
cholangitis (PSC), and that its expression was consistently elevated in three different mouse models of cholestasis at different time points: bile duct ligation (BDL), mice fed with a cholic acid diet and MDR2-KO mice. Surprisingly, we did not observe any change in its expression in livers from NAFLD models or CCl4 intoxicated mice, suggesting that the upregulation of this gene could be restricted to cholestatic liver injury. At cellular level, we observed that LncRNA-A1 was upregulated specifically in the biliary tree from MDR2-KO mice, but was not significantly altered in hepatocytes, Kupffer, endothelial or hepatic stellate cells. Remarkably, LncRNA-A1 was generally observed upregulated in CCA cells with KRAS or BRAF mutations (KKU-213, RBE, EGI-1, SK-ChA-1) or in EGFR-treated human cholangiocytes (MMNK1), in comparison with CCA cells without KRAS or BRAF mutations (TFK-1, SG231) or with untreated MMNK1 cells. In addition, we found that LncRNA-A1 was consistently elevated in tumoral liver from three different animal models of CCA (SB1-Singeneic, AKT-NICD and AKT-YAP) in comparison with non-tumoral liver. Next, we performed in vitro targeting of LncRNA-A1 and examined its effects in CCA cell lines and immortalized cholangiocytes (MMNK1). Silencing of this LncRNA induced cell death and reduced the expression of proliferative genes in CCA cell lines but not in MMNK1 cells.

**Conclusion:** Altogether these data suggest that hepatic upregulation of LncRNA-A1 in liver could be involved in CCA survival, although the physiological and mechanistic relevance of this upregulation is still under further investigation.

**SAF-276**

**Identification of hepatocyte-restricted antigens, epitopes, and T cell receptors to treat recurrent hepatocellular carcinoma after liver transplantation**

Yannick Rakké1, Dian Kortleve2, Astrid Oostvogels2, Robbie Luijten3, Monique de Beijer4, Stijn De Man4, Michael Doukas4, Jan Ijzermans1, Sonja Buschow1, Reno Debets1, Dave Sprengers1, Erasmus MC-Transplant Institute, University Medical Centre Rotterdam, Rotterdam, the Netherlands. Erasmus MC-Cancer Institute, University Medical Centre Rotterdam, Rotterdam, the Netherlands. Erasmus MC-Cancer Institute, University Medical Centre Rotterdam, Rotterdam, the Netherlands. Laboratory of Tumor Immunology, Department of Medical Oncology, Netherlands. Erasmus MC-Cancer Institute, University Medical Centre Rotterdam, Rotterdam, the Netherlands. Department of Gastroenterology and Hepatology, Netherlands. Erasmus MC-Cancer Institute, University Medical Centre Rotterdam, Rotterdam, the Netherlands. Department of Pathology, Netherlands. Email: y.rakké@erasasmusmc.nl

Target antigens, epitopes, and T cell receptors are not disclosed due to patent filing.

**Background and aims:** HCC recurrence in the context of an HLA-mismatched donor liver provides the unique setting that liver antigens from HCC versus the liver allograft are presented by different alleles of Human Leukocyte Antigen (HLA). Here, we present the development of an adoptive therapy with T cell receptor (TCR)-engineered T cells directed against hepatocyte-restricted antigens (HRAs) presented by the recipient, but not donor HLA.

**Method:** We have applied an integrative approach of *in silico* antigen and epitope prediction, immunopeptidomics, and *in vitro* laboratory tools to stringently select and validate HRAs, their immunogenic epitopes, as well as corresponding TCRs.

**Results:** 58 presumed liver antigens retrieved from the human protein ATLAS were further evaluated for liver-restricted expression in 6 public RNA databases and 1 protein database (HIPED), short-listing 14 candidate HRAs. 3/14 HRAs did not show RNA expression in healthy tissues, except for liver, in another five tissue datasets (n = 1,709) and validated using qPCR. Two HRAs demonstrated RNA expression in >70% of HCC patients (n = 421). Immunopeptidomics of HCC-derived hepatocytes (n = 12), together with *in silico* predictions of immunogenicity, revealed 36 HLA-A2-restricted epitopes. These epitopes were tested and ranked according to *in vitro* HLA-A2 binding ability. Epitope-specific T cells were enriched from healthy donors for 6 of these epitopes using an *in vitro* co-culture with autologous antigen presenting cells. Eleven TCRs directed against 4 HRA-derived epitopes were selected following epitope-MHC-directed fluorescence-activated sorting of T cells. Five TCRs were functionally expressed upon gene transfer into T cells and recognized their cognate peptide, of which 4 TCRs harboured a stringent safety profile according to amino acid scanning, and are expected to mediate no to negligible cross-reactivity.

**Conclusion:** We have identified HRAs, epitopes and corresponding TCRs, of which the lead TCRs will be further exploited for the treatment of recurrent HCC after liver transplantation with adoptive therapy of TCR-engineered T cells.

**SAF-277**

**Characterization of the immune tumor microenvironment in HCC**

Charlotte Hoffmann1, Simon Peter1, Valery Volk1, Melanie Batxon1, Tanja Reineke-Plaaß2, Nadine Schaudt1, Friedrich Feuerhake1, Arndt Vogel1, Anna Saborowski1, Medizinische Hochschule Hannover, Germany. Email: hoffmann.charlotte@mh-hannover.de

**Background and aims:** Current frontline therapy for hepatocellular carcinoma (HCC) is based on immune checkpoint inhibitors (ICIs) targeting the programmed cell death protein 1/ligand 1 (PD-1/PD-L1) axis, but alternative ICIs are under preclinical and clinical investigation. A more granular understanding of the immune contexture of HCC will be critical to determine recurrent patterns of the HCC immune tumormicroenvironment (iTME) and identify potential biomarkers that may ultimately allow for a more stratified approach to using immunomodulatory cancer therapies. We employed multiplex immunohistochemistry (miHC) to spatially resolve and clinically annotate the iTME in HCC in the context of the underlying etiologies.

**Method:** FFPE tissues from 95 resected and clinically annotated HCCs were selected, and attention was paid that both tumor- and surrounding non-tumoral liver tissue were represented on a single section. Using a miHC platform (Phenomics system, Akoya Bioscience) the sections were stained for the following markers: CD3, CD20, CD68, Perforin, PD-L1, TIM3, LAG3 and Arginase, and regions of interests for subsequent multispectral high-resolution image acquisition were placed i) within the tumor, ii) the margin (tumor invasive front) and iii) the adjacent non-tumoral liver. The
tissue samples were stratified according to the respective underlying diagnosis, ASH (n = 28), NASH (n = 40) and viral (HBV or HCV, n = 27).

**Results:** No significant etiology-dependent differences were evident in immune cell densities detected by our marker panel across all tumor areas and adjacent liver. According to the intratumoral localization, CD3 and CD20 positive cells were lowest within the tumor compared to margin and surrounding liver. Quantitative assessment of immune checkpoint expression revealed a striking dominance of PD-L1 over LAG3 and TIM3 in tumoral and non-tumoral regions, with a comparatively pronounced relative contribution of TIM3 signals in the margin area. Total PD-L1 signal was increased in HCCs with viral etiology, compared to those arising in the ASH context, but not to NASH-related HCC. Clinical correlations are currently under investigation and will be presented.

**Conclusion:** The iTME of human HCCs exhibits not only spatial dependencies, but also segregates with the respective underlying etiology. Distinct marker expression in VS vs. ASH argues in favor of a more differentiated view of “non-viral” subgroups of HCCs. In addition, we posit that instead of quantitative assessments of single markers, a deeper understanding of the spatially resolved and “etiologically” annotated iTME will be required to identify translationally relevant markers, especially in the context of immunother-apy clinical trials.

**SAT-278 Nuclear translocation of YAP drives BMI1-associated hepatocarcinogenesis in hepatitis B virus infection**

Xufeng Luo1, Rui Zhang2, Stefan Schefczyk3, Shi Liu4, Yaojie Liang3, Hideo Baba5, Christian M. Lange6, Heiner Wedemeyer7, Mengji Lu8, Ruth Broering1, 1The Affiliated Cancer Hospital of Zhengzhou University and Henan Cancer Hospital, Institute for Lymphoma Research, China, 2Sun Yat-sen University, Dept. of Biliary-Pancreatic Surgery, China, 3University Duisburg-Essen, Dept. of Gastroenterology, Hepatology and Transplant Medicine, Germany, 4College of Life Sciences, University and Henan Cancer Hospital, Institute for Lymphoma Research, China, 5University Duisburg-Essen, Dept. of Biliary-Pancreatic Surgery, China, 6University Duisburg-Essen, Institute of Pathology, Germany, 7LMU University Hospital Munich, Dept. of Internal Medicine II, Germany, 8Hannover Medical School, Dept. of Gastroenterology, Hepatology and Endocrinology, Germany.

**Email:** ruth.broering@uni-due.de

**Background and aims:** Hepatitis B virus (HBV) infection is a major cause of hepatocellular carcinoma (HCC) development and progression. The aim of this study was to mechanistically investigate the involvement of Hippo signalling in HBsAg-dependent neoplastic transformation.

**Method:** Liver tissue and hepatocytes from HBsAg-transgenic mice were examined for the Hippo cascade and proliferative events. Functional experiments in mouse hepatoma cells included knockdown, overexpression, luciferase reporter assays and chromatin immunoprecipitation. Results were validated in HBV-related HCC biopsies.

**Results:** Hepatic expression signatures in HBsAg-transgenic mice correlated with YAP responses, cell cycle control, DNA damage and spindle events. Polyploidy and aneuploidy occurred in HBsAg-transgenic hepatocytes. Suppression and inactivation of MST1/2 led to the loss of YAP phosphorylation and the induction of BMI1 expression in vivo and in vitro. Increased BMI1 directly mediated cell proliferation associated with decreased level of p16INK4A, p19ARF, p53 and Caspase 3 as well as increased Cyclin D1 and -H2AX expression. Chromatin immunoprecipitation and the analysis of mutated binding sites in DLR assays confirmed that the YAP/TEAD4 transcription factor complex bound and activated the Bmi1 promoter. In chronic hepatitis B patients, paired liver biopsies of non-tumour and tumour tissue indicated a correlation between YAP expression and the abundance of BMI1. In a proof-of-concept, treatment of HBsAg-transgenic mice with YAP inhibitor verteporfin directly suppressed the BMI1-related cell cycle.

**Conclusion:** In-vivo and in-vivo studies of the HBsAg-YAP-BMI1 axis and the abundance of BMI1. In a proof-of-concept, treatment of HBsAg-transgenic mice with YAP inhibitor verteporfin directly suppressed the BMI1-related cell cycle. The iTME of human HCCs exhibits not only spatial dependencies, but also segregates with the respective underlying etiology. Distinct marker expression in VS vs. ASH argues in favor of a more differentiated view of “non-viral” subgroups of HCCs. In addition, we posit that instead of quantitative assessments of single markers, a deeper understanding of the spatially resolved and “etiologically” annotated iTME will be required to identify translationally relevant markers, especially in the context of immunother-apy clinical trials.

**Background and aims:** Persistent inflammation is known to promote and exacerbate malignancy. The identification of key inflammatory signalling pathways causing transition from acute to chronic liver injury and from dysplasia to hepatocellular carcinoma (HCC) could depict novel predictive biomarkers and targets to identify and treat patients with chronic liver inflammation. microRNAs (miRNAs) are sequence-specific inhibitor of gene expression, which control cellular processes, whereas cellular signals and pathological conditions alter miRNA expression. With the aim of identifying miRNAs and mRNAs associated with nonresolving inflammation, genome-wide miRNomic and transcriptomic analyses were performed in the livers of animal models characterized by inflammation-driven liver cancer.

**Method:** Low density and Affymetrix arrays were used to identify miRNAs and mRNAs altered in animal model with inflammation-driven liver cancer. Expression of genes of interest was independently validated by qPCR in animal models and in cohort of HCC patients. Luciferase vectors carrying the promoter region of human or murine miR122 were transfected into tumor cell lines or primary hepatocytes, and the activity of selected cytokines was evaluated.

**Results:** The liver enriched miR-122 was identified as the most significantly downregulated microRNA in the liver of animal models with inflammation-driven liver cancer. Compelling evidence indicate that miR-122 is required for maintaining hepatic functionality. However, it remains unclear whether the observed phenotype is the trigger or consequence of ongoing diseases. Through this study, analysis of in-vitro and in-vivo experimental models, identified that miR-122 transcription is tightly interlinked with inflammation. We discovered that Lymphocytic choriomeningitis virus (LCMV) induced acute hepatitis in wild-type mice correlated with decreased level of hepatic miR-122. We identified that miR-122 transcription is differentially modulated by the immunoregulatory cytokines TGFβ and BMP6. We show that Sma4d is required for mediating TGFβ activity.

**Conclusion:** Collectively, our study provides new insights into the molecular mechanisms that potentially lead to downregulation of miR-122 in liver disease. As a result, new regulatory networks linking inflammation to the modulation of miR-122 expression have been identified. We propose that metabolic overload of regulatory networks driving cytokine-mediated deregulation of miR-122 expression may contribute to the development of chronic liver disease.

Model 1; positive feedback loop; In this model the role of miR-122 is to fine-tune HAMP transcription via inhibiting HVJ and HFE translation. Model 2; negative feedback loop; In this model, the role of miR-122 down-regulation is to activate inflammatory response via release of miR-122 inhibitions on its target genes.
SAT-280
Genetic variant in the hepatic sterol transporter is associated with increased gallstone risk in obese patients and with higher odds of developing gallbladder cancer in general
Piotr Kalinowski¹, Joanna Ligocka², Łukasz Krupa³, Marc Dauer⁴, Krzysztof Jankowski⁵, Jolanta Gozdowska⁶, Beata Kruk⁷, Susanne N Weber⁸, Frank Lammert⁹, Marcin Krawczyk¹, Joanna Ligocka², Piotr Kalinowski¹, Joanna Ligocka², Łukasz Krupa³, Marc Dauer⁴, Krzysztof Jankowski⁵, Jolanta Gozdowska⁶, Beata Kruk⁷, Susanne N Weber⁸, Frank Lammert⁹, Marcin Krawczyk¹. Abstract submitted.1Department of General, Transplant and Liver Surgery, Medical University of Warsaw, Warsaw, Poland, 2Department of Gastroenterology with Internal Medicine, Medical University of Warsaw, Warsaw, Poland, 3Department of Gastroenterology and Hepatology with Internal Disease Unit, Medical Department, University of Rzeszów, Rzeszów, Poland, 4Department of Gastroenterology and Hepatology with Internal Disease Unit, Medical Department, University of Rzeszów, Rzeszów, Poland, 5Department of Gastroenterology with Internal Medicine, Medical University of Warsaw, Warsaw, Poland, 6Department of Gastroenterology and Hepatology with Internal Medicine, Medical University of Warsaw, Warsaw, Poland, 7Laboratory of Metabolic Liver Diseases, Medical University of Warsaw, Warsaw, Poland, 8Laboratory of Metabolic Liver Diseases, Medical University of Warsaw, Warsaw, Poland, 9Laboratory of Metabolic Liver Diseases, Medical University of Warsaw, Warsaw, Poland.

Background and aims: Gallstone disease (GD) is one of the most common hepatobiliary conditions in Europe. In most cases gallstones remain asymptomatic. However, they might also cause complications like choledocholithiasis or gallbladder cancer in case of a long-lasting GD. Here, we analyse the common genetic risk modifier of GD (p.D19H variant in the sterol transporter ABCG8) in patients scheduled for bariatric surgery as well as in patients with gallbladder cancer and with recurrent common bile duct stones.

Method: Prospectively, we recruited three Polish cohorts of patients: 170 obese individuals scheduled for bariatric surgery (115 women, age range 19–65 years, 40 with GD), 65 patients with gallbladder cancer (49 women, age range 31–77 years), and 72 patients who underwent ERCP due to de novo stones that developed at least six months after cholecystectomy (49 females, age range 26–94 years). The control cohort comprised 172 gallstone-free adults. The ABCG8 p.D19H variant was genotyped in all cases and controls using TaqMan assays. In addition, we genotyped the c.711 (rs2109505) variant in the hepatic phospholipid transporter ABCB4 given the potential involvement of the ABCB4 locus in gallbladder cancer risk (Mhatre et al. Lancet Oncol 2017).

Results: Significantly more individuals carried at least one copy of the ABCG8 p.D19H risk allele among cases with either gallstones or gallbladder cancer (16.5%) as compared to controls (7.5%, p = 0.016). In particular, this variant was associated with an increased risk of developing gallbladder cancer (common OR 2.24, p = 0.017). It also increased the risk of GD in the obese scheduled for bariatric surgery (OR = 2.85, 95%CI 0.98–8.23, p = 0.045). On the other hand, it was not linked with de novo choledocholithiasis after cholecystectomy. We also did not find any significant link between the tested ABCB4 variant and the risk of gallbladder cancer either.

Conclusion: To the best of our knowledge, this is one of the first studies showing that the common ABCG8 risk variant increases the risk of gallbladder cancer in central Europeans. Moreover, this variant seems to increase the risk of gallstones in obese patients. Given the dismal prognosis of gallbladder cancer as well as the potential difficulties of treating symptomatic gallstones in obese patients, we reckon that carriers of this variant might profit from personalized diagnostic and therapeutic strategies to prevent both conditions.

SAT-281
CRISPR-engineered cholangiocarcinoma tumoroids generation from chemically-derived hepatic progenitor organoid for disease modelling
Michael Adisasmita¹,², Hyomin Lee³, MyoungHoi Kim¹,², Hayoon Kim¹,², Elsy Soraya Salas Silva¹,², Ji Hyun Shin¹,², Woochang Hwang⁴, Junho Hur⁵, Dongho Choi¹,², ¹Hanyang University College of Medicine, Surgery, Korea, Rep. of South, ²Research Institute of Regenerative Medicine and Stem Cells, Hanyang University, Korea, Rep. of South, ³Hanyang University College of Medicine, Genetics, Korea, Rep. of South, ⁴Hanyang University College of Medicine, Pre-Medicine, Korea, Rep. of South.

Background and aims: Intrahepatic cholangiocarcinoma (iCC) is a deadly malignancy of the liver’s biliary epithelial cells. This cancer has a high degree of heterogeneity, is extremely difficult to treat, and has a severely low survival rate. A vital discovery that significantly advances cancer research is the development of cancer organoid technique. These organoids can be derived from ICC patients’ specimens but with very limited efficiency due to its insufficient sample cell size and quality. In addition, cancer organoids can be derived from normal adult stem cells edited by CRISPR technology to emulate the gene mutation that occurred during early carcinogenesis.

Method: To generate the iCC tumoroid model, we transfected normal human chemically-derived hepatic progenitor cells (hCdHs) with...
CRISPR-Cas9 plasmid and gRNA plasmids for TP53 and BAP1 by electroporation. Following the transfection, we generated tumoroids in matrigel dome from these mutated progenitor cells and performed various analyses of these tumoroids.

**Results:** To overcome the current limitation of the patient-derived cancer organoid, we successfully generated tumoroids from hCdHs that can be robustly expanded from a relatively small cell number. Then, we introduced the double knock-out mutation of TP53 and BAP1 genes, a well-established iCC cancer driver gene. These CRISPR-engineered hCdHs-derived cancer organoids showed comparable phenotypes with the iCC tumor malignant features. We observed pathological features of biliary adenocarcinoma on these tumoroids and confirmed the presence of mucus including mucin in the tumoroids lumen.

**Conclusion:** These results demonstrated the capability of our CRISPR-engineered hCdHs-derived cancer organoid as a powerful cancer disease modelling platform.

This research is funded by grants Korean Fund for Regenerative Medicine funded by Ministry of Science and ICT, and Ministry of Health and Welfare (21A0401L1). MA is supported by Hyundai Motor Chung Mong-Koo Global Scholarship.

---

**SAT-282**

**Immunological impact of Axl/TGF-beta signaling in hepatocellular carcinoma**

Gregor Ortmayr1, Viola Hedrich2, Patrick Starlinger3, Thomas Grünberger4, Doris Chen5, Wolfgang Mikulits2.

**Background and aims:** A minority of hepatocellular carcinoma (HCC) patients is susceptible to conventional immune checkpoint blockade (ICB) as determined by immunological subtyping. The majority about 80% of HCC cases present an immunosuppressive or immune-excluded tumor microenvironment (TME). Interestingly, the class of immune-exhausted HCC, which is associated with poor response to ICB and prognosis, is also linked to “highly activated,” aberrant TGF-beta signaling. In HCC, the receptor tyrosine kinase Axl collaborates with TGF-beta by the phosphorylation of Smad3 at serine 213 in the linker region (Smad3L-Ser213) causing an aberrant, tumor-promoting TGF-beta signaling, which most likely also translates into the TME. As underlying mechanisms remain unclear, we aim to assess how Smad3L-Ser213-linked TGF-beta signatures shape an immunosuppressive TME.

**Method:** We used RNA-seq analysis and VENN relations of HCC models to identify targets of the Axl/TGF-beta signaling. Modulation of Axl/TGF-beta activity and analyses in publicly available data sets of HCC patients were employed to verify target expression.

**Results:** HCC cells showing aberrant TGF-beta signaling together with either proficiency or deficiency in Axl expression, the latter in the absence or presence of Axl reconstitution, were subjected to Gas6 and TGF-beta stimulation and subsequent RNA-seq analysis. Bioinformatics and VENN relations revealed uridine phosphorylases (UPP) as the most promising target since upregulation is associated with poor prognosis and immune evasion of HCC patients. Interference with Smad3L-Ser213 phosphorylation by inhibition of 14-3-3ζ or c-JNK confirmed UPP1 as a target of aberrant TGF-beta signaling. Genetic intervention with UPP1 reduced cell invasion and migration, while proliferation and survival of HCC cells remained unaffected. In line, cells exhibiting mesenchymal characteristics showed strong UPP1 expression.

**Conclusion:** We identified UPP1 as a target of Axl-driven, aberrant TGF-beta signaling in HCC cells. The link to immune escape and poor prognosis provides a clear rationale for further assessing its impact in reshaping the TME based on in vivo models and analyses in prospective HCC patient samples.

**SAT-283**

**Intrahepatic cholangiocarcinoma developing in patients with metabolic syndrome is characterized by Osteopontin overexpression in the tumor stroma**

Massimiliano Cadamuro1,2, Samantha Sarcognato3, Riccardo Camerotto4, Noemi Girardi4, Alberto Lasagni1, Giacomo Zanus5,6, Umberto Cillo5,6, Enrico Gringeri6,7, Giovanni Morana8, Mario Strazzabosco5, Elena Campello1,2,10, Paolo Simion1,2,10, Maria Guido2,3, Luca Fabris4,5,9, Padua University-Hospital, General Internal Medicine Unit, Italy, 2University of Padua, Department of Medicine (DIMED), Italy, 3Azienda ULSS2 Marca Trevigiana, Department of Pathology, Italy, 4University of Padua, Department of Molecular Medicine (DMM), Italy, 5Azienda ULSS2 Marca Trevigiana, 4th Surgery Unit, Italy, 6University of Padua, Department of Surgery, Oncology and Gastroenterology (DISCOG), Italy, 7University of Padua, Hepatobiliary Surgery and Liver Transplantation Unit, Italy, 8Treviso Regional Hospital, Division of Radiology, Italy, 9Vale University, Digestive Disease Section, Liver Center, United States, 10University of Padua, Thoracic and Haemorrhagic Disease Unit and Haemophilia Center, Department of Medicine (DIMED), Italy

**Background and aims:** Metabolic syndrome (MetS) is a common condition closely associated with non-alcoholic fatty liver disease/ non-alcoholic steatohepatitis (NASH). Recent meta-analyses show that MetS can be prodromal to intrahepatic cholangiocarcinoma (iCCA) development, a liver tumor with features of biliary differentiation characterized by dense extracellular matrix (ECM) deposition. Since ECM remodeling is a key event in the vascular complications of MetS, we aimed at evaluating whether MetS patients with iCCA present qualitative and quantitative changes in the ECM able to incite biliary tumorigenesis.

**Method:** Serial sections of liver tissue specimens of iCCA on a background of MetS (n = 22) and without MetS (non-MetS, n = 44), and relative peritumoral areas, were stained with Masson’s Trichrome (histological staining for fibrosis) and with immunohistochemistry to highlight ductular reaction (DR) and hepatic...
Background and aims: Liver cancer is one of the most common causes of cancer-related death worldwide, and hepatocellular carcinoma (HCC) accounts for approximately 90% of cases. Recent therapeutic advances extend overall survival by a few months, but only for a minority of patients. Realistic HCC models are necessary in order to bridge the gap between preclinical research and in situ human disease, and provide valuable insight into disease pathogenesis and drug discovery. Here we describe the development of two HCC models in precision-cut liver slices (PCLSs): a murine precision-cut tumour slice (PCTS) model utilising the Hep-53.4 cell line, and a spheroid-engrafted human PCLS model.

Method: Hep-53.4 PCTSs were generated from orthotopic tumours 21 days after an intrahepatic injection of 1 million cells in C57BL/6 mice, and subsequently treated in the presence of absence of the receptor tyrosine kinase (RTK) inhibitors sorafenib or lenvatinib. An ex vivo human HCC model was developed by engrafing spheroids generated from HuH7 cells that express a secreted luciferase, onto mouse PCLSs. The spheroid-engrafted PCLSs were then cultured in the presence or absence of the RTK inhibitors sorafenib, lenvatinib or regorafenib. Primary HCC cell lines derived from patient biopsies were expanded and lentiviral-transduced to express mCherry, and spheroids generated from these cells were also implanted onto human PCLSs. All tissue was cultured in a bioreactor system capable of maintaining the viability of the tissue for 7 days.

Results: Treatment of Hep-53.4 PCTSs with the RTK inhibitors sorafenib or lenvatinib resulted in decreased proliferation (Ki-67) and increased apoptosis (active caspase-3). Immunohistochemical characterisation of the PCTSs determined that they maintain a rich immune profile in culture, and treatment with anti-PD-1 immunotherapy results in significantly higher CD3 T-cell numbers, as well as increased HCC apoptosis. In relation to the human spheroid-PCLS model, complete invasion of the spheroids into the PCLSs was confirmed via multiphoton imaging. Measurement of luciferase secreted following treatment with RTK inhibitors indicated a significant and dose-dependent reduction in cancer growth, whilst the PCLSs remained viable. Primary HCC spheroids implanted onto human PCLS also displayed complete engrafment and invasion into the tissue (Figure 1).

Conclusion: The two models described potentially provide unique tools for discovery biology and precision medicine, where therapies can be tested on both PCTTs and patient-derived HCC cells in the context of the tumour microenvironment.

SAT-285

Investigation of optimization model for predicting ICI treatment efficacy on contrast-enhanced CT images of hepatocellular carcinoma using AI

Yasuhiro Nakao1, 2, Ryu Sasaki1, Masanori Fukushima1, Satoshi Miura1, Hisamitsu Miyazaki1, Kazuhiko Nakao1, 2 Nagasaki University Hospital, Gastroenterology and Hepatology, Nagasaki, Japan

Background and aims: The introduction of immune checkpoint inhibitors (ICls) for unresectable hepatocellular carcinoma (HCC) is expected to improve prognosis. However, since the introduction of ICI, it has been found that there are individual differences in treatment efficacy, and studies have been reported to examine the factors associated with treatment failure based on the contrast effect of the hepatocellular phase of EOB-MRI prior to the introduction of ICI. ICI may improve the prognosis of patients. In this study, we developed an AI-based prediction model to predict treatment efficacy based on the characteristics of contrast-enhanced CT scan before ICI introduction, including hepatocellular carcinoma (HCC) and contrast effect of the background liver.

Method: We evaluated the efficacy of atezolizumab and bevacizumab in 43 patients at Nagasaki University Hospital from 2020 to November 2022 using mRECIST. 197 PD (9 patients), 271 PR (14 patients), 342 SD (20 patients) contrast CT images of liver cancer including the background liver were used as a learning dataset. ResNet18 as the Convolutional Neural Network (CNN) model and YOLOv7 as the You Only Look Once (YOLO) model was used to learn to predict the treatment effect. Precision-Recall curves were used to
evaluate diagnostic performance, and class activation maps (CAM) were used to interpret the CNN models. The tSNE was used for feature analysis of the entire image.

**Results:**
(1) The CNN model had a PD prediction sensitivity of 84%. Due to the interpretation of the model, the sites indicated by CAM did not correspond to the tumors. tSNE analysis showed that they were clustered for each case. Although the accuracy of prediction by the CNN model was high, it was expected to over-learn the CT image features of each case other than the tumor site. (2) In the analysis using the YOLO model, the AUC of the Precision-Recall curve for PD was 0.995. The prediction by the YOLO model is not only accurate but also has high clinical versatility because it can identify the point that led to the decision (Figure).

**Conclusion:**
Since it is difficult to prepare a large amount of training data for a drug effect prediction model for tumors compared to a general tumor diagnosis model, a large-scale validation using a more efficient YOLO model is expected.

**SAT-286**

**CD40 expression in liver cancer cells is upregulated by CD4+T cells through IFN-gamma and ERK 1/2 pathway**

Norifumi Kawada1, Hanh Ngo Vinh1, Le Thi Thanh Thuy1, Hieu Vu2, Hai Hoang1, Akihiro Tamori1, Masaru Enomoto1, Sawako Uchida-Kobayashi1, 1Osaka Metropolitan University, Japan, 2Hanoi Medical University, Viet Nam

**Email:** kawadanori@omu.ac.jp

**Background and aims:** Hepatocellular carcinoma (HCC) is one of the most common primary liver cancers which is a leading cause of cancer-related death worldwide. CD40 is a costimulatory receptor essential for the survival and activation of antigen-presenting cells while its functional role in cancer remains controversial. This study aimed to examine the biological role of CD40 in liver tumor progression.

**Method:** 168 hepatitis C virus (HCV) -infected patients including 47 HCC and 121 non-HCC were enrolled in this study. The level of soluble (s) and membrane-bound (m) CD40 were examined in plasma and human liver tissues, respectively. Immunoblot and quantitative RT-PCR were performed to assess the expression of CD40 in five human HCC cell lines. The methylation index of the CD40 promoter region was examined. CD4+T cells isolated from the peripheral blood of healthy donors were stimulated to express CD40 ligand (CD40L). Human recombinant IFN-gamma was used to induce CD40 expression in HCC cells.

**Results:**
The plasma level of sCD40 was increased significantly in HCC patients compared to non-HCC patients at baseline ($p = 0.0003$), end of HCV treatment ($p = 0.047$), sustained virologic response ($p = 0.035$), end point (time of HCC occurrence, $p = 0.011$), and correlated with HCC accumulation. Immunohistochemistry revealed a dominant mCD40 expression in poorly differentiated HCC tissues compared with non-tumor areas. Consistent with the observations in human samples, CD40 was highly expressed in poorly differentiated HCC cells (SNU387, HLE, and HLF) while well-differentiated HCC cells (Huh7 and HepG2) showed no or weak signal. CD40 promoter region exhibited a low methylation index (all 5%) in SNU387, HLE, and HLF cells compared to a higher one (Huh7: 57.5%, HepG2: 27.5%) in the well-differentiated group. CD4+T cells isolated from healthy donors and activated by culturing on the anti-CD3-coated dish (5 microgram/ml) for 12 hours exhibited marked CD40L expression under flow cytometry analysis. The elevation of CD40 at both RNA and protein levels was noted in HLFs when cocultured with activated CD4+T cells compared to single-culture in both ratio- and time-dependent manners. Coculturing with unactivated TCD4+ cells that lack CD40L induced lower CD40 expression on HLFs compared to coculture in both ratio- and time-dependent manners. Coculturing with unactivated TCD4+ cells that lack CD40L induces lower CD40 expression on HLFs than with activated TCD4+ cells. Alternatively, this increase was partially canceled when a linkage between HLFs and CD4+T cells was disturbed by using a transwell culture, denoting the involvement of their both direct and indirect interaction in CD40 expression in HLFs. RNA sequencing from HLF co-cultured with activated TCD4+ cells from healthy donors revealed top three upregulated pathways including interferon response, immune response, and Jak-Stat signaling compared with Figure: (abstract: SAT-285).
single cultured HLF. We then stimulated HLFs with IFN-gamma (5 ng/ml) for 24 hours resulting in the phosphorylation of p65, Jak1 and ERK1/2 pathways, but not p38 nor Akt pathways, and the upregulation of CD40 at both mRNA and protein levels in HLFs. Jak1 inhibitor, CYT387 (2–16 micromolar), and ERK1/2 inhibitor, U0126 (5–80 micromolar), reduced CD40 expression in HLF cells under IFN-gamma stimulation.

**Conclusion:** CD40 expression in poorly differentiated HCC cells is possibly regulated by CD4+T cells and IFN-gamma. A high level of soluble CD40 in the plasma of HCV-SVR patients may indicate the risk of HCC development.

**SAT-287**

**Potential biomarkers predicting ferroptosis sensitivity in hepatocellular carcinoma**

Hyun Young Kim¹, Wan Seob Shim¹, Ga Hee Baek², Sang Kyum Kim², Keon Wook Kang¹. ¹Seoul National University, College of Pharmacy and Research Institute of Pharmaceutical Sciences, Seoul, Korea, Rep. of South, ²Chungnam National University Daedeok Campus, College of Pharmacy, Daejeon, Korea, Rep. of South

Email: kwkang@snu.ac.kr

**Background and aims:** Hepatocellular carcinoma (HCC) is one of the most common and aggressive forms of liver cancer characterized by high morbidity and mortality. Despite recent advances in understanding the mechanism underlying HCC progression, there are still limited treatment options in the clinical field. Ferroptosis, a typical form of regulated cell death induced by iron-mediated oxidative stress, has been proposed as a new strategy to treat HCC. Indeed, erastin—a ferroptosis inducer—has been shown to effectively inhibit the growth of tumour cells in preclinical studies. Herein, we aim to suggest potential biomarker(s) of erastin sensitivity to HCC.

**Method:** Ferroptosis-inducing effects of erastin in various HCC cell lines were examined using C11 BOBIPY™ 581/591 dye, which is a lipid peroxidation sensor. HCC cells were treated with erastin in phenol-red free, serum-containing media. The integrated intensity of green fluorescence and confluency of the cells were calculated automatically in Incucyte™ Live-Cell Imaging System. For stable isotope tracing, HCC cells were incubated with cystine- and methionine-free media supplemented with 0.2 mM 34S-methionine. Metabolites were analyzed by sample injection using an autosampler and separated by an AQUASIL C18 column. Protein and mRNA expressions were examined by Western blot and qPCR, respectively.

**Results:** The ferroptosis-inducing efficacy of erastin in nine HCC cell lines was cell-type dependent. Among these cell lines, HepG2, Huh7, and SKHep1 were selected for further experiments. Western blot and qPCR analyses revealed that expression of cancer stemness markers, enzymes for transsulfuration pathway and iron metabolism-related proteins were significantly correlated with erastin sensitivity. Next, stable isotope tracing confirmed that the activation of the transsulfuration pathway protects HCC cells from erastin-induced ferroptosis. Finally, the biomarkers listed above were validated by survival analysis using the Kaplan-Meier curve from public datasets.

**Conclusion:** Ferroptosis, an iron-dependent, reactive oxygen species-mediated cell death has been proposed as a promising strategy in treating HCC. To successfully clarify erastin-sensitive HCC, we propose several genes as predictive biomarkers related to cancer stemness, transsulfuration pathway and iron metabolism. Identifying these phenotypic signatures in HCC would help predict the efficacy of erastin-induced ferroptosis.
SAT-288
Genetic biomarkers for sorafenib response in patients with hepatocellular carcinoma

Giuseppa Augello1, Mariamena Arbitrio2, Lydia Giannitrapani3, Francesca Scionti2, Domenico Cicilberto4, Nicoletta Staropoli5, Giuseppe Agapito6, Pierfrancesco Tassone7, Pierosandro Tagliaferri8, Maurizio Soresi9, Aurelio Seidita10, Marco Affronti11, Gaetano Bertino6, Maurizio Russillo7, Francesca Di Gaudio10, Rosaria Ciriminna6, Francesca Spinotto2, Francesco Verderame3, Melchiorre Cerovello11, 

1Department of Health Promotion, Mother and Child Care, Internal Medicine and Medical Specialties, University of Palermo, Palermo, Italy, 2Institute for Biomedical Research and Innovation, National Research Council (CNR), Catania, Italy, 3Department of Legal, Economic and Social Sciences, Magna Graecia University, Catanzaro, Italy, 4Hepatology Unit, AOU San Marco University of Catania, Catania, Italy, 5Liver Unit, ARNAS Garibaldi-Nesima, Catania, Italy, 6Istituto per lo Studio dei Materiali Nanostrutturati, National Research Council (CNR), Palermo, Italy, 7Oncology Unit, Villa Sofia-Cervello Hospital, Palermo, Italy

Email: giuseppa.augello@irib.cnr.it

Background and aims: Sorafenib, a multitarget tyrosine kinase inhibitor (TKI) which exerts a strong antiangiogenic effect, is now one of the first-line treatments for patients with advanced hepatocellular carcinoma (HCC). Although sorafenib is well tolerated, a significant proportion of HCC patients do not respond to sorafenib treatment. It is increasingly necessary to find suitable biomarkers to predict interindividual response variability to sorafenib in HCC. Patient stratification based on genomic variations may help guide physicians in treatment selection.

Method: Thirty-four patients with advanced HCC, treated for the first time with sorafenib, were enrolled in our study. Patients came from 5 Sicilian hospital centers. Based on published data, five single nucleotide polymorphisms (SNPs) in angiogenesis-related genes, including rs2010963 (VEGF-A), rs4604006 (VEGF-C), rs12434438 (HIF-1alpha), rs55633437 (ANGPT2) and rs2070744 (NOS3), were tested for in 34 HCC patients, of which 9 were responders and 25 were non-responders to sorafenib. Additionally, a subgroup of 23 patients was genotyped for 1,931 SNPs and 5 copy number variations (CNVs) using the DMET Plus microarray platform.

Results: Analyzing the SNPs associated with angiogenesis, we found that only in VEGF-A (rs2010963) was the frequency of the G allele and CC/GG genotypes, compared to CC genotype, significantly associated with response to sorafenib. However, when we examined the cumulative effects of selected angiogenesis-related SNPs, developing a genetic response score (GRS), a higher mean GRS was significantly associated with responders compared to non-responders when the sum of the five scores for the rs2010963, rs4604006, rs12434438, rs55633437, and rs2070744 variants was considered for each patient (p = 0.042). The predictive performance of GRS was confirmed in vitro using HCC cells that displayed different responsiveness to sorafenib. ADME-related gene analysis allowed the identification of 10 predictive polymorphic variants in ADH1A (rs6811453), ADH6 (rs100088281), SLC1A2 (rs11401), CYP26A1 (rs7995939), DPYD (rs2297595 and rs1801265), FMO2 (rs2020863) and SLC22A14 (rs149738, rs171248 and rs183574) that were significantly associated with response to sorafenib. Pathway enrichment analysis (PEA) showed that the analyzed genes are associated in several key common biological pathways correlated to sorafenib and HCC.

Conclusion: We identified 15 SNPs associated with angiogenesis and ADME genes, inserted in key points of several biological pathways, as potential predictive biomarkers for response to sorafenib which could be considered as a proof of concept to be further validated in follow-up studies for the definition of a better treatment options to promote better outcomes in HCC patients.
SAT-290
Comprehensive analysis of single-cell and bulk RNA sequencing data identifies antioxidant-1 as a novel immune biomarker associated with immune cell infiltration in hepatocellular carcinoma metastasis
Ruijia Liu¹, Xudong Yu¹, Zao Xiaobin¹, Xu Cao¹, Yong’an Ye¹,².
¹Dongzhimen hospital, Beijing university of Chinese medicine, China,
²Beijing University of Chinese Medicine. Liver Diseases Academy of Traditional Chinese Medicine, Beijing, China
Email: yeyongan@vip.163.com

Background and aims: Copper is involved in cancer progression by affecting biological processes such as cell proliferation, invasion, metastasis, and angiogenesis. Antioxidant-1 (ATOX1) is aberrantly expressed as a copper chaperone protein in several cancers, but its function and mechanism in hepatocellular carcinoma (HCC) are unknown and were the purpose of this study.

Method: The expression, diagnostic, prognostic, clinical features, functional enrichment, and immune characteristics of ATOX1 in HCC were explored through R software using data from multiple

Figure: (abstract: SAT-290).
databases. ATOX1 expression in HCC cells and stromal cells was observed by single cell sequencing analysis.

Results: Compared with the non-tumor tissues, ATOX1 was significantly upregulated in HCC tissues. The GSE50579 and GSE76427 datasets validated this conclusion. And ATOX1 mRNAs in HCC cells was also significantly higher than that in primary human hepatocytes. Meanwhile, ATOX1 expression had a certain accuracy for HCC diagnosis, and lower expression predicted better prognosis in the stage 1 and sorafenib treatment subgroups. Enrichment analysis showed that ATOX1 was markedly negatively associated with most cancer-related pathways, such as PI3K-AKT-mTOR, EMT, ECM, Angiogenesis, Apoptosis, Ferroptosis, Reactive oxygen species and Inflammatory response. ATOX1 was significantly negatively associated with immune cell infiltration (ICI) in the tumor microenvironment (TME), including macrophages, monocytes, endothelial cells, dendritic cells, neutrophils, B cells, T cells, CD4+ T cells, CD8+ T cells, regulatory T cells (Treg) and natural killer cells. And it was remarkably positively correlated with tumor mutational burden. Single-cell sequencing showed that ATOX1 was highly expressed on HCC cells and stromal cells, especially Treg, endothelial cells, monocytes, T cell subsets and hepatocytes.

Conclusion: Our results revealed that ATOX1 activity was closely associated with cellular redox status and might play an important role in HCC invasion and migration by regulating ICI in TME. In conclusion, ATOX1 might be a promising predictive biomarker for immunotherapy of HCC.

SAT-291
PD-L1 small molecule inhibitors and Paclitaxel orchestrating CDB+ cell cytotoxicity via tumor-associated macrophages: a personalized HCC immunotherapeutic approach

Israa Helal1, Monica A. Kamal1, Ahmed Ramadan2, Tamer Elbaz2, Mohamed Mahmoud Nabeel2, Sally Elfishawi2, Hend Ibrahim Shousha2, Ashraf Omar2, Yasmine M. Mandour4,5, Hend El Tayebi1. 1German University in Cairo, Clinical Pharmacology and Pharmacogenomics Research Group, Department of Pharmacology and Toxicology, Faculty of Pharmacy and Biotechnology, Cairo, Egypt, 2Cairo University, Endemic Medicine, Faculty of Medicine, Cairo, Egypt, 3National Cancer Institute, Cairo University, Clinical Pathology department, Egypt, 4School of Life and Medical Sciences, University of Hertfordshire Hosted by Global Academic Foundation, Cairo, Egypt, 5German University in Cairo, Department of Pharmaceutical Chemistry, Faculty of Pharmacy and Biotechnology, Cairo, Egypt

Email: hend.saber@guc.edu.eg

Background and aims: The numerous side effects of chemotherapy, such as paclitaxel, in Hepatocellular Carcinoma (HCC) have triggered the development of novel treatment approaches. Combining immunotherapy with chemotherapy has become one of the most prevalent treatment modalities recently. Since 2018, small molecule inhibitors (SMIs) as immune checkpoint inhibitors have received the spotlight in immunotherapy research due to their safety and low cost of production. Specifically, programmed cell death 1 and its ligand (PD-1/PD-L1) inhibitors have shown promising results on a myriad of cancers including HCC in clinical trials. In HCC tumor microenvironment (TME), tumor associated macrophages (TAMs) were found to be a major contributor in several molecular pathways involved in HCC progression. CCL5 protein was reported to be upregulated in TAMs and a key molecule in downstream signalling of several molecular pathways that lead to HCC progression along with regulating the activity of multiple immune cells as CDB+ cells. The aim of our study...
is investigating the synergistic effect of tuning TAMs by silencing CCL5 along with PD-L1 SMIs on activating the anti-tumor response exerted by CD8+ cells in presence of paclitaxel as a combinational therapy approach. PD-L1 SMI used in this study is obtained through a virtual screening protocol, of commercial databases, that is reported by our group in a previous study.

**Method:** Monocytes were isolated from whole blood samples of 45 HCC patients (classified according to their alpha fetoprotein levels into two groups), differentiated into TAMs where finally CCL5 was silenced by siRNAs. Silenced TAMs (siTAMs) were co-cultured with CD8+ cells from HCC patients, HCC cell lines (Huh7 and HepG2 as a confirmatory cell line), PD-L1 SM and paclitaxel. Cell cytotoxicity was performed to assess the effect of regulation of TAMs on CD8+ cytotoxicity after coculturing (LDH assay). Cell viability assays were performed to assess the effect of all conditions on HCC cell lines (MTT assay). Tumor Necrosis Factor alpha (TNF-α), a pro-inflammatory cytokine, was measured in tumor-cultured media (TCM) using Enzyme-linked immunosorbent assay.

**Results:** The presented data in the figure attached is showing the experiments done on Huh7 cells: CD8+ tumor cytotoxicity showed a significant increase upon CCL5 knockdown in TAMs in the coculture with and without the combined therapy, TNF-α expression significantly declined upon CCL5 knockdown in TAMs and addition of combined therapy. Cell viability of HCC cell lines declined consequent to the knockdown of CCL5 in TAMs, also with combined therapy. Consistent results were observed in HepG2 cells as confirmation.

**Conclusion:** Combining the PD-L1 SMI with the siTAMs showed a synergistic effect on the activity of CD8+ cells. Combinational approach is more effective than either alone. The development of PD-1/PD-L1 immune checkpoint SMI opens a new avenue for alternative treatment modalities with less immune related adverse events.

**SAT-292**

**Intemittent fasting improves tumor-directed drug delivery by caveolar-mediated endocytosis**

Svea Becker1, Ilaria Biancacci2, Diana Möckel2, Qingbi Wang3, Jan-Niklas May2, Huan Su1, Jeffrey Momoh2, Lena Susanna Candels1, Marie-Luise Berres1, Fabian Kiessling2, Maximilian Hatting1, Twan Lammers2, Christian Trautwein1. 

**Background and aims:** Tumor cells rely on the Warburg effect to maintain their high proliferative activity; making them dependent on external glucose supply for cell metabolism and proliferation. Therefore, fasting may have health benefits to combat tumor growth. Furthermore, it can reduce toxicity and improve the efficacy of chemotherapy. This makes it a beneficial approach for cancers with limited systemic and local ablative therapies, such as hepatocellular carcinoma (HCC).

**Method:** The effects of intermittent (IF) fasting were investigated on tumor growth, development of the tumor microenvironment (TME) and tumor-targeted drug delivery in an intrahepatic murine hepatocellular carcinoma model and were subsequently subjected to IF for 24 days. Cy7-labeled liposomes were applied i.v. and their biodistribution and tumor accumulation was examined via combined micro-CT and fluorescence tomography (μCT-FLT). These effects were validated using immunohistochemistry staining and fluorescence microscopy. In vitro studies were performed with the hepatoma cancer cell line Hep-55.1C to identify the effect of liposome uptake under fasting conditions on a cellular level. The cells were stimulated with forskolin and inhibitors of endocytic mechanisms. Uptake was further analyzed by flow-cytometry and fluorescence microscopy.

**Results:** Analyses of MRI-scans demonstrated that IF decreased intrahepatic tumor growth compared to animals fed ad libitum. Fluorescence microscopy and two-photon laser microscopy images revealed significant changes in TME as evidenced by decreased extracellular matrix e.g. collagen production, and increased angiogenesis e.g. lectin-perfused vessels. These changes contributed to increased tumor-directed liposome accumulation and uptake in IF treated animals.

In vitro, Hep-55.1C were stimulated to fast and liposome uptake was analyzed via flow cytometry and immunofluorescence microscopy. Together, the in vitro data demonstrate that the fasting equivalent forskolin causes a significant increase in liposome uptake, which could be reversed specifically by nystatin inhibition. These results identified that the increase in liposome uptake in HCC cells is mediated by caveolar endocytosis.

**Conclusion:** Intermittent fasting improves tumor-directed targeting by modifying the TME, due to increased angiogenesis and decreased collagen abundance, and modifying intracellular mechanisms using a caveolar-mediated endocytosis-dependent mechanism. These influences make IF a promising approach when applied concomitantly to HCC targeted therapy.

---

**Liver tumours Therapy**

**WEDNESDAY 21 TO SATURDAY 24 JUNE**

**TOP-067**

*A simple characterization of dynamic changes in circulating CD8+PD1+ lymphocytes early predicts response to atezolizumab-bevacizumab in hepatocellular carcinoma*

Fabio Piscaglia1,2, Fabrizia Suazzi1,4, Francesco Tovoli1,2, Mariangela Brucolieri1,2, Mariarosaria Marseglia1, Eleonora Alimenti3, Francesca Fornari1,4, Massimo Lavaroni3, Laura Gramantieri3,4, Catia Giovannini1,4, University of Bologna, Department of Medical and Surgical Science, Italy; 2Division of Internal Medicine, Hepatobiliary and Immunoonergic Diseases, IRCCS Azienda Ospedaliero-Universitaria di Bologna, Italy; 3Centre for Applied Biomedical Research-CRBA, University of Bologna, Italy; 4Centre for Applied Biomedical Research-CRBA, University of Bologna, Italy; 5Fondazione IRCCS Cà Granda Ospedale Maggiore Policlinico di Milano. Division of Gastroenterology and Hepatology, Milan, Italy; 6University of Bologna, Department for Life Quality Studies, Italy

**Background and aims:** Atezolizumab+bevacizumab improves survival of patients with advanced Hepatocarcinoma (HCC) in comparison to Sorafenib. No biomarker predicts responders from non-responders to atezolizumab+bevacizumab or patients who benefit from this combination instead of TKIs. To identify early on treatment predictive biomarkers, we investigated whether baseline and early on treatment variation of CD8+, PD1+, PD-L1+, CD8+PD1+, CD8+PD1+ peripheral lymphocytes might offer a non-invasive, cheap and feasible assay.

**Method:** A prospective cohort of 31 patients treated with atezolizumab+bevacizumab and a control prospective cohort of 15 patients treated with sorafenib or lenvatinib were subjected to repeated blood tests, at baseline and during the course of treatments. At first imaging re-evaluation, 11 patients receiving atezolizumab+bevacizumab showed objective response, 13 stable disease, accounting for the responder group, while 7 patients displayed tumor progression, corresponding to primary non-response. Baseline and early on treatment variation of CD8+, PD1+, PD-L1+, CD8+PD1+, CD8+PD1+ peripheral lymphocytes were tested by cytfluorimetric analysis and compared in responders and non-responders.

**Results:** Baseline CD8+ and CD8+PD1+ peripheral lymphocytes were lower in responders versus non-responders (mean ± SD CD8+: 68 ±
30 vs 95 ± 5; T-test, p < 0.0001; mean ± SD CD8+PD-L1+: 77 ± 9.4 vs 82 ± 4.6; T-test: p = 0.004 respectively). Dynamic changes in CD8+PD1+ lymphocytes assessed at 3-weeks, before the second drug infusion, were the most informative test: 22 of 24 responders displayed a rise of CD8+PD1+ peripheral lymphocytes with a positive mean fold change of 4.63 (±5.5 SD). Conversely, 6 of 7 non-responders displayed a negative mean fold change of 0.89 (±0.84 SD) of CD8+PD1+ lymphocytes. These changes were restricted to patients treated with atezolizumab+bevacizumab, while they were not documented in TKI patients, irrespective of the response.

**Conclusion:** Early changes in circulating PD1+CD8+ lymphocytes predict the type of response to atezolizumab+bevacizumab and encourage evaluating this minimally invasive, cheap, easy and repeatable test in a larger cohort of patients to confirm its informativeness in this setting.

**TOP-071**  
Impact of statin on the survival of patients with advanced hepatocellular carcinoma treated with sorafenib or lenvatinib  
Hyo Jung Cho1, Ji Eun Han1, Jae Youn Cheong1, Soon Sun Kim1.  
1Ajou university school of medicine, Gastroenterology, Korea, Rep. of South  
Email: pilgrim8107@hanmail.net.

**Background and aims:** To overcome drug resistance to multityrosine kinase inhibitors (TKI) such as sorafenib and lenvatinib is major challenging issue for systemic treatment of hepatocellular carcinoma (HCC). Statin reduced the risk of developing HCC in patients with hepatitis B, C and diabetes mellitus and was also reported to potentiate anticancer effect of the TKIs. We aimed to verify the potential survival benefit of statin combined with the TKIs in patients with advanced HCC. Further, we investigated the impact of timing of statin administration, optimal statin type and dose on survival outcome of patients with HCC treated with the TKIs.

**Method:** Using large-scale data from 2010 to 2020 provided by National Health Insurance Service in Korea, we identified the effect of statin use on the patients with advanced HCC treated with the TKIs.

Statin user was defined as 28 cumulative defined daily dose (cDDD) ≥28 of filled statin prescriptions. After propensity score matching (PSM), 1,534 statin users were 1:4 matched with 6,136 non-users. Primary and secondary outcome were defined as overall survival (OS) and progression-free survival (PFS), respectively. Multivariate cox regression analyses were performed to identify the risk factors associated with survival outcome.

**Results:** Statin use improved both OS (Hazard ratio [HR] = 0.77, 95% Confidence interval [CI] = 0.72–0.82; p < 0.0001) and PFS (HR = 0.78, 95% CI = 0.74–0.84, p < 0.0001). Regarding the timing of statin use, continuous statin use without interruption from before TKI treatment (HR = 0.87, 95% CI = 0.80–0.95; p = 0.0016), post-TKI statin use (HR = 0.87, 95% CI = 0.80–0.95; p < 0.0001) significantly improved OS, while pre-TKIs statin use but stop after TKI prescription (HR = 1.33, 95% CI = 1.14–1.54; p = 0.0002) was independent risk factor of poor OS. Lipophilic statin use improved OS (HR = 0.75, 95% CI = 0.69–0.81, p < 0.0001) and PFS (HR = 0.74, 95% CI = 0.69–0.80, p < 0.0001). Hydrophilic statin use also improved OS (HR = 0.59, 95% CI = 0.53–0.66, p < 0.0001) and PFS (HR = 0.63, 95% CI = 0.57–0.69, p < 0.0001). 730 or higher cDDD of statin use was significantly associated with greater survival outcome.

**Conclusion:** In a nation-wide retrospective study, statin offered substantial survival benefit for overall death and tumor progression in dose and duration dependent manner, upon co-administration with the TKIs in patients with advanced HCC. Our study emphasizes the importance of continuous statin administration without interruption even after the TKI treatment.

**Figure:** (abstract: TOP-071): Comparison of OS and PFS according to statin use, statin type and cumulative statin dose through Kaplan-Meier analysis in the entire PS-matched cohort.

SS72  Journal of Hepatology 2023 vol. 78(S1) | S100–S1212
**Background and aims:** The IMbrave 150 phase 3 trial did not include patients with a variceal bleeding history or a high-risk varix. Little is known regarding the actual risk of gastrointestinal bleeding (GIB) in hepatocellular carcinoma (HCC) patients receiving atezolizumab and bevacizumab (A/B). Therefore, we sought factors associated with GIB in these patients.

**Method:** We performed a retrospective analysis of 321 HCC patients who underwent endoscopy prior to A/B treatment at Asan Medical Center, Seoul, Republic of Korea between 2018 and 2022. GIB was defined as documented hematemesis, melena, or hematochezia, or performing endoscopic hemostasis between the start of A/B treatment and 3 months following the last dose of A/B treatment. Using a multivariable logistic regression analysis, GIB-associated factors were sought. A prediction model was developed based on this multivariable analysis. Our model’s performance was displayed as an area under the receiver operating curve (AUROC).

**Results:** The median age was 60.9 years, and 82.6% of the patients were male. At the time of A/B treatment, 29 (9.0%) and 292 (91.0%) patients were in BCLC stage of B and C, respectively. Of the 321 patients, 287 (89.4%) patients were classified as Child-Pugh class A. A total of 20 patients experienced GIB with a median onset of 3 months after the first dose of A/B. Cumulative incidence rates of GIB at 3, 6, 9, and 12 months were 3.2%, 7.3%, 8.0%, 9.6%, respectively. No patient died because of GIB. Variceal bleeding was the most common cause of GIB in 12 (60.0%) patients, followed by unknown origin of GIB (n = 6), and benign gastric ulcer (n = 2). Platelet count <100,000/mm3, prothrombin time with INR ≥1.3, portal vein invasion (PVI), and endoscopic variceal categorization ≥F2 were significantly associated with an increased risk of GIB in multivariable analysis. Risk scores were assigned to platelet <100,000 (1 point), PT INR ≥1.3 (1 point), PVI (1 point), and EV ≥F2 (3 points). Our prediction model had an AUROC of 0.839 (95% confidence interval: 0.765–0.914). Patients categorized as low (0–1 points), intermediate (2–3 points), and high-risk group (≥4 points) showed an estimated risk of GIB of 1–2%, 2–4%, and 5–11%, respectively, after receiving A/B treatment.

**Figure:**

**Conclusion:** Factors associated with GIB after A/B treatment for HCC were lower platelet, prolonged PT, PVI, and EV ≥F2 by endoscopic findings. Our prediction model has a high predictive performance when estimating the real GIB risk following A/B treatment in patients with advanced HCC.
Conclusion: No clinically meaningful decline in HRQoL was observed in the vast majority of evaluable time points during treatment with nivolumab following SIRT. This combination does not compromise quality of life for this difficult-to-treat population of patients with uHCC.

THU-115
Impact of baseline liver function on overall survival (OS) and safety in patients (pts) with unresectable hepatocellular carcinoma (HCC) treated with first-line (1L) tislelizumab (TIS): results from the RATIONALE-301 study
Masatoshi Kudo1, Arndt Vogel2, Tim Meyer3, Frederic Boisserie4, Songzi Li5, Richard S. Finn11
1Kindai University Faculty of Medicine, Department of Gastroenterology and Hepatology, Osaka, Japan; 2Hannover Medical School, Department of Gastroenterology, Hepatology and Endocrinology, Hannover, Germany; 3Royal Free Hospital NHS Trust and University College London, Academic Department of Oncology, London, United Kingdom; 4BeiGene Ltd., Ridgefield Park, Clinical Science, NJ, United States; 5BeiGene Ltd., Ridgefield Park, Biometrics, NJ, United States; 6BeiGene USA, Inc., Clinical Development, Fulton, MD, United States; 7BeiGene (Beijing) Co., Ltd., Clinical Development, Beijing, China; 8Jiahui Health, Jiahui International Cancer Center, Shanghai, China; 9Harvard Medical School, Massachusetts General Hospital, MA, United States; 10Cancer Center of General Hospital of Eastern Theater of PLA, Nanjing, China; 11Geffen School of Medicine, University of California Los Angeles, Department of Medicine, Division of Hematology/Oncology, Los Angeles, CA, United States
Email: m-kudo@med.kindai.ac.jp.

Background and aims: TIS is a monoclonal antibody with high binding affinity to programmed cell death protein 1. The phase 3 RATIONALE-301 study (NCT03412773) demonstrated non-inferior OS with TIS versus sorafenib (SOR) (median [m] OS 15.9 vs 14.1 months [mo], respectively; HR: 0.85 [95% CI: 0.71, 1.02]) in 1L treatment of pts with unresectable HCC; OS superiority versus SOR was not met. As liver function is a known predictor of survival in pts with HCC, we evaluated baseline liver function and its impact on OS and safety in pts enrolled in RATIONALE-301.

Method: Systemic therapy-naïve adults with histologically confirmed HCC were randomized (1:1) to receive TIS (200 mg intravenously every 3 weeks) or SOR (400 mg orally twice daily) until disease progression, intolerable toxicity, or withdrawal. The primary end point was OS. In this exploratory analysis, OS and safety were assessed by Child-Pugh score (CPS: 5 vs 6) and albumin-bilirubin (ALBI) grade (1 vs 2).

Results: In pts randomized to TIS (n = 342), at baseline, 76.9% and 22.5% had a CPS of 5 and 6, respectively, and 74.9% and 23.7% had an ALBI grade of 1 and 2, respectively. In pts randomized to SOR (n = 332), 74.7% and 25.3% had a CPS of 5 and 6, respectively, and 68.1% and 29.5% had an ALBI grade 1 and 2, respectively. At data cutoff (July 11, 2022; minimum study follow-up 33 mo), mOS was similar in pts treated with TIS and SOR, and numerically longer in pts with CPS 5 vs 6, and ALBI grade 1 vs 2, regardless of treatment arm (Table). Incidence of any grade and grade ≥3 treatment-emergent adverse events (TEAEs) and treatment-related adverse events (TRAEs) were lower in pts treated with TIS versus SOR across CPS and ALBI grades (Table).

Conclusion: Survival was similar between arms, and TIS showed a favorable safety profile compared with SOR, regardless of CPS or ALBI grade, supporting the primary analysis. Pts with CPS 6 and ALBI grade 2 had poorer mOS than those with CPS 5 and ALBI grade 1, regardless of treatment arm, affirming that pts with better liver function have improved outcomes.

Table (abstract: THU-115).

<table>
<thead>
<tr>
<th>Efficacy*</th>
<th>CPS 5</th>
<th>CPS 6</th>
<th>ALBI grade 1</th>
<th>ALBI grade 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIS (n = 263)</td>
<td>SOR (n = 248)</td>
<td>TIS (n = 77)</td>
<td>SOR (n = 84)</td>
<td>TIS (n = 256)</td>
</tr>
<tr>
<td>Median OS, mo (95% CI)</td>
<td>19.5 (15.4, 23.5)</td>
<td>18.4 (14.5, 20.9)</td>
<td>8.7 (6.2, 12.3)</td>
<td>8.3 (5.6, 10.0)</td>
</tr>
<tr>
<td>Unstratified HR (95% CI)</td>
<td>0.88 (0.71, 1.08)</td>
<td>0.73 (0.52, 1.03)</td>
<td>0.73 (0.52, 1.03)</td>
<td>0.73 (0.52, 1.03)</td>
</tr>
<tr>
<td>Safety, n (%)†</td>
<td>TIS (n = 261)</td>
<td>SOR (n = 243)</td>
<td>TIS (n = 75)</td>
<td>SOR (n = 81)</td>
</tr>
<tr>
<td>TEAE any grade</td>
<td>251 (96.2)</td>
<td>243 (100)</td>
<td>72 (96.0)</td>
<td>81 (100)</td>
</tr>
<tr>
<td>TEAE grade ≥3</td>
<td>120 (46.0)</td>
<td>155 (63.8)</td>
<td>42 (56.0)</td>
<td>57 (70.4)</td>
</tr>
<tr>
<td>TRAE any grade</td>
<td>194 (74.3)</td>
<td>238 (97.9)</td>
<td>63 (84.0)</td>
<td>73 (90.1)</td>
</tr>
<tr>
<td>TRAE grade ≥3</td>
<td>56 (21.5)</td>
<td>131 (53.9)</td>
<td>18 (24.0)</td>
<td>42 (51.9)</td>
</tr>
</tbody>
</table>

*Efficacy analysis set; †Safety analysis set.
The ALBI grade refines prognostic prediction in advanced hepatocellular cancer and enables risk stratification for bleeding events following atezolizumab plus bevacizumab

Antonio D’Alessio1,2, Claudia Fulgenzi1,3, Bernhard Scheiner1,4, James Korolewicz5, JaeKyung Cheon5, Naoshi Nishida6, Celina Ang7, Thomas Marron7, Linda Wu7, Anwar Saeed8, Brooke Wiethorn9, Antonella Cammarota10,11, Tiziana Pressiani12, Matthias Pinter10, Lorenz Balcar10, Yi-Hsiang Huang13, Aman Mehan1, Samuel Phen14, Caterina Vivaldi15, Francesca Salani15,16, Gianluca Masi15, Dominik Bettinger1, Arndt Vogel16, Martin Schoelen16, Johann von Felden5, Kornelius Schulze2, Henning Wege20, Adel Samson11, Peter Galke22, Masatoshi Kudo8, Alessio Cortellini1,3, Amit Singal14, Lorenza Rimassa10,12, Rohini Sharma1, Hong Jae Chon5, David J. Pinato1,2, Imperial College London, Department of Surgery and Cancer, London, United Kingdom; 2University of Piemonte Orientale, Department of Translational Medicine, Novara, Italy; 3Division of Medical Oncology, Policlinico Universitario Campus Bio-Medico, Rome, Italy; 4Division of Gastroenterology and Hepatology, Department of Internal Medicine III, Medical University of Vienna, Vienna, Austria; 5Medical Oncology, Department of Internal Medicine, CHA Bundang Medical Center, CHA University, Seongnam, Korea, Korea, Rep. of South; 6Department of Gastroenterology and Hepatology, Kindai University Faculty of Medicine, Osaka, Japan; 7Department of Medicine, Division of Hematology/Oncology, Tisch Cancer Institute, Mount Sinai Hospital, New York, NY, USA, United States; 8Division of Hematology/Oncology, Department of Medicine, University of Pittsburgh (UPMC), USA, United States; 9Department of Medicine, Division of Medical Oncology, Kansas University Cancer Center, Kansas City, Kansas, USA, United States; 10Department of Biomedical Sciences, Humanitas University, Via Rita Levi Montalcini 4, 20072 Pieve Emanuele, Milan, Italy; 11Drug Development Unit, Sarah Cannon Research Institute UK, London, United Kingdom; 12Medical Oncology and Hematology Unit, IRCSS Humanitas Research Hospital, Rozzano (Milan), Italy; 13Division of Gastroenterology and Hepatology, Department of Medicine, Taipei Veterans General Hospital, Taipei, Taiwan; Institute of Clinical Medicine, National Yang Ming Chiao Tung University School of Medicine, Taipei, Taiwan; 14University of Texas Southwestern Medical Center, Dallas, Texas, USA, United States; 15Department of Translational Research and New Technologies in Medicine and Surgery, University of Pisa, Pisa, Italy; Unit of Medical Oncology 2, Azienda Ospedaliero-Universitaria Pisana, Pisa, Italy; 16Sant’Anna School of Advanced Studies, Pisa, Italy; 17Department of Medicine II (Gastroenterology, Hepatology, Endocrinology and Infectious Diseases), Freiburg University Medical Center, Faculty of Medicine, University of Freiburg, Freiburg, Germany; 18Hannover Medical School, Hannover, Germany; 19Department of Oncology, Hematology and Bone Marrow Transplantation with Section of Pneumology, University Medical Center Hamburg-Eppendorf, Hamburg, Germany; 20Department of Gastroenterology and Hepatology, University Medical Center Hamburg-Eppendorf, Hamburg, Germany; 21Leeds Institute of Medical Research at St James’s (LIMR), School of Medicine, Faculty of Medicine and Health, University of Leeds, St James’s University Hospital, Leeds, United Kingdom; 22University Medical Center Mainz, I. Dept. of Internal Medicine, Mainz, Germany

Email: david.pinato@imperial.ac.uk

Background and aims: The combination of atezolizumab plus bevacizumab (A+B) is the current standard of care for Child-Pugh A (CP-A) unresectable or metastatic hepatocellular carcinoma (HCC) and is being evaluated in CP-B patients. Whilst highly effective, A+B can lead to potentially life-threatening adverse events (AEs), including bleeding. We investigated whether liver dysfunction as measured by the albumin-bilirubin (ALBI) grade is associated with survival and adverse events (AEs) following A+B.

Method: We performed a multi-centre, retrospective study on patients consecutively treated with A+B in 15 tertiary referral centres. Patients exposed to systemic treatments or Child-Pugh (CP) C liver function were excluded. We correlated baseline ALBI grade with overall survival (OS) and progression-free survival (PFS) with the Kaplan-Meier method and we estimated predictors of survival with the Cox regression model. We assessed the predictive value for 6-months OS landmark with ROC curves. Association with treatment-related (tr)AEs was assessed with the chi² test.

Results: From the initial cohort of 433 patients, 368 were included in the analysis, mostly with underlying viral hepatitis (37.5% HBV, 24.2% HCV) and a diagnosis of cirrhosis (78.8%). 295 patients (80.2%) were in CP-A functional class and 73 (19.8%) CP-B. 163 patients (44.3%) were graded as ALBI 1, 192 (52.2%) ALBI 2, and 13 (3.5%) ALBI 3. After a median follow-up of 9.7 months (95% CI, 9.2–10.3), ALBI 1 patients did not reach a median OS (mOS), ALBI 2 achieved a mOS of 9.7 months (95% CI, 6.98–12.29) compared to 5.6 months of ALBI 3 (95% CI, 0.1–12.0, p < 0.001, Fig. 1). Similarly, ALBI grade was associated with improved mPFS: 8.1 months (95% CI, 6.0–10.2) for ALBI 1, 4.5 months (95% CI, 3.7–5.3) for ALBI 2, and 1.2 months (95% CI, 0.1–3.6) for ALBI 3 patients (p < 0.001). ALBI was independently associated with OS and PFS in multivariable models (p < 0.001) and out-ranked CP for 6-months OS prediction, with an area under the curve of the 0.79 (95% CI, 0.73–0.85) for ALBI score and 0.71 (95% CI, 0.63–0.78) for CP score (p = 0.013). Whilst rates of bevacizumab-related gastrointestinal bleeding events of any grade were similar according to CP class (6.8% in CP-A vs 8.2% in CP-B, p = 0.67), pre-treatment ALBI was associated with a 3-fold increase in risk of bleeding (3.1% in ALBI 1 vs 10.2% in CP 2/3, p = 0.008). Neither ALBI grade nor CP score were associated with atezolizumab-related AEs. At treatment discontinuation (n = 252, 68.5%) all patients were either ALBI 2 or 3. ALBI score predicted for worse OS after discontinuing A+B, with ALBI 2 patients achieving a post-treatment mOS of 6.8 months (95% CI, 4.4–9.2) while ALBI 3 reached 1.6 months (95% CI, 0.6–2.7, p < 0.001).

Figure:

Conclusion: ALBI grade identifies a subset of patients with higher probability of achieving an improved survival. Further studies should validate the role of ALBI as a predictor of bleeding events following A+B.

THU-117 Dipeptidyl-peptidase 4 inhibitors improve survival of patients with diabetes mellitus and hepatocellular carcinoma receiving immunotherapy

Dorothy Cheuk-Yan Yiu1,2, Huapeng Lin1,2, Terry Cheuk-Fung Yip1,2, Mandy Sze-Man Lai1,2, Vincent Wai-Sun Wong1,2, Ken Liu1,2, Grace Lai-Hung Wong1,2,3, The Chinese University of Hong Kong, Medical Data Analytics Centre, Hong Kong; 4The Chinese University of Hong Kong, Medical Data Analytics Centre, Hong Kong; 5Royal Prince Alfred Hospital, NSW Gastroenterology and Liver Centre, Sydney, Australia

Email: wonglaihung@cuhk.edu.hk

Background and aims: Preclinical studies suggest that dipeptidyl-peptidase 4 inhibitors (DPP4i) improve anti-tumor immunity in

with overall survival (OS) and progression-free survival (PFS) with the Kaplan-Meier method and we estimated predictors of survival with the Cox regression model. We assessed the predictive value for 6-months OS landmark with ROC curves. Association with treatment-related (tr)AEs was assessed with the chi² test.
hepatocellular carcinoma (HCC). By enhancing intrahepatic inflammatory cell infiltration, DPP4i may enhance response to immunotherapy regimens. This study aimed to investigate the impact of dipeptidyl-peptidase 4 inhibitors (DPP4i) on survival of patients who had advanced HCC undergoing immunotherapy in a real-world setting.

**Method:** This was a multi-center retrospective cohort study in Hong Kong and Australia. All patients with advanced HCC who had received at least one dose of immunotherapy were identified. Clinical, biochemical and medication data were collected and analyzed. The primary outcome was overall survival. The analysis was performed using Cox proportional hazards models.

**Results:** Among 451 patients with advanced HCC on immunotherapy, the mean age was 62.3 ± 12.4 years old. The cohort was predominantly male (n = 373, 82.7%) and the main etiology of HCC was chronic viral hepatitis (n = 331, 73.1%). 169 (37.5%) patients had diabetes and of which, 38 (22.5%) were treated with DPP4i. In diabetic patients, DPP4i use was associated with better survival (hazard ratio [HR] = 0.60 [95% CI 0.38–0.95], p = 0.029) in univariate analysis. After adjusting for patient demographics (age, sex) and pathologic variables (HCC etiology, albumin-bilirubin [ALBI]-grade, alpha-fetoprotein, platelets, alanine aminotransferase), the survival advantage of DPP4i remained similar in patients with diabetes (HR = 0.57 [0.35–0.92], p = 0.022). Within 23 DPP4i users who died, 17 (73.9%) died of cancer, 1 (4.3%) died of sepsis and 1 (4.3%) died of pneumonia.

**Conclusion:** The use of DPP4i is associated with improved survival in diabetic HCC patients receiving immunotherapy. The findings should be further validated in prospective studies with larger sample sizes.

**THU-118**

**Application of deep learning auto-segmentation and unsupervised machine learning in developing a radiomic prognostic score to predict disease recurrence post radiofrequency ablation for hepatocellular carcinoma**

Mathew Vithayathil1, Akshayaa Vaidyanathan2–4, Osman Ocal4, Matthias Fabritius5, Maciej Pech6, Thomas Berg7, Christian Loewe7, Heinz-Josef Klümpen8, Andrea Rockall1, Henry Woodruff2, Mathew Vithayathil1, Akshayaa Vaidyanathan2–4, Osman Ocal4, Matthias Fabritius5, Maciej Pech6, Thomas Berg7, Christian Loewe7, Heinz-Josef Klümpen8, Andrea Rockall1, Henry Woodruff2.

**Background and aims:** Disease recurrence after radiofrequency ablation (RFA) for hepatocellular carcinoma (HCC) is 60–85% at five years. Radiological features within the HCC and background liver may predict risk of reoccurrence. Through using a combination of deep-learning (DL) and machine-learning (ML) we developed a radiomic prognostic score to predict disease recurrence in patients undergoing RFA.

**Methods:** Patients undergoing RFA with or without sorafenib as part of the SORAMIC trial across 12 centers were included. An auto-segmentation tool for whole liver area was developed using DL on post-contrast hepatobiliary MRI sequences, and visually verified by experienced radiologists. Voxel resampling and intensity normalization was applied to segmented areas. 666 radiomic features were extracted using previously validated software (TexLAB 2.0). Least absolute shrinkage and selection operator (LASSO) Cox regression identified radiomic features and coefficients to construct the radiomic prognostic vector (RPV). RPV was evaluated for predicting time-to-recurrence (TTR) in Kaplan-Meier and Cox regression survival analysis.

**Results:** DL-derived auto-segmentation was applied to pretreatment MRIs in 79 patients undergoing RFA. Four radiomic features were identified from LASSO Cox regression to form the RPV score. Three RPV-associated clusters were identified using unsupervised k-means clustering. Kaplan-Meier survival analysis demonstrated these clusters correlated with low- (median TTR 54.3 months; 95% confidence interval [29.5–83]) medium- (median TTR 20.8 months; 95% CI [8.8–36.6]; log rank cf. low risk p < 0.005) and high-risk (median TTR 10.8 months; 95% CI [4.5–20.7]; p < 0.005) of HCC reoccurrence (Figure 1). In a multivariate Cox regression model including age, Barcelona Clinic Liver Cancer stage and adjuvant sorafenib, RPV was significant in predicting recurrence (Hazard ratio 3.08 [1.94–4.88]; p < 0.005).

**Conclusion:** DL derived auto-segmentation in combination with pretreatment radiomic feature extraction from whole liver imaging can predict disease recurrence in HCC patients post RFA. Radiomic scores can be used to stratify high-risk patients for post treatment surveillance.
Background and aims: The efficacy of atezolizumab/bevacizumab (AB) had never been reported in patients with metastatic/unresectable combined hepatocellular carcinoma-cholangiocarcinoma (cHCC-CCA). Therefore, the purpose of our study is to describe the effects of atezolizumab/bevacizumab treatment in patients with advanced cHCC-CCA.

Method: We retrospectively included patients with a histological diagnosis of unresectable/metastatic cHCC-CCA and treated by AB (2020 to 2022) in 7 centers. Clinical, and radiological features were collected at the beginning of AB. We reported radiological response using RECIST criteria and overall survival and progression-free survival.

Results: Sixteen patients with cHCC-CCA were included and were predominantly male (75%) with advanced fibrosis/cirrhosis (69%). Nine patients received AB as a first-line systemic treatment, 5 as a second line, one as a third line and one as a fifth line. Severe digestive bleeding occurred in two patients. Among the 9 patients treated in first-line, four experienced radiological progression, three partial response, and one had stable disease. Patients treated with AB in first line had a median overall survival of 13 months and a median progression-free survival of 3 months (Figure 1). Among the 7 patients receiving AB as a second line or more, 4 patients harbored a progression-free survival of 3 months (Figure 1). Among the 7 patients receiving AB in first-line, four experienced radiological progression, three partial response, and one had stable disease. Patients treated with AB in first line had a median overall survival of 13 months and a median progression-free survival of 3 months (Figure 1). Among the 7 patients receiving AB as a second line or more, 4 patients harbored a progression-free survival of 3 months (Figure 1).

Conclusion: The combination of atezolizumab and bevacizumab showed signs of anti-tumor efficacy in patients with unresectable/metastatic cHCC-CCA.

THU-120
Fragility index of positive phase 2 and 3 randomized clinical trials of treatment of hepatocellular carcinoma (2002–2022)
Sabrina Sidali1,2, Nanthara Sritharan3, Claudia Campani4, Jules Grégoire5, François Durand1, Nathalie Ganne-Carrié6,8, Maxime Ronot9, Vincent Lévy10, Jean Charles Nault6,7,8.

1Université de Paris, Service d’Hépato-Gastroentérologie et nutrition, Hôpital Saint-Louis, APHP, Paris, France; 2Department of Radiology, FHU MOSAIC, Hôpital Beaujon APHP Nord, Clichy, France; 3Liver unit, Hôpital Avicenne, Hôpitaux Universitaires Paris-Seine-Saint-Denis, Assistance-Publique Hôpitaux de Paris, Bobigny, France; 4Unité de Formation et de Recherche Santé Médecine et Biologie Humaine, Université Sorbonne Paris nord, Bobigny, France; 5Université de Paris, INSERM U1153, Epidemiology and Biomathematics Sorbonne Paris Cité Center (CRESS), METHODS Team, Paris, France; 6Université de Paris, Service d’Hépato-Gastroentérologie, DMU DIGEST, Hôpital Beaujon, APHP Nord, Clichy, France; 7Centre de Recherche sur l’inflammation, CRI, Paris, France; 8Department of Clinical Research, Paris Seine Saint Denis Hospital, Sorbonne Paris University, Bobigny, France; 9Department of Radiology, FHU MOSAIC, Hôpital Beaujon APHP Nord, Clichy, France; 10Université de Paris, INSERM U1153, Epidemiology and Biomathematics Sorbonne Paris Cité Center (CRESS), METHODS Team, Paris, France; 11Department of Clinical Research, Paris Seine Saint Denis Hospital, Sorbonne Paris University, APHP, Bobigny, France; 12ECSTTRA team, CRESS UMR 1153, Hôpital Saint-Louis, APHP, Paris, France.

Background and aims: The fragility index (FI), i.e., the minimum number of best survivors reassigned to the control group required to revert the statistically significant result of a clinical trial to non-significant, has been developed as a metric to evaluate the robustness of randomized, controlled trials (RCTs). We aimed to assess the FI in the field of HCC.

Method: This is a retrospective analysis of phase 2 and 3 RCTs for the treatment of HCC published between 2002 and 2022. We included two-arm studies with 1:1 randomization and significant positive results for a primary time-to-event end point for the FI calculation, which involves the iterative addition of a best survivor (patients with the longest follow-up time, regardless of having an event or being censored) from the experimental group to the control group, until positive significance (p < 0.05, Log-rank test) is lost.

Results: We identified 51 phase 2 and 3 positive RCTs, of which 29 (57%) were eligible for fragility index calculation. After reconstruction of the Kaplan-Meier curves, 25/29 studies remained significant, among which the analysis was performed. The median (interquartile range (IQR)) FI was 5 (2–10) and Fragility Quotient (FQ) was 3% (1%–6%). Ten trials (40%) had a FI of 2 or less. FI was positively correlated to the blind assessment of the primary end point (median FI 9 with blind assessment versus 2 without, p = 0.01), the number of reported events in the control arm (Rk = 0.45, p = 0.02) and to impact factor (RS = 0.58, p = 0.003), and negatively correlated to the p value (Rs = −0.83, p < 0.0001). Overall survival and progression-free survival were represented using Kaplan–Meier curve with the number at risk under the X axis. The median overall survival was 13 months. The median progression-free survival was 3 months.
**THU-121**

**Genomic characteristics of hepatocellular carcinoma patients with response to sorafenib**

Sun Young Yim1, Sang-Hee Kang1, Young-Sun Lee1, Yoonseok Lee1, Ji-Hwan Lim1, Tae Hyung Kim1, Young Kul Jung2, Yeon Seok Seo1, Hyung Joon Yim1, Jong Eun Yeon1, Ju-Seog Lee1, Ji Hoon Kim1. 1Korea University Hospital, Korea, Rep. of South; 2MD Anderson Cancer Center, United States

**Background and aims:** Sorafenib is a multiple receptor tyrosine kinase inhibitor which is the standard systemic therapy for advanced hepatocellular carcinoma (HCC). However, the objective response rate is low only reaching 10% and since there are other new 1st line treatment options such as lenvatinib and immune checkpoint inhibitors, biomarkers that may predict patients who will respond well to sorafenib is required. We implemented RNA sequencing (RNA-seq) in HCC tumors to identify potential biomarkers that would predict response to sorafenib and uncover underlying biological features associated with better response.

**Method:** A total of 33 patients who had undergone liver resection prior to sorafenib treatment were enrolled. Matched tumor/surrounding tumor tissues were obtained and RNA-seq was performed with the NextSeq500. Cluster analysis was performed and gene signature associated with sorafenib response was identified. The gene signature was validated in independent Sorafenib as Adjuvant Treatment in the Prevention Of Recurrence of Hepatocellular Carcinoma (STORM) cohort. Gene network analysis by Ingenuity Pathway Analysis (IPA) was performed to uncover activated pathways and key upstream regulators associated with response to sorafenib. The composition of infiltrated immune cells in tumors was also investigated by using the CIBERSORTx algorithm.

**Results:** The mean age was 58 ± 11 years with male predominance (81.8%), median child pugh score was 5 (range, 5–8) and 57.6% of the patients switched to second-line chemotherapy mostly due to HCC progression. The best response among 33 patients was complete response (CR) observed in 1 patient, partial response (PR) in 2 patients, stable disease (SD) in 12 patients while 18 patients showed disease progression. Gene signature (721 genes) associated with disease control (SD, PR, CR vs. no response) was derived using cluster analysis and was named as Korea University Sorafenib Response (KUSOR) gene signature. When applied on STORM cohort, KUSOR gene signature was able to predict patients who do not recur on adjuvant setting of sorafenib treatment after HCC resection or ablation with sensitivity of 91% and specificity of 74%. Gene network analysis by IPA revealed that patients who showed disease control were characterized by IL-6 and IL-18 activation. In contrast, MYC was more activated in HCC tumors showing no benefit of the treatment, suggesting that MYC may trigger resistance of HCC cells to sorafenib. In addition, regulatory T cells (Treg cells) and M2 macrophage fractions were significantly higher in poor response group while the fraction of activated NK cells and CD4 cells were substantially higher in disease control group.

**Conclusion:** Our study reveals that KUSOR gene signature was able to identify patients who would show disease control when treated with sorafenib. MYC promotes hepatocarcinogenesis in chronic liver disease and overexpression is associated with poor response. Furthermore, it can also be inferred that poor response to sorafenib could be related to immunosuppression observed in Treg cells and M2 macrophages in tumor microenvironment. Our study is in accord with previous studies where patients with high MYC activation showed poor response to sorafenib indicating that combination therapy such as immune checkpoint blockade should be recommended for these patients.

---

**THU-122**

**Efficacy and safety of atezolizumab and bevacizumab in the real-world treatment of Child Pugh B patients with advanced hepatocellular carcinoma**

Leonardo Stella1, Francesca Ponzian1, Francesco Santopado1, Clemence Hollande2, Antonio Gasbarrini1, Sabrina Sidda2, Maurizio Pompili1, Mohamed Bouattour2. 1IRCCS Policlinico Universitario Agostino Gemelli, Italy; 2APHP-Beaujon Hospital, France

**Background and aims:** Immunotherapy has changed the prognosis and the treatment paradigm in patients with advanced HCC. Despite the lack of well-designed multicenter studies involving cirrhotic patients with reduced liver function, initial evidence suggests that treatment with atezolizumab plus bevacizumab can be safely administered in patients with Child Pugh B (CP-B) class.

**Method:** We conducted a 2-years multicenter retrospective study enrolling 132 patients with unresectable or metastatic HCC treated with atezolizumab plus bevacizumab as part of routine clinical care, after a multidisciplinary team evaluation. We evaluated the coprimary end points, more precisely overall survival (OS), progression-free survival (PFS, as assessed at an independent review facility according to Response Evaluation Criteria in Solid Tumors or RECIST 1.1), and decomposition-free survival (defined as “the length of time during and after the treatment, that a patient does not develop new cirrhosis complications”), in CP-B cirrhotic patients compared to CP-A patients. Then, safety has been analyzed as a secondary outcome in the same subgroups of patients.

**Results:** CP-B patients achieved a median OS of 6.2 months (95% CI 5.0–7.2), which was significantly worse than CP-A patients (HR 2.78, 95%CI 1.34–5.64; p < 0.0001). However, there wasn’t any difference in PFS between CP-A and CP-B patients (HR 1.68, 95%CI 0.78–3.65, p = 0.6). Moreover, disease control rate (DCR) was 69% in CP-A patients and 57% in CP-B patients (p > 0.5). Median time to decompensation (TTD) was 7 months (95% CI 5.3–8.7) in CP-B patients, remarkably lower than in CP-A patients (HR 3.27, 95% CI 1.4–7.4, p < 0.01). Main predictors of death were performance status, serum platelet count, serum albumin, and signs of portal hypertension. Main predictors of liver decompensation were performance status, signs of portal hypertension, diabetes, and serious adverse events linked to cancer treatment. The only protective factor for death and liver decompensation was chronic treatment with non-selective beta-blockers.
Transarterial chemoembolization and systemic treatment in patients with autoimmune liver disease-associated hepatocellular carcinoma: outcome and safety profile

Louisa Stern1, Constantin Schmidt2, Christian Casar3, Aurélie Walter4, JFH. Drenth5, Frederik Nevens6, Maria Papp7, Nikolaos Catselis8, Kalliopi Zachou8, Matthias Pinter9, Bernhard Scheiner9, Arndt Vogel10, Martha M Kirstein11, Fabian Finkelmeier12, Kalliopi Zachou8, Matthias Pinter9, Bernhard Scheiner9, Arndt Weimann13, Oliver Waidmann12, Piotr Milkiewicz14, Douglas Thorburn15, Neil Halliday15, Ana Lleo16, Samuel Huber2, Jean Charles Nault17,18, Johann von Felden2, Kornelius Schulze2.

Background and aims: Hepatocellular carcinoma (HCC) develops in patients with autoimmune liver disease (AILD) such as autoimmune hepatitis (AIH) and primary biliary cholangitis (PBC). Due to the low incidence of AILD, this subgroup is regularly underrepresented in HCC clinical trials. Data on treatment tolerability and prognosis in these rare liver patients is scarce. Hence, the aim of this study was to investigate whether patients with HCC-AILD will equally benefit from systemic treatment with tyrosininkase inhibitors (TKIs) or transarterial chemoembolization (TACE) and demonstrate a similar safety profile compared to patients with HCC due to viral, or non-/alcoholic liver disease.

Method: For this European retrospective study, conducted by the ERN Rare Liver, we initially enrolled 107 patients with HCC-AILD (55 × AIH, 52 × PBC) treated at 13 centers from 1996 to 2020. Of these, 72 remained for the final analysis (exclusions criteria: treatment other than TACE or TKIs, 38 × AIH, 34 × PBC). Propensity score matching 1:1 with a pool of 347 non-AILD associated HCC patients from Hamburg was conducted to adjust for differences in major clinical confounders between the two groups. Subsequently, comparative analyses of median overall survival (mOS) and treatment tolerability were performed, thereby applying a sequential analysis method for patients having undergone both TACE and systemic treatment.

Results: The final propensity-matched cohort included a total of 130 patients who were treated with TACE and 56 with systemic treatment. HCC-AILD patients demonstrated a comparable mOS for both TACE (19.5 months [10.1–28.3] vs 22.1 months [11.4–30.2], p = 0.9) and systemic treatment with TKIs (15.4 months [5.3–na] vs 15.1 months [9.4–35], p = 0.5). For TACE, adverse events (AE) occurred less frequently in HCC-AILD patients than in controls (e.g. post-TACE embolization syndrome) (≥ 1 AE: 34% vs 62%, p = 0.003), whereas there was no significant change in rate of AEs for systemic treatment (≥ 1 AE: 68% vs 82%, p = 0.2).

Conclusion: In conclusion, we present the first study, investigating the outcome and safety profile of rare liver patients with HCC-AILD treated with TACE or TKIs. Patients with HCC-AILD have similar mOS to both local and systemic treatment, and a more favorable tolerability compared to non-AILD associated HCC. Due to the exclusion of HCC-AILD patients in recent immunotherapy trials, systemic treatment with TKIs will continue to be the standard of care for HCC-AILD.

THU-124
Interim analysis of the ACTION trial: Cabozantinib for Interstitial cell sarcoma patients who discontinued first line treatment other than sorafenib or due to sorafenib intolerance

Marco Sanduzzi Zamparelli1,2,3,4, Sergio Muñoz Martínez1,2,3,4, Mariona Calvo5, Maria Varela6, Neus Llarch1,2,3,4, Gemma Iserte1,2,3,4, Berta Laquente5, Andrés Castano-García6, José Luis Lledó7, Christie Perelé6,8,9, Gemma Domenech10, Ezequiel Mauro1,2,3,4, Maria Ángeles García-Criado1,4,11, Carmen Ayuso3,4,11, Angelis Kateb1, Jordi Rimola1,4,11, Jordi Bruix1,2,3,4, María Reig1,2,3,4, IBLCC group.

Fundació Clinic per a la Recerca Biomèdica-IDIBAPS, Barcelona, Spain; 2CIBERehd, Madrid, Spain; 3Liver Oncology Unit, Liver Unit, Hospital Clinic of Barcelona, Barcelona, Spain; 4University of Barcelona, Barcelona, Spain; 5Catalan Institute of Oncology, Hospital Duran i Reynals, Institut d’Investigació Biomèdica de Bellvitge (IDIBELL), Department of Oncology, L’Hospitalet de Llobregat, Spain; 6Hospital Universitario Central de Asturias, IUOPA, FINBA, University of Oviedo, Oviedo, Spain; 7Hospital Universitario Ramón y Cajal, IRYCIS, CIBERehd, University of Alcalá, Madrid, Spain; 8Gastroenterology Department, Hepatology Unit, Hospital Universitario Puerta de Hierro, Madrid, Spain; 9IDIPHISA, Spain; 10Medical Statistics Core Facility, Fundació de Recerca Clinic Barcelona (FRCB)-IDIBAPS, Barcelona, Spain; 11Radiology Department, Hospital Clinic de Barcelona, IDIBAPS, Barcelona, Spain; 12Fundació Clinic per a la Recerca Biomèdica-IDIBAPS, Barcelona, Spain; Email: mreig1@clinic.cat.
Background and aims: The landscape of hepatocellular carcinoma (HCC) changed in the last 5 years. Cabozantinib was approved for HCC, but the outcome of HCC patients who received cabozantinib as second-line due to sorafenib intolerance or after discontinuing first-line treatment other than sorafenib, mostly come from retrospective analysis. This clinical trial evaluates the safety profile established by the rate of adverse events (AE), rate of related-AEs and rate of death in HCC patients who received cabozantinib in second-line.

Method: Phase II, open label and investigator initiated clinical trial (CT) including HCC patients intolerant to sorafenib or those who discontinued first-line treatment with lenvatinib or atezolizumab-bevacizumab. Cabozantinib was initiated at 60 mg every day, which was modified upon development of AE. Treatment continued until symptomatic tumor progression, unacceptable AEs, patient’s decision or death. An interim analysis was planned when 14 patients had a minimum follow-up of 30 days, while the CT would have to be stopped because of futility if there were 8 or more patients with critical AEs according to investigators.

Results: At November 2022, 22 patients had been enrolled: 19 included, 11 on treatment and 8 discontinued cabozantinib. Four patients discontinued due to symptomatic progression, and the other 4 due to anorectal hemorrhage, intestinal ischemia, hand-foot skin reaction grade 3 and investigator decision, respectively. Twelve out of the 14 patients with >30 days follow-up (interim analysis) were sorafenib intolerant, 6 were BCLC-C and all had preserved liver function when starting cabozantinib. Eight patients developed 17 AE >grade 3, 11 of them were cabozantinib-related and 7 meet the definition of serious adverse events (SAE). Table 1 shows the 7 SAEs observed in 5 patients, among which 4 SAEs were cabozantinib-related and occurred in 3 patients.

<table>
<thead>
<tr>
<th>Subject Patient</th>
<th>Benzenib tolerance</th>
<th>AE description</th>
<th>Start date</th>
<th>End date</th>
<th>Event</th>
<th>Rate</th>
<th>Cabozantinib relationship</th>
<th>Cabozantinib doses (mg)</th>
<th>Action taken</th>
<th>Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dermatologic adverse events and fatigue</td>
<td>Wound dehiscence</td>
<td>2020-09-08</td>
<td>2020-10-07</td>
<td>3</td>
<td>Related</td>
<td>80</td>
<td>Cabozantinib Interrupted</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Rectal ulcer</td>
<td>Anorectal hemorrhage</td>
<td>2020-12-11</td>
<td>2020-12-22</td>
<td>3</td>
<td>Related</td>
<td>60</td>
<td>None</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Dermatologic adverse events</td>
<td>Wound dehiscence</td>
<td>2021-07-28</td>
<td>2021-08-10</td>
<td>3</td>
<td>Not related</td>
<td>60</td>
<td>Cabozantinib Interrupted</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Dermatologic adverse event</td>
<td>Wound dehiscence</td>
<td>2021-07-16</td>
<td>2021-07-25</td>
<td>3</td>
<td>Related</td>
<td>80</td>
<td>Cabozantinib Interrupted</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Not reported</td>
<td>Wound dehiscence</td>
<td>2021-02-04</td>
<td>2021-02-11</td>
<td>3</td>
<td>Not related</td>
<td>60</td>
<td>None</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Severe adverse events

Conclusion: The Data and Safety Monitoring Board concluded that the ACTION trial could continue, since it did not met the safety futility criteria. The final analysis is expected on June 2023.

THU-125
Association of tumor response with survival in patients with unresectable hepatocellular carcinoma treated with first-line tislelizumab versus sorafenib: results from the RATIONALE-301 study
Tim Meyer1, Richard S. Finn2, Masatoshi Kudo3, Andrew X. Zhu4,5, Songzi Li5, Yaxi Chen5, Frederic Boisserie1, Ramil Abdishaitov6, Arndt Vogel6, Shukui Qin7, Royal Free Hospital NHS Trust and University College London, Academic Department of Oncology, London, United Kingdom; 2Geffen School of Medicine, University of California Los Angeles, Department of Medicine, Division of Hematology/Oncology, Los Angeles, CA, United States; 3Kindai University Faculty of Medicine, Department of Gastroenterology and Hepatology, Osaka, Japan; 4Jiahui Health, Jiahui International Cancer Center, Shanghai, China; 5Harvard Medical School, Massachusetts General Hospital, MA, United States; 6BeiGene Ltd., Ridgefield Park, NJ, United States; 7BeiGene (Beijing) Co., Ltd., Clinical Science, Beijing, China; 8BeiGene Ltd., Ridgefield Park, Clinical Science, NJ, United States; 9BeiGene USA, Inc., Clinical Development, Fulton, MD, United States; 10Hannover Medical School, Department of Gastroenterology, Hepatology and Endocrinology, Hannover, Germany; 11Cancer Center of General Hospital of Eastern Theater of PLA, Nanjing, China
Email: t.meyer@ucl.ac.uk

Background and aims: Tislelizumab (TIS) is a monoclonal antibody with high affinity and binding specificity to programmed cell death protein 1. In RATIONALE-301 (NCT03412773) TIS was non-inferior to sorafenib (SOR) for overall survival (OS) as first-line treatment of patients (pts) with unresectable hepatocellular carcinoma (HCC); OS superiority vs SOR was not met. We evaluated the association of response with survival in pts from the RATIONALE-301 study.

Method: In this phase 3, open-label study, systemic therapy-naïve adult pts with histologically confirmed Barcelona Clinic Liver Cancer Stage B/C HCC were randomized (1:1) to receive TIS (200 mg intravenous every 3 weeks) or SOR (400 mg orally twice daily) until disease progression, intolerable toxicity, or withdrawal. The primary end point was OS; secondary efficacy end points included progression-free survival (PFS) and best overall response (BOR; per RECIST v1.1) by blinded independent review committee. We assessed OS and PFS according to BOR (complete response [CR] vs partial response [PR] vs stable disease [SD] vs progressive disease [PD]). Limitation of this analysis is related to its retrospective nature.

Results: Overall, 674 pts were randomized (TIS: n = 342; SOR: n = 332). At data cutoff (Jul 11, 2022), minimum study follow-up was 33 months. Pt characteristics were generally balanced at baseline in both arms. Survival outcomes across response categories are presented in the table. Response was associated with longer median OS and PFS according to BOR. OS vs SOR (TIS; OS: 91.7%, 95% CI: 79.4, 96.8; SOR; OS: 72.2%, 95% CI: 45.6, 87.4).

Conclusion: Though there are limitations in the analysis, response achieved on treatment with TIS was associated with better survival vs SOR, in pts with unresectable HCC.
Effectiveness and safety of conversion surgery for patients with initially unresectable hepatocellular carcinoma using lenvatinib combined with TACE plus PD-1 inhibitors: a real-world study

Xingzhi Li1, Xiaobo Wang1, Tao Bai1, Jie Chen1, Zhihong Tang1, Tao Wei1, Shaolong Lu1, Lequn Li1, Feixiang Wu1.

1Guangxi Medical University Cancer Hospital, Department of Hepatobiliary Surgery, China
Email: wufeixiang@gxmu.edu.cn

Background and aims: Conversion surgery for patients with initially unresectable hepatocellular carcinoma (uHCC) using lenvatinib combined with transcatheter arterial chemoembolization (TACE) plus programmed cell death protein-1 (PD-1) inhibitors (LTP) has been promising. However, the effectiveness and safety of conversion surgery for initially uHCC requires additional study. The purpose of this real-world, retrospective study was to compare the effectiveness and safety of conversion surgery for patients with initially uHCC managed with LTP to initial surgery in patients with resectable HCC.

Method: The data of 32 consecutive patients with initially uHCC receiving conversion surgery and 419 consecutive patients with resectable HCC receiving initial surgery from November, 2019, to September, 2022, were analyzed retrospectively. After propensity score matching (PSM) in a 1:2 ratio, 65 patients were selected. The major outcomes were safety of the operation, event-free survival (EFS), overall survival (OS), and clinicopathological factors.

Results: Compared to initial surgery, conversion surgery was safe. Before matching, the conversion surgery group had longer EFS (not reached vs 11.5 months, p = 0.003) and similar OS (not reached vs not reached, p = 0.62) compared with the initial surgery group. Similar results for EFS (p = 0.005) and OS (p = 0.28) were also obtained after matching. Multivariate analysis confirmed that conversion surgery was an independent prognostic factor of EFS. The conversion surgery group had significantly lower incidence of microvascular invasion (MVI) (3.1% vs 50.4%; p < 0.001), grade III/IV tumor differentiation (15.6% vs 45.8%; p < 0.001), and incomplete tumor capsule (12.5% vs 54.7%; p < 0.001). Before matching, patients with MVI-negative in the conversion surgery group had significantly longer EFS than those in the initial surgery group (not reached vs 14 months, p = 0.008). After matching, patients with MVI-negative in both groups had similar EFS (p = 0.39).

Table: (abstract: THU-125).

<table>
<thead>
<tr>
<th></th>
<th>Tislelizumab (n = 342)</th>
<th>Sorafenib (n = 332)</th>
<th>Hazard Ratio*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mOS, mo (95% CI)</td>
<td>mPFS, mo (95% CI)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Responders</td>
<td>49 (14.3)</td>
<td>NE (NE, NE)</td>
<td>38.2 (21.7, NE)</td>
</tr>
<tr>
<td>Non-responders</td>
<td>274 (80.1)</td>
<td>13.3 (11.0, 15.9)</td>
<td>2.1 (2.1, 2.1)</td>
</tr>
<tr>
<td>CR</td>
<td>10 (2.9)</td>
<td>NE (NE, NE)</td>
<td>29.5 (13.1, 45.0)</td>
</tr>
<tr>
<td>PR</td>
<td>39 (11.4)</td>
<td>NE</td>
<td>24.0 (19.4, 29.3)</td>
</tr>
<tr>
<td>SD</td>
<td>94 (27.5)</td>
<td>4.9 (4.2, 5.2)</td>
<td>139 (41.9)</td>
</tr>
<tr>
<td>PD</td>
<td>169 (49.4)</td>
<td>9.9 (8.6, 10.9)</td>
<td>121 (36.4)</td>
</tr>
</tbody>
</table>

*Unstratified hazard ratio of tislelizumab vs sorafenib
CI, confidence interval; CR, complete response; NE, not estimable; mo, months; mOS, median overall survival; PD, progressive disease; mPFS, median progression-free survival; PR, partial response; SD, stable disease

Figure: (abstract: THU-126).
**Conclusion:** Conversion surgery is effective and safe for patients with initially unresectable HCC receiving LTP. Conversion therapy of LTP has the potential to reduce risk factors for postoperative recurrence, especially in an Asian population.

**Method:** We screened our global, multi-center, prospectively maintained registry database for patients who received any systemic therapy before AB. Primary end point was OS, secondary end points were time-to-progression (TTP), progression-free survival (PFS), objective response rate (ORR), and safety (rate and severity of adverse events).

**Results:** Among 493 patients who received AB for unresectable HCC, 61 patients received prior systemic therapy and were included in this analysis. Median age of the study population was 66 years, with 91.8% males. Predominant risk factors for HCC were viral hepatitis (59%) and alcohol (23%). OS for AB was 16.2 (95% CI, 14.5–17.9) months, TTP and PFS were 4.1 (95% CI, 1.5–6.6) and 3.1 (95% CI, 1.1–5.1) months, respectively. ORR was 38.2% (7.3% with complete and 30.9% with partial response). Overall survival was not influenced by treatment line (2nd vs >2nd) or previous systemic treatment modality (tyrosine kinase inhibitors (TKI) vs. immune checkpoint inhibitors (ICI)). Treatment-related adverse events (trAE) of any grade according to CTCAE were documented in 42.6% of patients with only 13.1% of grade ≥3, incl. one death.

**Conclusion:** In this observational study, AB emerges as a safe and effective treatment option in patients with HCC previously treated with other systemic agents.

**Background and aims:** Since the introduction of the combination treatment of anti-PD-L1 antibody atezolizumab and anti-VEGF antibody bevacizumab (AB) median overall survival (OS) in hepatocellular carcinoma (HCC) has drastically improved. However, evidence on efficacy and safety of the novel treatment standard in patients with prior exposure to systemic treatment is scarce. Up to now, global positive phase 3 clinical trials for second line treatments are limited to regorafenib, cabozantinib, and ramucirumab following sorafenib treatment. The aim of this global, multi-center, observational study was to evaluate efficacy and safety of AB in patients after previous systemic therapy.

**Method:** We screened our global, multi-center, prospectively maintained registry database for patients who received any systemic therapy before AB. Primary end point was OS, secondary end points were time-to-progression (TTP), progression-free survival (PFS), objective response rate (ORR), and safety (rate and severity of adverse events).

**Results:** Among 493 patients who received AB for unresectable HCC, 61 patients received prior systemic therapy and were included in this analysis. Median age of the study population was 66 years, with 91.8% males. Predominant risk factors for HCC were viral hepatitis (59%) and alcohol (23%). OS for AB was 16.2 (95% CI, 14.5–17.9) months, TTP and PFS were 4.1 (95% CI, 1.5–6.6) and 3.1 (95% CI, 1.1–5.1) months, respectively. ORR was 38.2% (7.3% with complete and 30.9% with partial response). Overall survival was not influenced by treatment line (2nd vs >2nd) or previous systemic treatment modality (tyrosine kinase inhibitors (TKI) vs. immune checkpoint inhibitors (ICI)). Treatment-related adverse events (trAE) of any grade according to CTCAE were documented in 42.6% of patients with only 13.1% of grade ≥3, incl. one death.

**Conclusion:** In this observational study, AB emerges as a safe and effective treatment option in patients with HCC previously treated with other systemic agents.

**Background and aims:** Since the introduction of the combination treatment of anti-PD-L1 antibody atezolizumab and anti-VEGF antibody bevacizumab (AB) median overall survival (OS) in hepatocellular carcinoma (HCC) has drastically improved. However, evidence on efficacy and safety of the novel treatment standard in patients with prior exposure to systemic treatment is scarce. Up to now, global positive phase 3 clinical trials for second line treatments are limited to regorafenib, cabozantinib, and ramucirumab following sorafenib treatment. The aim of this global, multi-center, observational study was to evaluate efficacy and safety of AB in patients after previous systemic therapy.

**Method:** We screened our global, multi-center, prospectively maintained registry database for patients who received any systemic therapy before AB. Primary end point was OS, secondary end points were time-to-progression (TTP), progression-free survival (PFS), objective response rate (ORR), and safety (rate and severity of adverse events).

**Results:** Among 493 patients who received AB for unresectable HCC, 61 patients received prior systemic therapy and were included in this analysis. Median age of the study population was 66 years, with 91.8% males. Predominant risk factors for HCC were viral hepatitis (59%) and alcohol (23%). OS for AB was 16.2 (95% CI, 14.5–17.9) months, TTP and PFS were 4.1 (95% CI, 1.5–6.6) and 3.1 (95% CI, 1.1–5.1) months, respectively. ORR was 38.2% (7.3% with complete and 30.9% with partial response). Overall survival was not influenced by treatment line (2nd vs >2nd) or previous systemic treatment modality (tyrosine kinase inhibitors (TKI) vs. immune checkpoint inhibitors (ICI)). Treatment-related adverse events (trAE) of any grade according to CTCAE were documented in 42.6% of patients with only 13.1% of grade ≥3, incl. one death.
stratified by tumour volume and tumour distribution to improve prognostication.

**Method:** Included are patients at least 18 years old treated with resin microsphere Y90 SIRT for unresectable HCC between 1st January 2008 and 22nd May 2019 at National Cancer Centre Singapore (NCCS) and Singapore General Hospital (SGH) and had follow-up data. Patients with metastatic HCC, a second primary cancer, or lost to follow-up were excluded. The study cohort was divided into the following subgroups to improve prognostication: 1) within Milan (<Milan); 2) unilobar HCC beyond Milan within Up-To-7 (<UT7-u); 3) bilobar HCC beyond Milan within Up-To-7 (<UT7-b); 4) unilobar HCC beyond Up-To-7 (>UT7-u), 5) bilobar HCC beyond Up-To-7 (>UT7-b), 6) portal vein invasion (PVI) and Child-Pugh class A (PVI-CPA) and 7) PVI and Child-Pugh class B (PVI-CPB).

**Results:** Among 721 patients treated with Y90 SIRT within the study duration, 413 patients fulfilled inclusion/exclusion criteria. The median follow-up was 16.3 months. The median overall survival (mOS) of the whole cohort was 20.9 months (95% CI 18.2–24.0) and did not significantly differ with age or gender. In patients with HCC without PVI, survival differed significantly with performance status, liver function (Child-Pugh class, Albumin-Bilirubin grade), tumour size and distribution, whereas in patients with PVI, alpha-foetal protein levels and extent of PVI were additional predictors of OS. Of note, patients with solitary HCC (25.3 months, 95% CI 20.4–37.0) and 2–5 tumours (25.7 months, 95% CI 20.2–31.1) had comparable mOS (p = 0.323). Solitary HCCs with an absorbed Y90 dose above 150Gy tended towards a better mOS (46.4 months, 95% CI 26.2–NE) versus mOS 22.7 months (95% CI 13.7–37) in those with ≤150 Gy (p = 0.085). Median OS of the subgroups is shown in the Figure. Seventy patients (70/413, 16.9%) received curative modalities after Y90 SIRT downstaged the disease with mOS of 79.7 months (95% CI 40.4–NE), versus those who did not receive subsequent curative treatments (mOS 17.1 months; 95% CI 13.5–20.4, p < 0.001), and this was observed among all the subgroups.

**Conclusion:** Treatment outcomes of Y90 SIRT are favourable for patients with unresectable intermediate-locally advanced HCC. Incorporating tumour distribution improved prognostication of intermediate HCC, whereas the Child-Pugh class can stratify HCC with PVI. Patients downstaged with Y90 SIRT who subsequently received curative therapy had significantly improved mOS.

**THU-130**

**Salvage hepatectomy for recurrent hepatocellular carcinoma after radiofrequency ablation**

Jai Young Cho1, He Seong Han1, Hae Won Lee1, Boram Lee1, Ye Shong Park1, MeeYoung Kang1, Sook-Hyang Jeong2, Jin-Wook Kim2, Gwang Hyeon Choi2, 1Seoul National University Bundang Hospital, Surgery, Korea, Rep. of South; 2Seoul National University Bundang Hospital, Internal Medicine, Korea, Rep. of South

**Email:** jychogs@gmail.com

**Background and aims:** Radiofrequency ablation (RFA) is a widely used percutaneous local ablation technique for the treatment of hepatocellular carcinoma (HCC). Yet the optimal treatment for marginal recurrence after RFA is still unclear.

**Method:** A retrospective analysis was performed on 60 patients who underwent salvage hepatectomy (SH) for recurrent HCC after RFA between January 2004 and August 2022 at a single tertiary referral center. Short-term and long-term outcomes were compared to a matched control group (n = 60) of patients who underwent primary hepatectomy (PH) as initial treatment during the same period.

**Results:** The two groups showed no statistically significant difference in operative extent, operation time, and intraoperative blood loss. Postoperative morbidity rates were similar, and there was no postoperative mortality in either group. After intention-to-treat analysis, recurrence rates were significantly higher in the SH group for both local recurrence (36 [60.0%] vs. 14 [23.3%], p < 0.001) and systemic recurrence (22 [36.7%] vs. 3 [5.0%], p < 0.001). The 1-, 3-, and 5-year DFS rates were significantly worse in the SH group compared to the PH group (83.1% vs. 94.5%, 46.9% vs. 70.4%, and 26.2% vs. 66.9%, respectively; p < 0.001). Cancer-related death showed higher incidence in the SH group (13 [21.7%] vs. 4 [6.7%], p = 0.018). However, the difference in 1-, 3-, and 5-year overall survival rates between the two groups was not statistically significant (93.0% vs. 98.1%, 81.9% vs. 95.8%, and 78.0% vs. 92.2%, respectively; p = 0.091).

**Conclusion:** Salvage hepatectomy is an acceptable treatment option for recurrence after RFA with short-term outcomes comparable to primary resection. However, treatment should be planned carefully, because recurrent HCC after RFA exhibits more aggressive behavior.
Incidence and risk factors of esophagogastroduodenal varices bleeding in patients with advanced hepatocellular carcinoma treated with lenvatinib

Massimo Iavarone1, Eleonora Alimenti2, Toshifumi Tada3, Shimose Shigeo4, Goki Suda5, Changhoon Yoo6, Caterina Solda7, Fabio Piscaglia8, Andrea Casadei Gardini9, Fabio Marra10, Caterina Vivaldi11,12, Marta Schirripa14, Hideki Iwamoto4, Takuya Sho5, So Heun Leo6, Mario Domenico Rizzato15, Matteo Ntonni16, Margherita Rimini9, Claudia Campani10, Gianluca Masii11,12, Francesco Foschi13, Mariangela Bruccoleri1, Takumi Kawaguchi6, Takashi Kumada17, Atsushi Hiraoka18, Masanori Atsukawa19, Shinya Fukunishi20, Kazuhito Kawata27, Faujimasa Tada28, Hideko Ohama18, Norio Itokawa19, Tomomi Okubo19, Taeang Arai19, Michiaka Imai21, Atsushi Naganuma28, Giulia Tosetti1, Pietro Lampertico1.

1Foundation IRCCS Ca’ Granda Ospedale Maggiore Policlinico, Division of Gastroenterology and Hepatology, Milan, Italy; 2Department of Medical Sciences, University of Pavia, Italy; 3Japanese Red Cross Society Himeji Hospital, Internal Medicine, Japan; 4Kumamoto University School of Medicine, Division of Gastroenterology, Department of Medicine, Japan; 5Kokkaido University Graduate School of Medicine, Division of Gastroenterology and Hepatology, Japan; 6Department of Oncology, Asan Medical Center, University of Ulsan College of Medicine, Seoul, Korea, Rep. of South; 7Medical Oncology 1, Veneto Institute of Oncology Iov-Irccs, Italy; 8Irccs Azienda Ospedaliero-Universitaria Di Bologna, Department of Medical and Surgical Sciences, Italy; 9Irccs-Sан Raffaele Hospital, Milan, Italy; 10University of Florence, Medicina Sperimentale e Clinica, Italy; 11Department of Translational Research and New Technologies in Medicine, University of Pisa, Italy; 12Unit of Medical Oncology 2, Azienda Ospedaliero-Universitaria Pisana, Italy; 13Medicina Interna Di Fienza, Azienda Ospedaliero-Universitaria Di Bologna, Italy; 14Medicina Interna di Bologna, University of Bologna, Italy; 15Department of Surgery, Oncological, and Gastroenterological Sciences, University of Padua, Italy; 16Dept Medical and Surgical Sciences, University of Bologna, Italy; 17Gifu Kyoritsu University Department of Nursing, Japan; 18Gastroenterology Center, Ehime Prefectural Central Hospital, Matsuyama, Japan; 19Division of Gastroenterology and Hepatology, Department of Internal Medicine, Nippon Medical School, Japan; 20Osaka Medical College 2nd Department of Internal Medicine, Japan; 21Department of Gastroenterology, Saiseikai Niigata Hospital, Japan; 22Toyama University, Gastroenterology, Japan; 23Matsuyama Red-Cross Hospital Hepato-Biliary Center, Japan; 24Department of Gastroenterology and Hepatology, Osaka Municipal Hospital, Japan; 25Gunma Saiseikai Hospital National Hospital Organization Takasaki General Medical Center Department of Clinical Research, Japan; 26Hamamatsu University School of Medicine Hepatology Division, Department of Internal Medicine, Japan; 27National Hospital Organization Takasaki General Medical Center Department of Clinical Research, Japan; 28CRC “A. M. and A. Migliavacca” Center for Liver Disease, Department of Pathophysiology and Transplantation, University of Milan, Jamaica Email: massimo.iavarone@gmail.com

Background and aims: Lenvatinib (LEN) is among the drugs used in the forefront treatment of patients with advanced hepatocellular carcinoma (HCC) and in the future it could be part of therapeutic combinations with immunotherapy. However, the presence of esophagogastroduodenal varices (EGV) and the risk of bleeding might either contraindicate or limit this therapeutic choice. Thus study aimed to assess prevalence, risk factors and clinical consequences of EGV in LEN-treated patients with HCC.

Method: Among 816 patients of a large international cohort of patients treated with LEN for HCC not eligible for other therapies, we selected those with an upper-gastrointestinal endoscopy (UGE) available in the 6 months before treatment starts. Primary end points were: prevalence and risk factors for EGV bleeding during LEN treatment; secondary end points were prevalence and risk factors for presence of high risk EGV at baseline.

Results: We enrolled 535 patients with baseline UGE [median age 72 years, 78% male, 63% viral aetiology, 89% Child-Pugh A, 16% neoplastic portal vein thrombosis (nPVT), 56% BCLC-C]. At baseline, 301 (56%) patients were EGV free. Among the 234 patients with EGV (44%), 206 had esophageal varices (EV), 16 gastric varices (GV) and 12 both; 70/234 (30%) were high-risk EGV (small EV with red signs, medium/large EV, any GV) at baseline and 59 of them were treated with primary prophylaxis (non-selective beta-blockers 25, endoscopic band...
ligation 32 and both 2). Child-Pugh B (OR 2.11; 95% CI 1.18–3.77, p = 0.01), platelets <150,000 (OR 3.19; 95% CI 2.17–4.70, p = 0.001) and nPVT (OR 2.44; 95% CI 1.48–4.02, p < 0.001) independently predicted presence of EVG; while Child-Pugh B (OR 2.12; 95% CI 1.08–4.17, p = 0.03), platelets <150,000 (OR 2.47; 95% CI 1.35–4.50, p = 0.003) and nPVT (OR 2.54; 95% CI 1.40–4.61, p = 0.002) independently predicted high risk EVG. During LEN therapy, 17 patients bled from EVG (3 grade 2, 11 grade 3–4 and 3 grade 5): prevalence of EVG bleeding was 3% overall, 7% among patients with EVG and 17% among those with high-risk varices. Among the 234 patients with baseline EVG, the only independent predictor of bleeding was the presence of high-risk varices (HR 6.94; 95% CI 2.23–21.57, p = 0.001). Risk of EVG bleeding can be stratified according to Child-Pugh B, presence of nPVT and platelets <150,000/L, into low (0/3 risk factors, 6-months cumulative incidence 0.77%), intermediate (1/3 risk factors, 6-months cumulative incidence 2.31%) and high (2/3 or 3/3 risk factors, 6-months cumulative incidence 7.4%).

Conclusion: In HCC patients treated with lenvatinib, the risk of EVG bleeding is low but it increases in patients with high-risk EVG at baseline. A risk stratification for high-risk EVG and bleeding can be applied for decision-making, according to liver reserve, platelet count and nPVT.

THU-132
Risk stratification for early recurrence after resection in patients with intermediate stage hepatocellular carcinoma
Han Ah Lee1, Jeong-Ju Yoo2, Minjong Lee1, Ho Soo Chun1, Hwi Young Kim1, Tae Hun Kim1, Yeon Seok Seo3, Dong Hyun Sinn4.
1Ewha Womans University College of Medicine, Korea, Rep. of South; 2Soonchunhyang University Bucheon Hospital, Korea, Rep. of South; 3Korea University College of Medicine, Korea, Rep. of South; 4Sungkyunkwan University School of Medicine, Korea, Rep. of South.

Background and aims: It is unclear which patients will benefit from resection at intermediate stage of hepatocellular carcinoma (HCC). We aimed to identify high-risk patients for early recurrence in patients resectable for intermediate-stage HCC.

Method: This multicenter, retrospective study involved 1,686 patients who underwent resection or transarterial chemoembolization (TACE) for intermediate-stage HCC (2008–2019). Multivariable Cox proportional analysis for identifying high-risk patients treated with resection was performed. A prediction model for 2-year recurrence-free survival (RFS) was developed in the training cohort and validated in the validation cohort. 2-year RFS in each risk group was compared to those treated with TACE after propensity-score matching.

Results: During median follow-up of 31.4 months, 2-year RFS was significantly higher in the resection group (28.5%, n = 480) than in the TACE group (71.5% n = 1,206) (adjusted hazard ratio [aHR] = 1.471, 95% CI = 1.199–1.803, P = 0.001). Higher alpha-fetoprotein (aHR = 0.202), ALBI grade (aHR = 0.709), tumor number (aHR = 0.404), and maximal tumor size (aHR = 0.323) were significant risk factors for 2-year RFS in patients with resection. The newly developed Surgery Risk score in BCLC-B (SR-B score) with four variables showed an area under the curve of 0.801 for 2-year RFS and was externally validated. Based on risk stratification by the SR-B score, low-risk patients had a significantly higher 2-year RFS (training: aHR = 5.834; validation: aHR = 5.675) than high-risk patients (all P < 0.001). In a propensity-score matched cohort, low-risk patients treated with resection had a significantly higher 2-year RFS than those with TACE (aHR = 3.891); high-risk patients had a comparable 2-year RFS than those with TACE (aHR = 0.816).

Conclusion: Resection may be beneficial to resectable patients with intermediate-stage HCC based on the SR-B score.

THU-133
Impact of radiological response and pattern of progression on overall survival in patients with hepatocellular carcinoma treated by atezolizumab-bevacizumab
Claudia Campiani1,2,3, Ariane Vallot4, Haroun Ghannouchi3, Manon Allaire5,6,7, Manon Evain8, Philippe Sultanik9, Sabrina Sidali1,8, Lorraine Blaise9,10, Dominique Thabut9,10, Nathalie Ganne9,10, Mathilde Wagner4, Olivier Sutter3, Jean Charles Nault1,5,10, 1Centre de Recherche des Cordeliers, Sorbonne Université, Inserm, Université de Paris Cité, Team « Functional Genomics of Solid Tumors », Paris, France; 2Equipe labellisée Ligue Nationale Contre le Cancer, Labex OncoMunnoMedicine, Paris, France; 3Department of Experimental and Clinical Medicine, Internal Medicine and Nationale Hépatologie Unit, University of Firenze, Florence, Italy; 4Service de Radiologie AP-HP Sorbonne Université, Hôpital Universitaire Pitié Salpêtrière, Paris, France; 5Unité de Radiologie Interventionnelle, Hôpital Avicenne, Hôpitaux Universitaires Paris-Seine-Saint-Denis, Assistance-Publique Hôpitaux de Paris, Bobigny, France; 6Service d’Hépato-Gastroentérologie, AP-HP Sorbonne Université, Hôpital Universitaire Pitié Salpêtrière, Paris, France; 7Centre de Recherche des Cordeliers, INSERM, Sorbonne Université, Université de Paris, Team ProliFeration Stress and Liver Physiopathology, Paris, France; 8Assistance-Publique Hôpitaux de Paris, Hôpital Beaujon, Service d’Hépato-Gastroentérologie, DMU DIGEST, Clichy, France; 9Livr er Unité, Hôpital Avicenne, Hôpitaux Universitaires Paris-Seine-Saint-Denis, Assistance-Publique Hôpitaux de Paris, Bobigny, France; 10Unité de Formation et de Recherche Santé Médecine et Biologie Humaine, Université Paris Nord Bobigny, France; 11Sorbonne Université, INSERM, Centre de recherche Saint-Antoine (CRSA), Institute of Cardiometabolism and Nutrition (ICAN), Paris, France.

Background and aims: The combination of atezolizumab and bevacizumab (A-B) is the first-line treatment for patients with unresectable hepatocellular carcinoma (HCC). RECIST 1.1 are the validated criteria used to define the response to systemic therapy in oncology whereas mRECIST criteria have been proposed for the radiological evaluation of patients treated for HCC. Our study aims to assess the radiological response (rR) to A-B therapy using RECIST 1.1 and mRECIST criteria, to define the predictors of rR and radiological progression (rP) for each of the criteria, and the ability of these criteria and of the pattern of progression to predict overall survival (OS).

Method: HCC patients treated with A-B were retrospectively included in two centers between July 2020 and October 2022. A retrospective blinded central analysis was performed using contrast-enhanced liver imaging at 12w after the start of treatment by two radiologists in order to assess RECIST1.1 and mRECIST response. Inter-reader agreement was analyzed using weighted k statistics and logistic regression was used to assess predictors of rR and rP. The association between the variables at the start of A-B treatment, rR, and OS were modelled in univariate and multivariate analysis using the Cox model. Differences in survival between the different categories of rR and according progression pattern were assessed using Kaplan-Meier curves and the log-rank test.

Results: A total of 125 patients were included, median age was 65y and 78% were male. Etiology included hepatitis B (23.2%) and C (39.2%), excessive alcohol consumption (35.2%) and/or NAFLD (25.6%). Cirrhosis was present in 73.6% of the patients including 80.4% Child-Pugh A; 69.6% of the patients were classified as BCLC C. The median OS of the population was 12.4 months (95%CI:9.43–15.37). At the first imaging assessment, according to RECIST 1.1 and mRECIST, 13.6% and 20.8% had response, 39.2% and 35.2% stable disease and 47.2% and 44% progression respectively. Interobserver agreement with weighted k values was substantial with both criteria (0.789 for RECIST 1.1 and 0.790 for mRECIST, p < 0.001). The presence of extrahepatic metastases (HR:4.22, C95%:1.90–9.32, p < 0.001) was independently associated with a higher risk of rP in RECIST 1.1 in multivariate analysis. No significant predictors of response or
Background and aims: No randomized controlled trial evidence exists to support use of systemic therapy in patients with hepatocellular carcinoma (HCC) in the setting of liver dysfunction. Although selected patients with Child-Pugh (CP) B cirrhosis can likely be safely treated with immunotherapy, whether systemic anti-cancer therapy (SACT) improves survival in this population is unclear. In this retrospective study, we described outcomes of CP-B patients treated with either sorafenib (Sor), nivolumab (Nivo) or atezolizumab plus bevacizumab (A+B) and compared them to best supportive care (BSC) in a propensity score weighted (PSW) analysis.

Method: From two international consortia, we selected CP-B patients receiving A+B (n = 72), Nivo (n = 46) or Sor (n = 114) as first-line systemic therapy for advanced HCC between 2010 and 2022 and compared outcomes to a cohort of 159 patients receiving BSC in the same timeframe. SACT exposure was evaluated in relationship to OS using propensity score weighted (PSW) multivariate regression models.

Results: In the unmatched population (n = 392), the 233 patients receiving active treatment for HCC had a longer mOS compared to the 159 receiving BSC (6.5 vs. 5.5 months, p = 0.011). Following PS matching for Barcelona Clinic Liver Cancer (BCLC) stage (A/B vs C), alpha-fetoprotein (AFP) (>400 vs ≤400 ng/ml), CP score (7/8 vs 9) and presence of main portal vein tumor thrombosis (PVTT), 114 couples were left, and receipt of SACT remained associated with improved mOS (7.7 vs 5.8 months, p < 0.001). PSW univariate regression analyses demonstrated a significant reduction in the risk of death in patients exposed to A+B (HR: 0.6, 95%CI: 0.4–0.8); Nivo (HR: 0.5, 95%CI: 0.4–0.8) and Sor (HR: 0.6, 95%CI: 0.5–0.9, p = 0.001). Better OS was observed in patients exposed to A+B (HR: 0.6, 95%CI: 0.4–0.8), Nivo (HR: 0.4, 95%CI: 0.3–0.7) and Sor (HR: 0.7, 95%CI: 0.6–0.9, p < 0.001) following adjustment for unbalanced prognostic traits in PSW-multivariate models. Significantly inferior survival was observed in patients with AFP >400 ng/ml (HR: 1.9, 95%CI: 1.5–2.5), CP score of 9 (HR: 1.7, 95%CI: 1.2–2.4) and in the presence of PVTT (HR: 1.8, 95%CI: 1.4–2.4).

In the SACT-exposed group, incidence of treatment-related adverse events (tRAEs) of all grades was 59%, tRAEs rates were higher in A+B (69%) and Sor (67.5%) than Nivo (43.2%, p < 0.001).
Background and aims: There is scant literature on Budd-Chiari syndrome (BCS) in Hepatocellular carcinoma (HCC). Radiological interventions play an important role in the management of BCS and HCC. The feasibility and outcomes of interventions for the management of BCS and HCC in primary BCS-HCC are unclear. We aimed to assess the clinical presentations and outcomes of patients with primary BCS-HCC.

Method: All consecutive patients diagnosed with primary BCS-HCC evaluated between January 1987 and January 2023 were included in this retrospective analysis of a prospectively maintained database. The diagnosis was based on either imaging/liver biopsy with elevated alpha-fetoprotein (AFP). As a protocol, BCS was managed first with endovascular intervention followed by HCC therapy.

Results: Overall, 35/904 (3.8%) BCS patients evaluated had primary BCS-HCC. BCS-HCC patients, when compared to patients with BCS alone, were older (mean age: 32 vs 26 years, P = 0.001), with higher proportion of IVC block, cirrhosis and long-segment vascular obstruction. 18 had HCC at first presentation [prevalence 18/904 (1.99%) and 17 developed HCC (among 886) over a follow-up of 4601 person-years with an incidence of 0.36 (0.22–0.57) per 100 person-years. The median AFP levels in BCS-HCC group was 1310 ng/ml, with higher levels in patients with BCS-HCC at first presentation, compared to those who developed HCC at follow-up (1302 vs 500 ng/ml, P = 0.01). The BCLC presentation included A: 5 (14.28%), B: 17 (60.71%), C: 9 (25.71%) and D: 4 (11.4%). Of the 35 BCS-HCC, 26 (74.3%) underwent radiological interventions for BCS and 22 (62.8%) patients underwent treatment for HCC. Thirteen (37.1%) BCS-HCC patients were not treated for HCC: 7 (53.8%) in group at first presentation and 6 (46.2%) in the BCS-follow-up group. The interventions for HCC included transarterial chemoembolization in 18 (81.8%), oral TKI in 3 (13.6%) and TARE in 1 (4.5%) patient. The response at 1 month based on m-RECIST criteria was available in 15/22 (68.2%). Of these 15, 5/15 (33.3%) showed complete response, 6/15 (40.0%) showed partial response, 4/15 (26.7%) had progressive disease. One patient died within 1 month of TACE. The median number of interventions for HCC were 1 (range, 1–5). The median survival among patients who did not undergo interventions for HCC, compared with those who did, was 3.5 years vs 3.1 months (p = 0.0001) (figure a). The median survival among those who underwent intervention as per BCLC stages A, B, C, D was 172 days, 1352 days, 240 days and 40 days, respectively (figure b).

Conclusion: Hepatocellular carcinoma is not uncommon in patients with BCS. Radiological interventions are feasible in select primary BCS-HCC patients and may improve outcomes.
Background and aims: There are scarce data in the literature about liver resection of hepatocellular carcinoma (HCC) in non-cirrhotic patients. 

Method: One hundred and forty-one non-cirrhotic patients with HCC diagnosed by histology were included in a Spanish multicenter prospective registry (23 centers, May 2018-October 2022). Surgical resection was performed in 90 patients (63.8%). Liver cirrhosis was excluded by histology. We analyzed the baseline characteristics, evolution and prognostic factors.

Results: Median age was 70.4 (range: 31–86) years. Eighty-three percent were male, 25.6% had other cancers, 2.2% had family history of HCC, 56.7% hypertension and 35.6% diabetes. Toxic habits: non-smoker 27.8%, non-alcohol 52.2%. Etiological study showed hepatopathy in 80%: NASH ± alcohol 26.7%, viral infection ± alcohol 25.5% (HCV 17.7%, HBV 7.8%), alcohol 14.6%, other 8.8% and unknown etiology 4.4%. Twenty percent had no underlying liver disease. Fibrosis stage was mild fibrosis (0–1) in 57.8%, stage 2 in 20%, 3 in 18.9% and unknown in 3.3%. aMAP score had 14.4% in the low-risk group. In 23.3% the diagnosis was made by follow-up ultrasonography, 56.7% the diagnosis was casual and 20% by symptoms. A single nodule was detected in 63.5% respectively. Deaths: 23.3% (71.4% due to liver related causes). The global 1-, 2-, 3- and 4-years survival rate was 95.5%, 84%, 77% and 63.5% respectively. 

Surgical piece had: microvascular invasion 25.3%, satellitosis 7.7% and capsule 36.3%. Tumor differentiation: well 29%, moderate 61.1%, poor 4.4%, undifferentiated 1.1%, other histologic variants 4.4%. There were some complications in 15 patients (16.7%): 10 mild and 5 severe, with only 2 cases of perioperative mortality (2.2%). Median follow-up was 3.6 (range: 0.9–24868) ng/ml (21.1% >20 ng/ml). ECOG 0: 88.9%. The Barcelona Clinic Liver Cancer (BCLC) staging was 0 in 7.8%, A in 80%, B in 10%, C in 2.2%. Resection was anatomical in 85.7% (39.6% laparoscopy/46.1% laparotomy) and non-anatomical in 14.3% (1.1% laparoscopy/13.2% laparotomy), with Pringle maneuver in 46.2%. Surgical piece had: microvascular invasion 25.3%, satellitosis 7.7% and capsule 36.3%. Tumor differentiation: well 29%, moderate 61.1%, poor 4.4%, undifferentiated 11%, other histologic variants 4.4%. There were some complications in 15 patients (16.7%): 10 mild and 5 severe, with only 2 cases of perioperative mortality (2.2%). Median follow-up was 31 (range: 2–53) months. Recurrence was 15% at 1 year, 31% at 2 years, 35% at 3 years. AFP > 20 ng/ml was a predictor of relapse. Twenty nine percent received sequential therapy: 6.7% surgery, 2.2% TACE, 13.4% systemic therapy, 2.2% ablation, 4.4% other (1 liver transplantation). The global 1-, 2-, 3- and 4-years survival rate was 95.5%, 94%, 77% and 63.5% respectively. Deaths: 23.3% (71.4% due to liver related causes). BCLC staging, differentiation degree and microvascular invasion were predictors of survival.

Conclusion: This multicenter prospective study showed that surgical resection of non-cirrhotic HCC is an adequate therapeutic approach, with favorable results even in extensive tumors. Less than a third of patients received subsequent therapies. Perioperative morbidity and mortality were low.

THU-138 Atezolizumab plus bevacizumab for patients with unresectable hepatocellular carcinoma and high hepatitis B viral load: focusing on hepatic safety and viral kinetics


Email: sunkist.chen37@gmail.com

Background and aims: The safety of immune checkpoint inhibitor therapy for hepatitis B (HBV)-related unresectable hepatocellular carcinoma (uHCC) with high viral load was not clear. This study, sponsored by Taiwan Cooperative Oncology Group (ClinicalTrials.gov: NCT04180072), aimed to clarify the liver-related adverse events (AEs). The most common AEs was proteinuria (14.8%). The rate of grade 3 or higher AE is higher in high risk population (24.5% vs. 11.3%).

Conclusion: ATE+BEV treatment showed consistent efficacy and tolerable safety event including patients with the high risk advanced HCC and Child-Pugh class B. Furthermore, radiation therapy could improve the PFS and OS in the high risk patients.

THU-137 Real-world experience of atezolizumab plus bevacizumab combination treatment in high risk patients with advanced hepatocellular carcinoma

Sangyoun Hwang1, Hyun Young Woo2, Jeong Heo2, Hyung Jun Kim1, Byoung Kuk Jang4, Woo Jin Chung4, Won Young Tak3.

Email: m.romero.gutierrez@gmail.com

Background and aims: Atezolizumab plus bevacizumab was achieved as the first line therapy for patients with advanced Hepatocellular carcinoma through phase 3 clinical trial. However, real world data is lacking in patients who showed poor response to this combination regimen such as high risk patients.

Method: This is a multicenter retrospective study. Between January 2020 to April 2022, 215 patients treated for advanced HCC with atezolizumab plus bevacizumab (ATE+BEV) from four tertiary hospital was analyzed. High risk patients was defined as patients with Vp4 portal vein thrombus, bile duct infiltration, or liver infiltration >50%. Tumor response was evaluated with the Response Evaluation Criteria in Solid Tumors (version 1.1).

Results: Out of 215, 98 (45.6%) was high risk population. Child-Pugh class was A in 186 (86.5%) and B in 29 (13.5%). 128 (59.5%) received neoadjuvant or concomitant radiation treatment. In overall population, objective response rate (ORR) was 21.8% and disease control rate (DCR) was 73.9%. The median progression free survival (PFS) was 8.68 months (95% CI, 7.26–10.10) and median overall survival (OS) was 11.25 months (95% CI, 9.50–13.00). In high risk population, ORR and DCR were 23.5% and 67.3%. The median PFS was 7.32 months (95% CI, 4.78–9.87) and median OS was 10 months (95% CI, 8.19–11.82). Only OS was significantly shorter in high risk population. In total population, neutrophil to lymphocyte (NLR) was common factor associated with both PFS and OS in multivariate analysis. In high risk population, preemptive or concomitant radiation therapy was common factor associated with better PFS and OS in multivariate analysis. Baseline Child-Pugh score was only associated with OS. A total of 92 (42.8%) patients experienced any grade of adverse events (AEs). The most common AEs was proteinuria (14.8%). The rate of grade 3 or higher AE is higher in high risk population (24.5% vs. 11.3%).

Conclusion: ATE+BEV treatment showed effective and tolerable safety event including patients with the high risk advanced HCC and Child-Pugh class B. Furthermore, radiation therapy could improve the PFS and OS in the high risk patients.
<25 IU/ml). The median time to VR was 2.1 months and was not correlated with baseline viral load. No HBV seroconversion occurred. All-grade liver AE occurred to 13 patients and 6 of them considered immune-related (grade 3; patient; grade 1–2, 5 patients). This grade 3 liver immune-related AE (hepatitis), along with grade 4 Stevens-Johnson syndrome, occurred after 2 cycles of atezo + bev therapy, and resolved after methylprednisolone treatment. No patients experienced HBV reactivation. Five partial responses and 15 stable diseases according to RECIST 1.1 were documented among 28 evaluable patients. One additional patient with documented partial response, after initial progressive disease, that lasted for about 8 months. As of December 31, 2022 (median follow-up 8.21 months, range 1.90–30.03), the median progression-free and overall survival was 6.28 months (95% CI 3.75–8.34) and 19.70 months (95% CI 7.79–NR).

Conclusion: Atezo + bev was generally safe and efficacious in uHCC 

Figure:

Conclusion: This retrospective study suggests that RT should be avoided in patients with a HTP score >6 to prevent ascites occurrence that could preclude access to further HCC treatments.

THU-140
Outcomes between surgical resection and transarterial chemoembolization in patients with multifocal BCLC-A and Child-Pugh B

Ji won Yang1, Won-Mook Choi1, Danbi Lee1, Ju Hyun Shim1, Kang Mo Kim1, Young-Suk Lim1, Han Chu Lee1, Jonggi Choi1,2. Liver Center, Asan Medical Center, University of Ulsan College of Medicine, Gastroenterology, Korea, Rep. of South

Background and aims: Radiotherapy (RT) appears as a new treatment in the hepatocellular carcinoma (HCC) therapeutic arsenal but can expose to radiation induced liver disease that includes ascites occurrence. We aimed (i) to study the impact of PHT on RT outcome and (ii) to identify predictive factors of ascites occurrence as this could preclude the access to further HCC treatment.

Method: We conducted a retrospective monocentric study in which all cirrhotic patients who received either stereotactic ablative body radiation therapy (SABR) or conventionally fractionated radiotherapy (CFRT) for HCC between 2012 and 2022 were included. PHT was assessed on upper endoscopy and on imaging using the Portal hypertension score (PHT Score) based on the presence on imaging of ascites (0–3), varices (0–3), and spleen size (0–3). Threshold of 6 was chosen according AUROC analyze. Time-to-events data were estimated by Kaplan-Meier method with log-rank test, along with Cox models.

Results: 60 patients were included (female 27%, median age 49 yrs, Child-Pugh class A 82%, cause of liver diseases alcohol/metabolic syndrome/hepatitis C in 56/40/32%). 40% and 15% presented history of ascites and acute variceal bleeding (AVB) respectively, 26% had large size esophageal varices (EV), median HTP score was 4 and 19% presented a HTP score ≥6. All patients underwent appropriate prophylaxis for AVB when indicated (1 TIPS and 9 NSBB). 92% were BCLC-0/A, median tumor size was 30 mm. An infiltrative form and vascular invasion were present in 2% and 3% respectively. SABR was performed in 39 (48Gy/9 fractions) and CFTR in 21 patients (54Gy/29 fractions).

The maximal PTV1 EQD2 (a/b = 10) and PTV1 volumes were 124Gy and 103cc (SABR) and 64Gy (p < 0.001) and 173cc (p = 0.91) (CFTR). Median EQD2 to uninvolved liver (a/b = 3) were 11Gy and 13Gy (p = 0.41) in the SABR and CFTR group respectively. Overall survival (OS) was 75%, 50% and recurrence free survival 54%, 22% at 1 and 3 years after RT, respectively. At six months, progressive disease according to RECIST1.1 was more frequent in patients treated by CFTR vs SABR (18% vs 7%, p < 0.001). In univariate but not in multivariate analysis, SABR (HR = 2.65, p = 0.03), albumin (HR = 1.00, p = 0.05), maximal PTV1 EQD2 (a/b = 10) (HR = 1.02, p = 0.01) and PTV1 volume (HR = 0.99, p = 0.04) were associated with mortality. In log rank analysis, HTP score ≥6 was associated with lower survival (p = 0.07). EV and platelets were not associated with OS in univariate analysis. OS was lower in SABR patients compared to CFTR (p = 0.03) and no specific predictor of mortality was identified in Cox analysis. HTP score was similar between both group (p = 0.68). Compared to CFTR patients, SABR patients were significantly older (median age: 73 vs 49 yrs, p < 0.001) with more metabolic disease (51% vs 19%, p = 0.02). Ascites incidence after RT was 24%, 34%, and 38% at 6, 12, and 24 months, respectively. In univariate analysis, platelets count (HR = 1, p = 0.08), history of AVB (HR = 2.58, p = 0.09) and SABR tended (HR = 2.59, p = 0.09) to be associated with ascites but the only significant predictive factor was a HTP score ≥6 (HR = 4.25, p = 0.007) and this result was confirmed in log rank analysis (p = 0.003).

Presence of large size EV was not associated with ascites occurrence (p = 0.12). Among 14 patients who developed ascites, 11 were treated with NSBBs.

Background and aims: 2022 version of the Barcelona Clinic Liver Cancer (BCLC) system does not recommend resection for multinodular hepatocellular carcinoma (HCC) within Milan criteria. Thus, transarterial chemoembolization (TACE) is regarded the preferred treatment option. In addition, no specific recommendation exists regarding patients with Child-Pugh (CP) class B and this multifocal BCLC stage A of HCC. Therefore, we aimed to compare the outcomes between surgical resection and TACE in patients with multinodular HCC and CP class B.

Method: We retrospectively analyzed 487 patients with multinodular treatment-naive HCC within Milan criteria and CP class B who received either resection or TACE as an initial therapy at Asan Medical Center, Seoul, the Republic of Korea between 2013 and 2022. Overall survival (OS) was estimated using Kaplan-Meier method and comparison of the OS between resection and TACE was conducted by log-rank test. Propensity-score (PS) matching analysis was also used to identify factors associated with a worse prognosis. Median follow-up period was 5.3 years.

Results: The median age was 68 years, and 85.0% of the patients were men. 72.5% of the patients had two lesions of HCC and the median size of the largest tumor was 2.0 cm. The 3-, 5-year survival rates were 96.2% and 90.0% in the resection group and 82.2% and 68.3% in the TACE group, respectively. Median OS was significantly longer in the resection group than the TACE group (p < 0.01). In multivariate analysis, OS was associated with factors such as Child-Pugh class (CP) B vs A (HR = 2.65, p = 0.03), performance status (PS) ≥2 vs ≤1 (HR = 1.74, p = 0.04), and tumor size ≥5 cm (HR = 1.78, p = 0.03). In the resection group, OS was better for Child-Pugh class A vs B (HR = 2.65, p = 0.03) and tumor size <3 cm (HR = 1.78, p = 0.03). In the TACE group, OS was better for Child-Pugh class A vs B (HR = 2.65, p = 0.03) and tumor size <3 cm (HR = 1.78, p = 0.03). In both groups, OS was better for patients with low tumor burden (HR = 1.78, p = 0.03) and low tumor grade (HR = 1.78, p = 0.03).

Conclusion: This retrospective study suggests that RT should be avoided in patients with a HTP score >6 to prevent ascites occurrence that could preclude access to further HCC treatments.
analysis, TACE (hazard ratio [HR]: 1.91, 95% confidence intervals [CIs]: 1.12–3.26, p = 0.02), age (HR: 1.05, 95% CIs: 1.03–1.07, p < 0.01), and tumor size (HR: 1.41, 95% CIs: 1.08–1.83, p = 0.01) were associated with a worse prognosis. PS matched analysis also demonstrated that the resection group had a significantly longer OS than the TACE group (p = 0.036).

**Conclusion:** In the present study, surgical resection showed a better OS than TACE in patients with multinodular HCC (within Milan criteria) and CP class B. Surgical resection can be considered as an effective treatment option in this category of patients.

**THU-141**
Downstaging hepatocellular carcinoma with checkpoint inhibitor therapy safely improves access to curative liver transplantation: a case series
Margaret Liu1, Blanca Lizaola-Mayo1, Channa Jayasekera1, Amit Mathur2, Nitin Katariya2, Bashar Aqel1, David Chascsa1. Mayo Clinic Arizona, Gastroenterology and Hepatology, Scottsdale, United States; Mayo Clinic Arizona, Transplant Surgery, United States
Email: liu.margaret@mayo.edu

**Background and aims:** Hepatocellular carcinoma (HCC) is the third most common cause of malignancy related mortality globally. Checkpoint inhibitor therapy (CIT) has traditionally been used as a treatment modality in unresectable HCC, but recent advances have demonstrated the possibility of CIT as an innovative method of downstaging patients with advanced HCC with the caveat that CIT prior to transplantation has recognized risks including potentially irreversible graft rejection. The aim of this case series is to report the outcomes of patients at our center who received CIT in an attempt to shrink the tumor volume to within Milan criteria to allow candidacy for liver transplantation. All patients were approved and listed for liver transplantation; 3 patients ultimately received a transplant, 1 was delisted due to his exceptional response to therapy and preserved quality of life, and 1 was waitlisted. The etiologies of liver disease included alcohol (n = 1), non-alcoholic steatohepatitis (n = 2), hepatitis C (n = 2), and primary sclerosing cholangitis (n = 1). The average native MELD prior to listing was 13.4 (SD 10.5) with a range of 7–32. All patients received locoregional therapy, including bland or chemoembolization (40%), Y-90 (60%), and/or ablation (60%). Maximum AFP pre-transplant pre-CIT ranged from 8 to 24 000 ng/ml, which decreased to 5.8–19.6 on CIT. In addition to CIT, 2 patients received sorafenib and 1 patient received lenvatinib. CIT regimens included atezolizumab and bevacizumab (60%), ipilimumab and nivolumab (20%), and pembrolizumab (20%). The median length of time CIT was held prior to transplant was 3 months, with a range of 2–10 months. Immunosuppression regimens were standard to our center except in 1 patient who received thymoglobulin for induction. There were no cases of rejection upon most recent follow-up, which ranged from 4 months to 2 years post-transplant.

**Conclusion:** The 5 cases at our center thus far have shown promising outcomes with CIT as a downstaging tool in order to meet criteria for liver transplantation. The 3 cases who ultimately received a liver transplant demonstrated no evidence of rejection or recurrence up to 2 years post-transplant. Future studies are needed to further assess the outcomes of a larger sample size as well as evaluate areas of interest, such as optimal timing of CIT discontinuation prior to transplant and to assess whether novel tumor biomarkers may provide insight into which patients will respond to this intervention.
Clinical outcomes of surgical resection vs yttrium 90 radioembolization (Y90) in hepatocellular carcinoma (HCC) patients with macrovascular invasion (MVI)

Zhaozhen Zou1, Brian Goh2, Peng Chung Cheow2, Alexander Chung2, London Lucien Ooi2, David Chee Eng Ng3, Richard Hoau Gong Lo4, Karaddi Venkatanarasimha Nanda Kumar4, Apoorva Gogna4, Chow Wei Too4, Farah Irani4, Sean Xuexian Yan3, Kelvin Siu Hoong Loke5, Sue Ping Thang3, Aaron Kian Ti Tong3, Hian Liang Huang3, Kaina Chen5, Fiona Ni Ni Moe6, Weng Yan Ng6, Siou Sze Chua6, Jade Shu Qi Goh6, Pierce Chow1,2.

1Duke-NUS Medical School, Singapore; 2Singapore General Hospital, Department of Hepatopancreatobiliary and Transplantation Surgery, Singapore; 3Singapore General Hospital, Department of Nuclear Medicine and Molecular Imaging, Singapore; 4Singapore General Hospital, Department of Vascular and Interventional Radiology, Singapore; 5Singapore General Hospital, Department of Gastroenterology, Singapore; 6National Cancer Centre Singapore, Singapore

Email: pierce.chow@duke-nus.edu.sg

Background and aims: Hepatocellular carcinoma (HCC) patients with macrovascular invasion (MVI) have poorer prognosis, and are more challenging to treat due to the increased likelihood of tumour progression and metastasis. The best treatment method for these patients remain unproven and controversial. In this study, we compared the overall survival (OS) and progression free survival (PFS) of HCC patients with MVI treated with surgical resection or with Y90 radioembolization.

Method: The retrospective study included non-metastatic HCC patients with MVI who underwent Y90 radiotherapy or surgical resection at the National Cancer Centre Singapore and Singapore General Hospital between January 2000 and May 2019. The patients were stratified based on the degree of portal vein thrombosis (according to Cheng’s classification) and compared using inverse probability of treatment weighting (IPTW) -adjusted Kaplan-Meier analysis.

Results: A total of 209 patients were included, with 68 patients undergoing surgical resection and 141 undergoing Y90. After IPTW, the population was well balanced. The OS and PFS of resection patients and Y90 patients were similar (OS: 15.686 vs 14.93, p = 0.343, PFS: 5.907 vs 3.38, p = 0.132). Length of hospital stay for Y90 patients was significantly shorter than the resection group (3.94 ± 1.27 vs 13.12 ± 11.55 days, p = 0.003). For type I PVTT patients, the IPTW-adjusted Kaplan Meier analysis showed significantly better OS for the Y90 group than the surgical resection group (p = 0.046), but PFS did not differ significantly between the two groups (p = 0.248). For type II PVTT, there was no significant difference between the two groups in either OS (p = 0.243) or PFS (p = 0.193).

Table: (abstract: THU-141): Patient demographics, treatment regimens, and outcomes.
Conclusion: Compared with surgical resection, Y90 radiotherapy is associated with shorter hospital stay and significantly prolonged overall survival in HCC patients with PVTT and better OS in patients with Type I PVTT.

THU-143
Survival outcomes from Atezolizumab plus Bevacizumab versus Lenvatinib versus Sorafenib in Child Pugh B unresectable hepatocellular carcinoma patients

Margherita Rimini1, Mara Persano2, Toshifumi Tada3, Goki Suda4, Shimose Shigeo5, Masatoshi Kudo6, JaeKyung Cheon7, Fabian Finkelmeier8, Ho Yeong Lim9, José Presa10, Sara Lonardi11, Fabio Piscaglia12, Hong Jae Chon13, Gianluca Masi12, Mario Scartozzi2, Stefano Cascinu1, Andrea Casadei-Gardini1. 1Vita-Salute San Raffaele University, Italy; 2University of Cagliari, Italy; 3Japanese Red Cross Himeji Hospital, Japan; 4Graduate School of Medicine, Japan; 5Veneto Institute of Oncology IOV-IRCCS, Italy; 6IRCCS Azienda Ospedaliero-Universitaria di Bologna, Italy; 7University Hospital of Pisa, Italy

Email: margherita.rimini@gmail.com

Background and aims: The best first line treatment for patients with advanced hepatocellular carcinoma (HCC) and Child-Pugh (CP) class B remains unknown. The aim of the present study was to perform a real-world analysis on a large sample of patients with unresectable HCC with CP B treated with atezolizumab plus bevacizumab vs Lenvatinib.

Method: The study population included patients affected by advanced hepatocellular carcinoma (HCC) and Child-Pugh (CP) class B remains unknown. The aim of the present study was to perform a real-world analysis on a large sample of patients with unresectable HCC with CP B treated with atezolizumab plus bevacizumab vs Lenvatinib.

Results: 217 CP B HCC patients were enrolled in the study: 65 (30%) received atezolizumab plus bevacizumab, and 152 (70%) received lenvatinib. The mOS for patients receiving Lenvatinib was 13.8 months (95% CI: 11.6–16.0), compared to 8.2 months (95% CI: 6.3–10.2) for patients receiving atezolizumab plus bevacizumab as first line treatment (atezolizumab plus bevacizumab vs Lenvatinib: HR 1.9, 95% CI 1.2–3.0, p = 0.0050). No statistically significant differences were highlighted in terms of mPFS. The multivariate analysis confirmed that patients receiving Lenvatinib as first line treatment has a significantly longer OS compared to patients receiving atezolizumab plus bevacizumab (HR 2.01; 95% CI 1.29–3.25, p = 0.0023). By evaluating the cohort of patients who received atezolizumab plus bevacizumab, we found that Child B patients with ECOG PS 0, or BCLC B stage or ALBI grade 1 were those who had benefit from the treatment thus showing survival outcomes no significantly different compared to those receiving Lenvatinib.

THU-144
Balancing efficacy and tolerability of first-line systemic therapies for advanced hepatocellular carcinoma: a network meta-analysis

Ciro Celsa1, Giuseppe Cabibbo1, Gabriele Di Maria1, Marco Vaccaro2, Salvatore Battaglia3, Giacomo Emanuele Maria Rizzo2, Roberta Ciccia1, Alessandro Grova1, Mauro Salvato1, Paolo Giuffrida1, Marco Giacchetto1, Gabriele Rancatore1, Maria Vittoria Grassini1, Michela Antonucci1, Piera Morana1, Marco Enea1, Calogero Camma1. 1University of Palermo, Section of Gastroenterology and Hepatology, PROMISE Department, Italy; 2University of Palermo, Dipartimento di Scienze Economiche, Aziendali e Statistiche, Italy; 3University of Palermo, Department of Biomedicine, Neurosciences and Advanced Diagnostics (BIND), Italy

Email: celsacro@gmail.com

Background and aims: Atezolizumab plus Bevacizumab represents the current standard of care for first-line treatment of advanced HCC. However, direct comparison with other combination treatments including immune-checkpoint inhibitors (ICI) plus tyrosine-kinase inhibitors (TKIs) or anti-CTLA4 are lacking. The aim of this network meta-analysis (NMA) is to indirectly compare the efficacy and the safety of first-line systemic treatments.

Method: Literature search of MEDLINE, EMBASE and SCOPUS databases was conducted up to October, 2022. Phase 3 randomized controlled trials (RCTs) testing TKIs, including Sorafenib and Lenvatinib, or ICIs reporting overall survival (OS) and progression-free survival (PFS) were included. Individual survival data were extracted from OS and PFS curves to calculate restricted mean survival time (RMST). A Bayesian NMA was performed to compare treatments in terms of efficacy (15- and 30-month OS, 6-month PFS)
and safety, represented by grade ≥ 3 (severe) adverse events (SAEs). The incremental safety-effectiveness ratio (ISER) as measure of net health benefit was calculated as the difference in probability of SAEs divided by difference in survival between the 2 most effective treatments.

**Results:** Nine RCTs enrolling 6600 patients were included. Atezolizumab+bevacizumab showed the highest probability (88%) of being the best in 30-month OS. Pembrolizumab+lenvatinib and Lenvatinib showed the highest probability (93% and 86%, respectively) of being the best in terms of PFS. SCI monotherapies were the most safe combination. At a willingness-to-risk threshold of 10% of SAEs for month-year gained, pembrolizumab+lenvatinib was favored in 72% of cases, while at a threshold of 30% of SAEs for month-year gained, pembrolizumab+lenvatinib was favored in 72% of cases.

**Conclusion:** Atezolizumab plus Bevacizumab is the preferred option in unfit patients with high tumor burden, while Lenvatinib with or without Pembrolizumab could be preferred for fit patients with less advanced vascular tumor spread

**THU-145 Sequential therapies after atezolizumab plus bevacizumab or lenvatinib first-line treatments**

Mara Persano¹, Margherita Rimini², Toshifumi Kudo³, Goki Suda⁴, Shimose Shigeo⁵, Masatoshi Kudo⁶, Jaekyung Cheon⁷, Fabian Finkelmeier⁸, José Presa⁹, Gianluca Masi¹⁰, Claudio Granda¹¹, Sara Lonardi¹², Fabio Piscaglia¹³, Massimo Lavarene¹⁴, Giuseppe Di Costanzo¹⁵, Fabio Marra¹⁶, Giuseppe Cabibbo¹⁷, Francesco Finkelmeier¹⁸, Mariana Siletta¹⁹, Stefano Cuscinu²⁰, Mario Scartozi²¹, Andrea Casadei Gardini²², Medical Oncology, University Hospital of Cagliari, Cagliari, Italy; ²²Department of Oncology, Vita-Salute San Raffaele University, IRCCS San Raffaele Scientific Institute Hospital, Milan, Italy; ²²Department of Internal Medicine, Japanese Red Cross Himeji Hospital, Himeji, Japan; ²²Department of Gastroenterology and Hepatology, Graduate School of Medicine, Hokkaido University; ²²North 15, West 7, Kita-ku, Sapporo, Hokkaido 060-8638, Japan; ²²Division of Gastroenterology, Department of Internal Medicine, Kurume University School of Medicine, Kurume, Fukuoka 830-0011, Japan; ²²Department of Gastroenterology and Hepatology, Kindai University Faculty of Medicine, Higashi-osaka, Japan; ²²Department of Medical Oncology, CHA Bundang Medical Center, CHA University School of Medicine, Seongnam, Korea, Rep. of South; ²²Department of Internal Medicine 1, University Hospital Frankfurt, Goethe University, Frankfurt am Main, Germany; ²²Liver Unit-CHTMAD, Vila Real, Portugal; ²²Unit of Medical Oncology 2, University Hospital of Pisa, Pisa, Italy; ²²Department of Oncology, ASAN Medical Center, University of Ulsan College of Medicine, 88, Olympic-ro 43-gil, Songpa-gu, Seoul 05505, Korea, Rep. of South; ²²Oncology Unit 1, Veneto Institute of Oncology IOV-IRCCS, Padua, Italy; ²²Division of Internal Medicine, Hepatobiliary and Immunoallergic diseases, IRCCS Azienda Ospedaliero-Universitaria di Bologna, via Albertoni 15 Bologna, Italy; ²²Division of Gastroenterology and Hepatology, Fondazione IRCCS Ca’ Granda Ospedale Maggiore Policlinico di Milano, Milan, Italy; ²²Department of Hepatology, Naples, 80131, Italy; ²²Dipartimento di Medicina Sperimentale e Clinica, Università di Firenze, Firenze, Italy; ²²Section of Gastroenterology and Hepatology, Department of Health Promotion, Mother and Child Care, Internal Medicine and Medical Specialties, PROMISE, University of Palermo, 90127 Palermo, Italy; ²²Department of Internal Medicine, Ospedale per gli Infermi di Faenza, Faenza, Italy; ²²Division of Medical Oncology, Policlinico Universitario Campus Bio-Medico, Rome, Italy

Email: marapersano@alice.it

**Background and aims:** Today the most used first-line treatments in hepatocellular carcinoma (HCC) patients are lenvatinib (L) and atezolizumab plus bevacizumab (AB). All the data available about second-line therapies derive from trials conducted in patients who progressed to first-line sorafenib (S) therapy. The aim of this retrospective proof-of-concept study is to compare different second-line drugs for HCC patients progressed to first-line L or AB.

**Method:** The overall cohort included 2225 consecutive patients from 5 countries (Italy, Germany, Portugal, Japan, and Republic of Korea). A total of 1381 patients had progressed disease (PD) at first-line therapy. 917 patients were in L first-line arm, and 464 patients were in AB first-line arm.

**Results:** 49.6% of PD patients received second-line therapy without any statistical difference in OS between L first-line arm (20.6 months) and AB first-line arm [15.7 months; p = 0.12; hazard ratio (HR) = 0.80]. In L first-line arm, there was a statistical difference between second-line therapy subgroups [p = 0.04; S HR = 1; trans-arterial chemoembolization (TACE) HR = 0.65; immunotherapy (I) HR = 0.69; other therapies (O) HR = 0.85]. 40.1% of patients were treated with S achieving an OS of 15.8 months; 36.8% of patients underwent TACE with an OS of 24.7 months; 13.1% of patients were treated with I not reaching a median OS; 10.0% of patients received O with an OS of 20.8 months. Patients who underwent TACE had a significative longer OS than patients who received S (p < 0.01; HR = 0.64). In AB first-line arm, there was a statistical difference between second-line therapy subgroups [p < 0.01; S HR = 1; L HR = 0.50; cabozantinib (C) HR = 1.34; TACE HR = 0.39; O HR = 0.54]. 18.4% of patients were treated with S achieving an OS of 14.2 months; 36.0% of patients were treated with L achieving an OS of 15.8 months; 9.9% of patients received C achieving an OS of 12.4 months; 11.6% of patients underwent TACE with an OS of 15.9 months. Patients who received L had a significative longer OS than patients treated with S (p = 0.01; HR = 0.45). Patients who underwent TACE had a significative longer OS than patients who received S (p < 0.05;
Koo Jeong Kang1.  

S594 Journal of Hepatology

Keimyung University Dong-San Hospital, Surgery, Daegu, Korea, Rep. of South

radical surgical resection achieve longer survivals than second-line S in both first-line arms.

Figure:

Conclusion: The L-I and AB-L sequences are able to achieve the longest median survivals. For patients eligible for locoregional therapy after first-line systemic therapy, TACE has been shown to achieve longer survivals than second-line S in both first-line arms.

THU-146

Prognostic factors of intrahepatic cholangiocarcinoma after radical surgical resection

Keun Soo Ahn1, Yong Hoon Kim1, Tae-Seok Kim1, Koo Jeong Kang1.  
1Keimyung University Dong-San Hospital, Surgery, Daegu, Korea, Rep. of South  
Email: kjkang@dsmc.or.kr

Background and aims: Still it is not clear what status of intrahepatic cholangiocarcinoma shows a good prognosis after surgical resection. We evaluated prognostic factors of intrahepatic cholangiocarcinoma (iCCA) to suggest surgical indications.

Method: Between 2001 and 2020, surgical resection for iCCA was performed in 204 patients. We analyzed demographic factors perioperative results, and long-term prognostic factors.

Results: Mean age of patients was 66.1 ± 9.7. The mass-forming type was most frequent (n = 124), followed by periductal infiltrating (n = 59) and intraductal growing (n = 21). The overall 5-year survival was 33.9%, and the disease-free survival rate was 23%. On univariate analysis, a mass size larger than 5 cm, high CEA level, portal vein invasion, perineural invasion, lymphovascular invasion, and lymph node metastasis were significantly poor prognostic factors. Patients with small less than 5 cm sized had a good prognosis (53.6% of 5-year overall survival). On multivariate analysis, the presence of lymph node metastasis was the only significant independent poor prognostic factor.

Conclusion: Present retrospective study showed that lymph node metastasis shows the only significant independent poor prognostic factor. Tumor size, number, and the level of the tumor markers affect survival, but these factors are not barriers to obtaining significantly better survival if it is resected radically.

THU-147

Sequential systemic treatment in patients with hepatocellular carcinoma: real-world data in the era of immune checkpoint inhibition

Jana Pauly1, Cyrill Wehling1,2, Christoph Springfeld2,3, Aurelie Tomczak2,4, De-Hua Chang2,5, Jakob Liermann2,6, Clemens Kratochwil2,7, Arianeb Mehrabi2,8, Antje Brockschmidt2,9, Thomas Longerich2,4, Conrad Rauber1,2, Jan Pfeiffenberger1,2, Patrick Michl1,2, Michael Dill1,2,10, 1Department of Gastroenterology, Infectious Diseases, Intoxication, Heidelberg University Hospital, Heidelberg, Germany; 2Liver Cancer Center Heidelberg, Heidelberg, Germany; 3Medical Oncology, National Center for Tumor Diseases, Heidelberg, Germany; 4Institute of Pathology, Heidelberg University Hospital, Heidelberg, Germany; 5Department of Diagnostic and Interventional Radiology, Heidelberg University Hospital, Heidelberg, Germany; 6Department of Radiation Oncology, Heidelberg University Hospital, Heidelberg, Germany; 7Department of Nuclear Medicine, Heidelberg University Hospital, Heidelberg, Germany; 8Department of General, Visceral and Transplantation Surgery, Heidelberg University Hospital, Heidelberg, Germany; 9Clinical Cancer Registry, National Center for Tumor Diseases, Heidelberg, Germany; 10Experimental Hepatology, Inflammation and Cancer Research Group, German Cancer Research Center, Heidelberg, Germany  
Email: jana.pauly@meduni-heidelberg.de

Background and aims: The approval of new systemic therapy (ST) agents for patients with advanced hepatocellular carcinoma (HCC) has increased therapeutic options and allows for sequential ST (SST). Approved agents have generally been tested only in first or second line. The introduction of Atezolizumab/Bevacizumab as novel first-line therapy further led to a shift in ST lines. Data is currently limited to assess how much patients benefit from additional treatment lines. Our aim was to investigate survival parameters using real-world data.

Method: A total of 161 patients with advanced HCC who started ST for HCC at Heidelberg University Hospital between 02/2008 and 03/2022 were included into this retrospective study and follow-up data available until death or data cut-off (12/2022) were included into this retrospective study. To avoid bias, we compared a historical cohort of patients receiving sorafenib (SOR, n = 87) monotherapy with a modern cohort, once multiple systemic agents where available (SST, n = 74), receiving between one to six lines of treatment. Kaplan-Meier estimates were performed for assessment of overall survival (OS). Univariate and multivariate cox regression was used to identify favourable survival parameters.

Results: The baseline characteristics between the two cohorts were mostly similar, except the SOR cohort containing significantly more cases of portal vein thrombosis (PVT) than the SST cohort (33% vs 19%, respectively). The SST cohort with up to 6 ST lines had a significant superior median OS (mOS) in comparison to the SOR cohort (8.5 months (SOR) vs 16.9 months (SST), p < 0.0001). Among the parameters identified to positively influence OS in the univariate analysis (ECOG ≤1, Child Score ≤6, ALBI score, PVT, AFp <200 ng/ml, pre-treatment, combined loco-regional treatment (LRT) during or after ST), PVT, AFP, pre-treatment, and LRT remained significant in the multivariate analysis. Accordingly, combined ST and LRT had a significantly positive impact on mOS (8.6 months (ST) vs 25.9 months (ST and LRT), p < 0.0001) in all patients with ST. In the SST cohort, 31/74 patients (42%) received immune checkpoint inhibitors (ICI) either in combination (Atezolizumab/Bevacizumab, Ipilimumab/Nivolumab) or as monotherapy (Nivolumab, Pembrolizumab), of which 19 patients (61%) at 2nd line or higher. ICI-therapy, including given as second or higher line, had a significantly positive impact on mOS (9.1 months (non-ICI SST) vs 25.7 months (ICI SST), p = 0.0002).

Conclusion: A selection of patients with advanced HCC seem to profit from a combination of ST with LRT indicating a rationale for further investigation in a prospective trial. Patients treated with ICI, also when administered in advanced therapy lines, had a substantial longer OS.
Comparison of clinical outcome between Nivolumab and Regorafenib as second-line systemic therapy after Sorafenib failure in patients with advanced hepatocellular carcinoma

Jae Seung Lee1,2,3, Hong Jun Lee4, Hye Won Lee1,2,3, Beom Kyung Kim1,2,3, Seung Up Kim1,2,3, Jun Yong Park1,2,3, Sang Hoon Ahn1,2,3, Do Young Kim1,2,3,1 Yonsei University College of Medicine, Department of Internal Medicine, Seoul, Korea, Rep. of South; 2Yonsei University College of Medicine, Institute of Gastroenterology, Seoul, Korea, Rep. of South; 3Severance Hospital, Yonsei Liver Center, Seoul, Korea, Rep. of South; 4Yonsei University College of Medicine, Seoul, Korea, Rep. of South

Email: dyk1025@yahoo.com

Background and aims: Nivolumab and regorafenib are used as second-line therapies for patients with advanced hepatocellular carcinoma (HCC). We aimed to compare the effectiveness of nivolumab to regorafenib.

Method: We retrospectively reviewed HCC patients treated with nivolumab or regorafenib after sorafenib failure. Progression-free survival (PFS) and overall survival (OS) were analyzed. Inverse probability of treatment weighting (IPTW) using the propensity score (PS) was conducted to reduce treatment selection bias.

Results: Among the recruited 189 patients, 137 and 52 patients received regorafenib and nivolumab after sorafenib failure, respectively. Nivolumab users showed higher Child-Pugh B patients (42.3% vs. 24.1%) and shorter median sorafenib maintenance (2.2 vs. 3.5 months) compared to regorafenib users. Compared to regorafenib users, nivolumab users showed shorter median OS (4.2 vs. 7.4 months, P = 0.045) and similar median PFS (1.8 vs. 2.7 months, P = 0.070), respectively. However, median OS and PFS were not different between the two treatment groups after 1:1 PS matching yielded 34 pairs (log-rank P = 0.810 and 0.810, respectively), and after stabilized IPTW (log-rank P = 0.445 and 0.878, respectively). In addition, covariate-adjusted Cox regression analyses showed that the nivolumab (vs. regorafenib) use was not significantly associated with the PFS and OS after 1:1 PS matching and stabilized IPTW (all P > 0.05).

Conclusion: Clinical outcomes in patients treated with nivolumab and regorafenib after sorafenib failure did not differ significantly.

Efficacy of Atezolizumab/Bevacizumab combination therapy in BCLC-C cirrhotic patients with hepatocellular carcinoma according to the type of disease progression and liver disease severity

Spyridon Pantzios1, Antonia Syriha1, Dionysia Mandilara1, Ioanna Stathopoulou1, Georgia Barla1, Petros Galanis1, Nikolaos Ptohis2, Ioannis Elefsiniotis1.1 General Oncology Hospital of Kifisia “Oi Agioi Anargyroi”, Academic Department of Internal Medicine-Hepatogastroenterology Unit, National and Kapodistrian University of Athens, Kifisia, Greece; 2General Hospital of Athens G. Gennimatas, Department of Interventional Radiology, Athens, Greece

Email: spiros_pant@hotmail.com

Background and aims: Registrational study (IM BRAVE 150) mainly included hepatocellular carcinoma (HCC) patients at BCLC-C stage, irrespective of the type of progression to this stage, with well compensated liver disease (CPT-A stage). The aim of our study was to retrospectively evaluate, under real life conditions, the overall survival (OS) of patients with advanced HCC (BCLC-C stage), either initially presenting in the advanced stage or migrating from BCLC-A to BCLC-C stage within 2 years after curative LR or RFA, treated either with atezolizumab-bevacizumab (ATZ/BEV) combination or with TKIs sequentially (sorafenib as 1st line and cabozantinib as 2nd line treatment).

Method: Sixty four cirrhotic patients with advanced HCC (56 males, mean age 67y, 22 with diabetes, CPT-A = 45/B = 19, mean MELD/Na = 11, ALBI grade I = 12/grade II = 38, 28 with varices, 18 with extrahepatic metastasis, 24 with macrovascular invasion) who either initially presented on the BCLC-C stage and were treated with ATZ/BEV (group A, N = 23) or TKIs (group B, N = 15) or who migrated from BCLC-A to BCLC-C stage within 2 years after LR or RFA and were treated with ATZ/BEV (group C, N = 12) or TKIs (group D, N = 14) were evaluated.

Results: The four groups were comparable for all the baseline parameters evaluated (age p = 0.9, gender p = 0.08, platelets p = 0.246, chronic liver disease etiology p = 0.408, coexistence of diabetes p = 0.314, presence of varices p = 0.066, CPT stage p = 0.057, ALBI grade p = 0.398) except for CPT score (p = 0.012) and MELD/Na score (p = 0.002). As expected, median OS was significantly higher for group C patients (61 m) compared to group D (27 m), group A (11 m) and group B (8 m) patients (p<0.001). Moreover, post-recurrence
survival for group C patients seems to be significantly higher compared to those of group D (9 m) patients (p = 0.007) as well as for group A and B (figure). Using cox regression analysis, we observe that the OS of group A (HR = 3.71, 1.20–11.46, p = 0.02) was significantly worse than post-recurrence survival of group C, which was comparable to group D (HR = 3.14, 0.95–10.35 p = 0.06), adjusted for CPT, ALBI and MELD/Na score (figure).

**Conclusion:** Median survival of ATZ/BEV or TKI-treated patients who were initially classified in BCLC-C stage is less than 12 m, irrespective of treatment schedule, as was post-recurrence survival of sequentially TKI-treated patients. ATZ/BEV therapy seems to benefit mainly BCLC-C patients who migrate from earlier stages after curative LR or RFA compared to patients initially presented in the advanced stage. Liver disease severity assessed using CPT and MELD/Na scores.

**THU-150**

**Changing treatment landscape associated with improved survival in patients with hepatocellular carcinoma: a nationwide, population-based study**

Najib Ben Khaled1, Bernhard Mörtl2, Dominik Beier3, Alexander Philipp1, Andreas Teufel4, Ilja Kubisch5, Daniel Schwade6, Andreas Geier7, Florian P Reiter7, Christian M. Lange1, Julia Mayerle1, S596 Journal of Hepatology

![Image](https://example.com/image)

**Figure:** Survival of group A (blue), B (green), C (yellow) and D (purple) and cox regression analysis for survival after the beginning of systemic therapy comparing group C to the other groups and adjusted for CPT, ALBI and MELD/Na scores.

**Results:** We identified a total of 5586 individuals with a diagnosis of HCC in the study period. Statistically significant developments included an increase in mean age and proportion of patients receiving systemic therapies, and a decrease in chronic hepatitis C virus infection. To investigate the association between systemic therapy availability and survival, we identified patients with HCC starting on first line systemic therapy in the study period and grouped them according to time of treatment initiation, defining the cut-off date of the two groups as the approval of lenvatinib in period A (01/2015-07/2018, n = 255) and period B (08/2018-12/2020, n = 205). Baseline characteristics among patients in both periods were similar. Median overall survival (mOS) in the whole cohort was 5.5 months (95% confidence interval (CI) : 4.8–6.9). In period B, a superior mOS of 6.5 months (95% CI : 4.9–8.9) was identified as compared to period A with an mOS of 5.3 months (95% CI : 4.5–6.3) (p = 0.046). Multivariate Cox’s regression analysis to adjust for confounders revealed that treatment initiation in period B was an independent, statistically significant factor for a longer survival (period B vs period A hazard ratio 0.77, 95% CI : 0.61–0.96, p = 0.0196). When comparing first line treatment options, lenvatinib showed a significantly longer OS as compared to sorafenib. Median OS with lenvatinib was 9.7 months (n = 103, 95% CI : 6.3–18.4) versus 4.8 months with sorafenib (n = 102, 95% CI : 4.0–7.1, p = 0.008). Patients treated with lenvatinib were younger and had a lower proportion of metastatic disease.

**Background and aims:** The treatment of hepatocellular carcinoma (HCC) is undergoing a historic transformation with the availability of several new systemic therapies. The impact of this changing landscape on patient outcomes has not yet been studied in a German cohort in a nationwide, real-world setting.

**Method:** This observational, retrospective study is based on a claims data base including anonymized, longitudinal data of around 8.8 million persons (InGef database). A sample of four million persons representative for the German population was drawn. We assessed the implementation and impact of systemic therapies for patients with HCC in nationwide clinical routine in three parts: First, we describe patient characteristics, drug treatments, and associated costs in a large, representative cohort of patients with HCC between 2015 and 2020. Second, we examine the association between drug availability and outcomes comparing survival of HCC patients by date of initiation of systemic therapy. Third, we explore the impact of treatment sequencing based on lenvatinib or sorafenib in the first line setting after the approval of lenvatinib in 2018.

**Results:** We identified a total of 5586 individuals with a diagnosis of HCC in nationwide clinical routine in three parts: First, we describe patient characteristics, drug treatments, and associated costs in a large, representative cohort of patients with HCC between 2015 and 2020. Second, we examine the association between drug availability and outcomes comparing survival of HCC patients by date of initiation of systemic therapy. Third, we explore the impact of treatment sequencing based on lenvatinib or sorafenib in the first line setting after the approval of lenvatinib in 2018.

![Image](https://example.com/image)

**Figure:** mOS (95% CI) months

**Table:**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Hazard ratio</th>
<th>95% confidence interval</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child number</td>
<td>1.03</td>
<td>0.69 to 1.52</td>
<td>0.89</td>
</tr>
<tr>
<td>Meld-Na</td>
<td>1.13</td>
<td>0.98 to 1.31</td>
<td>0.09</td>
</tr>
<tr>
<td>ALBI</td>
<td>0.86</td>
<td>0.47 to 1.57</td>
<td>0.62</td>
</tr>
<tr>
<td>A vs. C</td>
<td>3.71</td>
<td>1.20 to 11.46</td>
<td>0.02</td>
</tr>
<tr>
<td>B vs. C</td>
<td>2.89</td>
<td>0.87 to 9.56</td>
<td>0.08</td>
</tr>
<tr>
<td>D vs. C</td>
<td>3.14</td>
<td>0.95 to 10.35</td>
<td>0.06</td>
</tr>
</tbody>
</table>

**Conclusion:** Median survival of ATZ/BEV or TKI-treated patients who were initially classified in BCLC-C stage is less than 12 m, irrespective of treatment schedule, as was post-recurrence survival of sequentially TKI-treated patients. ATZ/BEV therapy seems to benefit mainly BCLC-C patients who migrate from earlier stages after curative LR or RFA compared to patients initially presented in the advanced stage. Liver disease severity assessed using CPT and MELD/Na scores seems to drive the overall as well as post-recurrence survival.

**THU-150**

**Changing treatment landscape associated with improved survival in patients with hepatocellular carcinoma: a nationwide, population-based study**

Najib Ben Khaled1, Bernhard Mörtl2, Dominik Beier3, Alexander Philipp1, Andreas Teufel4, Ilja Kubisch5, Daniel Schwade6, Andreas Geier7, Florian P Reiter7, Christian M. Lange1, Julia Mayerle1, S596 Journal of Hepatology

![Image](https://example.com/image)

**Figure:** Survival (%)

**Figure:** Median survival of ATZ/BEV or TKI-treated patients who were initially classified in BCLC-C stage is less than 12 m, irrespective of treatment schedule, as was post-recurrence survival of sequentially TKI-treated patients. ATZ/BEV therapy seems to benefit mainly BCLC-C patients who migrate from earlier stages after curative LR or RFA compared to patients initially presented in the advanced stage. Liver disease severity assessed using CPT and MELD/Na scores seems to drive the overall as well as post-recurrence survival.
**Conclusion:** The introduction of multiple new treatment options resulted in survival improvements of patients with HCC in Germany.

**THU-151**

**Efficacy and tolerability of stereotactic body radiation therapy in patients with hepatocellular carcinoma: a retrospective cohort study**

Dorothy Liu¹, Jennifer Tan², Marcus Robertson¹. ¹Monash Health, Gastroenterology, Clayton, Australia; ²Peter MacCallum Cancer Centre, Radiation Oncology, Bentleigh East, Australia

Email: dorothyliu22@gmail.com

**Background and aims:** Hepatocellular carcinoma (HCC) is a leading cause of cancer-related mortality worldwide. There is emerging evidence for the role of stereotactic body radiation therapy (SBRT) as an alternative locoregional therapy in the management of HCC, with high rates of local control and low rates of significant toxicity reported. A multicentre retrospective cohort series was conducted to evaluate the efficacy and safety of SBRT for the treatment of HCC.

**Method:** A retrospective analysis of a prospective database including adult patients that underwent treatment for HCC with SBRT between July 2012 and September 2021 in Melbourne, Australia, was performed. The primary outcome was local tumour control and secondary outcomes included progression-free survival, overall survival and adverse events (AEs).

**Results:** 60 patients were included with a median follow-up of 16 months (IQR 7–23). Cirrhosis was documented in 37 (62%) patients with the most common underlying aetiology being alcohol (49%), and a median baseline Child-Pugh grade of A and albumin-bilirubin (ALBI) score of −2.35 (IQR −2.65–2.15). Forty-seven patients had received prior alternative HCC therapies. A total of 81 lesions were treated (median size 40.5 mm, IQR 30–59 mm) with a median biologically effective dose (BED10) of 86 Gy. The most common reported AE was fatigue. AEs of at least grade 2 severity were reported in 19% of patients. One patient died from radiotherapy induced liver disease 3 months following SBRT. Local control was 76% and 41% at 1 and 2 years, respectively. Progression free survival and overall survival at 1 year were 40% and 75%, respectively. Progression free survival and overall survival at 1 and 2 years were 16% and 42%, respectively.

**Conclusion:** SBRT can provide durable local control of HCC in the short term with low rates of significant AEs, however disease progression remains common. Thus, larger prospective studies are required to establish the role of SBRT in combination with other therapies in the management of HCC.

**THU-153**

**Prognostic impact of metastatic site in patients receiving first-line sorafenib therapy for advanced hepatocellular carcinoma**

Luca Lelasi¹,², Francesco Tovoli¹,², Matteo Tonnini¹,², Bernardo Stefanini¹,², Raffaella Tortora¹, Giulia Magini³, Rodolfo Sacco⁵,⁶, Tiziana Pressiani⁴, Franco Trevisani²,⁸, Fabio Piscaglia¹,², Alessandro Graniti¹,², ¹IRCCS Azienda Ospedaliero-Universitaria di Bologna, Division of Internal Medicine, Hepatobiliary and Immunolergic Diseases, Bologna, Italy; ²University of Bologna, Department of Medical and Surgical Sciences, Bologna, Italy; ³Cardarelli Hospital, Liver Unit, Department of Transplantation, Naples, Italy; ⁴Papa Giovanni XXIII Hospital, Department of Gastroenterology and Transplant Hepatology, Bergamo, Italy; ⁵Azienda Ospedaliero-Universitaria Pisana,

Figure: (abstract: THU-151): Local tumour control following stereotactic body radiation therapy
Background and aims: Extrahepatic spread is a well-known negative prognostic factor in patients with advanced hepatocellular carcinoma (HCC). The prognostic role of different metastatic sites and their response rate to systemic treatment is still being debated. Method: We considered 237 metastatic HCC patients treated with sorafenib as first-line therapy in five different Italian centers from 2010 to 2020. Results: The most common metastatic sites were lymph nodes, lungs, bone and adrenal glands. In survival analysis, the presence of dissemination to lymph nodes (OS 7.1 vs 10.2 months; p = 0.007) and lungs (OS 5.9 vs 40.10.2 months; p < 0.001) were significantly related to worse survival rates compared with all other sites. In the subgroup analysis of patients with only a single metastatic site, this prognostic effect remained statistically significant. Palliative radiation therapy on bone metastases significantly prolonged survival in this cohort of patients (OS 19.4 vs 6.5 months; p < 0.001). Furthermore, patients with lymph node and lung metastases had worse disease control rates (39.4% and 30.5%, respectively) and shorter radiological progression-free survival (3.4 and 3.1 months, respectively).

Conclusion: In conclusion, some sites of extrahepatic spread of HCC have a prognostic impact on survival in patients treated with sorafenib; in particular, lymph node and lung metastases have worse prognosis and treatment response rate.

THU-154
Improved identification of good candidates for the treatment of intermediate/advanced hepatocellular carcinoma by Yttrium-90 transarterial radioembolization
Carole Vitellius1, Severine Poulard1, Julien Fontana1, Ines Oreinstein1, Pacome Fosse1, Anita Paisant1, Laurent Vervuren1, Frédéric Oberti1, Christophe Aubé1, Franck Laceuille1, Jerome Boursier1. 1Angers University Hospital, France
Email: jeboursier@chu-angers.fr

Background and aims: Yttrium-90 transarterial radioembolization (TARE) is a treatment for intermediate/advanced hepatocellular carcinoma (HCC), but its position in the therapeutic arsenal remains poorly defined. We aimed to validate the prognostic score for HCC treated with TARE recently proposed by Spreafico, and to improve prediction by considering also pre-operative dosimetry.

Method: Eighty-six patients with HCC treated by TARE in our center were included. The previsional tumoral dose of 90Yttrium was calculated using images acquired during the work-up. The Spreafico prognostic score was calculated as previously described and delineated three patients groups with “favorable,” “intermediate,” and “dismal” prognosis (PMID 29331342). The main study outcome was overall survival (OS) and the secondary outcome was progression-free survival (PFS).

Results: Fifty-three patients (62%) were treated with 90Yttrium-glass-microspheres (Therasphere®), and 33 patients (38%) were treated with 90Yttrium-resin-microspheres (Sirisphere®). Sixty-nine patients died during the follow-up. Median OS was 12.0 months (95% CI: 9.0–15.0), and median PFS was 5.0 months (95% CI: 3.5–6.5). OS was 15, 10, and 4 months in the three prognostic groups defined by the Spreafico score (p < 0.001, Figure A). Independent predictors of OS were the presence of cirrhosis, an optimal previsional tumoral dose, and the ALBI grade. The CODAG score, developed as the sum of points attributed to these three independent predictors, identified three patient groups: good (0–1point), intermediate (2 points) and poor (3–4 points) candidates. The CODAG score better discriminated the prognosis with median OS in the three groups being respectively 32, 11, and 4 months (p < 0.001, Figure B). Median PFS was respectively 8, 5, and 3 months in the three CODAG groups (p < 0.001). The previsional and the received tumoral doses were very well correlated (Rs = 0.814, p < 0.001).

Conclusion: The CODAG score improves the identification of good candidates for the treatment of intermediate/advanced hepatocellular carcinoma with transarterial radioembolization.

THU-155
Clinical impact of relative dose intensity over the first four weeks in cabozantinib therapy for unresectable hepatocellular carcinoma
Kaoru Tsuchiya1, Tsubasa Nobusawa1, Yutaka Yasui1, Taisei Keitoku1, Nobuharu Tamaki1, Hiroyuki Nakashiki1, Masayuki Kurosaki1, Namiki Izumi1. 1Musashino Red Cross Hospital, Department of Gastroenterology and Hepatology, Tokyo, Japan
Email: tsuchiyakaoru3@gmail.com

Background and aims: Cabozantinib (CAB) has been used as 2nd or later-line worldwide in patients with unresectable hepatocellular carcinoma (u-HCC). In the phase III study of CAB (CELESTIAL study), the initial dose of CAB was 60 mg/day, while in the phase III study of the combination of atezolizumab plus CAB (COSMIC312 study), the initial dose of CAB was 40 mg/day. Recently the standard first-line therapy for u-HCC is atezolizumab plus bevacizumab or durvalumab plus tremelimumab. We investigated the clinical impact of relative dose intensity over the first four weeks (4W-RDI) in CAB therapy for u-HCC.

Method: A total of 43 u-HCC patients who received CAB between Jan 2021 and Dec 2022 at our institution was included. Tumor
assessments in accordance with RECIST ver1.1 were performed using dynamic CT or MRI within 4–8 weeks and every 8–10 weeks thereafter. The 4W-RDI was calculated as the cumulative dose in the initial 4 weeks divided by the standard dose (60 mg/day), and we evaluated its association with overall survival (OS) and progression-free survival (PFS).

**Results:** The median age was 74 (24–87) years, and 33 patients were male. Sixteen patients had HBV (n = 7) or HCV (n = 9) infection, and 30 patients were Child-Pugh A. BCLC stage A/B/C were 0/14/29 patients, Department of Translational Medicine, Novara, Italy; 2 AOU Maggiore della Carità, Division of Internal Medicine, Novara, Italy; 3 PO Sant’Andrea, Division of Internal Medicine, Vercelli, Italy.

Objective response rate (ORR) and disease control rate (DCR) was 62.5%. In a multivariate analysis, the median PFS and OS were 4.1 and 16.2 months, and the median duration of CAB was 2.7 months. The initial dose of CAB was 60 mg (n = 14), 40 mg (n = 13), and 20 mg/day or less (n = 16). The median PFS and OS were 4.1 and 16.2 months. The objective response rate (ORR) and disease control rate (DCR) was 12.1% and 94.8%. The median 4W-RDI was 33%, and there was no significant difference in PFS and OS between 4W-RDI<45% (n = 27) and ≥40% (n = 16) (3.1 vs. 4.4 months, p = 0.25 and 19.0 vs. 10.2 months, p = 0.78). Adverse events due to CAB were observed in all patients, requiring dose reduction in 35 patients (81%) and interruption of CAB in 32 patients (74%). The rate of molecular targeted therapies after CAB was 62.5%. In a multivariate analysis, the pretreatment ALBI score (HR 7.57, 95% CI 2.10–27.5, P = 0.002) was the only significant factor associated with OS. The 4W-RDI of CAB and treatment -line (CAB as 4-6 line) were not associated with OS. The median OS of the patients who received atezolizumab plus bevacizumab before or after CAB was 19.1 months.

**Conclusion:** Maintaining a high 4W-RDI of CAB was not associated with OS and PFS in real-world practice. Prior atezolizumab plus bevacizumab would contribute to prolonged survival in CAB therapy for u-HCC.

**THU-156**

**Tolerability of first line systemic therapy in elderly patients with advanced hepatocellular carcinoma**

Giulia Francesca Manfredi1, 2, Davide Di Benedetto1, 2, Antonio Acquaviva3, Francesca Baorda1, 2, Carla De Benedittis2, Chiara Gerevini1, 2, Cristina Rigamonti1, 2, Michela Burlone2, Mario Pirisi1, 2, 1 Università degli Studi di Piemonte Orientale, Department of Translational Medicine, Novara, Italy; 2 AOU Maggiore della Carità, Division of Internal Medicine, Novara, Italy; 3 PO Sant’Andrea, Division of Internal Medicine, Vercelli, Italy.

**Background and aims:** Hepatocellular carcinoma (HCC) accounts for 90% of primary liver cancer. The average age of HCC development is 70, with aging being a known risk factor. Elderly patients should not be excluded from systemic therapy based upon age alone and all available treatments can be recommended for them.

**Method:** We considered 126 patients affected by advanced HCC, treated with first line systemic therapy. Four patients were excluded from the final analysis due to lack of follow-up (FU) information, 6 patients on atezolizumab/bevacizumab therapy were excluded for less than 3 months of FU at the time of data collection. We studied patients’ overall survival (OS), time to progression (TTP) represented as therapy duration and adverse events (AE) secondary to two systemic therapies, namely sorafenib (SB) and lenvatinib (LB).

**Results:** Patients were predominantly men (80.3%); 84.6% of them suffered from cirrhosis, which is the most frequent etiology was hepatitis C (44.4%). Thirty-nine percent of patients carried steatosis and metabolic syndrome. Median age at diagnosis of HCC was 72 (27–88), median age at systemic therapy start was 73 (28–88). Patients older than 65 years represented the 80.2% of our cohort, over 70 were the 42.2%, while over 80 were 19.8% of the total. The median alpha-fetoprotein value before initiation of therapy was 45 [1.2–83000]. Twenty-six patients were treated with LB and median age at therapy start was 78, 90 patients were treated with SB, median age at therapy start was 72.5 (p = 0.04). Median systemic therapy duration was 11 months in patients treated with LB, 4 months in patients treated with SB (p < 0.05). Median OS was 18.8 months in SB group and 52.7 months in LB group (p < 0.05). No difference was observed in therapy duration considering age >80 years (p = 0.97). No difference was observed in term of OS considering patients younger or older than 80 years (p = 0.72). Most reported AE were fatigue, anorexia and diarrhea, with the latter more common in patients younger than 80 years (p < 0.05). Regarding diarrhea, only 4 patients over 80 (17.4%) had a Common Terminology Criteria for Adverse Events grade >1. Patients over 80 years did not require a dose reduction more than younger ones (p = 0.97). Considering the reason for discontinuing therapy, no difference was observed between patients older than or younger than 80 years of age (p = 0.70).

**Conclusion:** Our study demonstrates how elderly patients could be treated safely with the same intensity as younger ones. AE didn’t represent a crucial factor for discontinuing therapy in elderly. It is essential to know how to manage AE in a timely way, educating the patient to recognize them. Knowing that the epidemiology of HCC will increasingly affect elderly patients, the choice of treatment based on the comorbidity and characteristics of the subject will be decisive, but age alone should not represent a limitation at the beginning of systemic therapy.

**THU-157**

**Incidence and risk factors of post-transarterial chemoembolization complications in patients with hepatocellular carcinoma: a single center retrospective cohort analysis in a large tertiary hospital**

Melissa April Pajinag1, Stephanie Ventura1, Jose Guilain Cataluña2, Nathaniel Paragast, Dennis Villanueva2, 1 St. Luke’s Medical Center Quezon City, Department of Medicine, Quezon City, Philippines; 2 St. Luke’s Medical Center Quezon City, Section of Interventional Radiology, Institute of Radiology, Quezon City, Philippines.

**Email:** melissa_pajinag@yahoo.com

**Background and aims:** Transarterial chemoembolization (TACE) is used most often for the treatment of large unresectable hepatocellular carcinoma (HCC) that are not amenable to other treatments or as a bridging therapy prior to liver transplantation. This procedure is generally well tolerated with an incidence of major complications post-TACE described as 2–7% with a risk of mortality estimated at 1%. Complications contribute to the prognosis of patients which can be associated with several other risk factors. Once these risk factors are identified, clinicians can carefully select, stratify, and prepare patients for TACE. At present, there is a lack of analysis of the risk factors of complications after TACE of patients with HCC. This study investigated the incidence and risk factors in developing infection, acute kidney injury (AKI), and acute liver decompensation in patients with HCC receiving TACE.

**Method:** A retrospective cohort study of all adult patients with HCC who have undergone TACE from January 2013 to October 2022 was conducted. Incidence and risk factors developing post-TACE complications were analyzed. Univariate and multivariate analyses were performed to identify factors predictive of infection, AKI, and acute liver decompensation.

**Results:** Out of the total of 318 patients who underwent TACE, 220 TACE sessions were included. Of these, major complications occurred in 56 cases with an incidence rate of 25.45%. Majority were managed as post-embolization syndrome (43.2%), while 11.8% had infections, 9.1% had acute liver decompensation, and 4.5% had AKI. Total of 4 mortalities were seen with a mortality rate of 1.8%. Larger tumor size (OR 0.19, CI 0.05–0.69, p = 0.03) was identified as a risk factor for the development of infection. While older age was a significant risk factor for developing both AKI (OR 1.09, CI 1.00–1.18, p = 0.10) and acute liver decompensation (OR 1.08, CI 1.02–1.14, p = 0.02). Barcelona
Clinic Liver Cancer (BCLC) stage B was also a risk factor in developing AKI (OR 0.08, CI 0.01–0.95, p = 0.09). Over-all multivariate analysis of the major complications showed that older age (OR 1.06, CI 1.02–1.11, p = 0.01), larger tumor size (OR 0.34, CI 0.13–0.90, p = 0.07), multinodular tumor (OR 5.64, CI 1.17–27.18, p = 0.07) and longer prothrombin time (OR 1.50, CI 1.16–1.95, p = 0.01) were independent risk factors of over-all major complications post-TACE.

### Table 5. Multivariate logistic regression of risk factors of over-all major complications

<table>
<thead>
<tr>
<th>Variable</th>
<th>Adjusted OR (95% CI)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>1.06 (1.02–1.11)</td>
<td>0.012</td>
</tr>
<tr>
<td>Tumor size (cm)</td>
<td>0.34 (0.13–0.90)</td>
<td>0.070</td>
</tr>
<tr>
<td>Tumor classification</td>
<td>0.94 (1.17–27.18)</td>
<td>0.070</td>
</tr>
<tr>
<td>Baseline prothrombin time (sec)</td>
<td>1.50 (1.16–1.95)</td>
<td>0.011</td>
</tr>
</tbody>
</table>

**Conclusion:** Majority of complications post-TACE consist of minor post-embolization syndrome. The incidence of major complications was notably high at 25% with a mortality rate of 1.8%. Older age poses risk of developing AKI, and acute liver decompensation. Larger tumor size poses risk for infection while BCLC Stage B in developing acute liver decompensation. Risk factors in developing major complications include older age, larger tumor size, multinodular tumor, and longer prothrombin time.

---

**NAFLD Clinical aspects except therapy**

### WEDNESDAY 21 TO SATURDAY 24 JUNE

**TOP-079**

Risk of bacterial infections in non-alcoholic fatty liver disease: a nationwide population-based cohort study

Axel Wester1, Ying Shang2, Linnea Widman3, Fahim Ebrahimi1, Jonas Ludvigsson1, Hannes Hagström1, Karolinska Institutet, Sweden

E-mail: axel.wester@ki.se

**Background and aims:** Previous literature suggests an association between non-alcoholic fatty liver disease (NAFLD) and bacterial infections. We aimed to determine the rate and risk of severe bacterial infections in NAFLD compared to the general population.

**Method:** In this population-based cohort study, we used national registers to identify all patients diagnosed with NAFLD in Sweden between 1987 and 2020 (n = 14,869). The patients were matched at the date of diagnosis with up to ten controls from the general population for age, sex, and municipality (n = 137,145). Cox regression was used to estimate hazard ratios (HR) for infections in patients with NAFLD compared to the controls. Cumulative incidences were calculated while accounting for competing risks (non-infection death and liver transplantation).

**Results:** Severe bacterial infections leading to death or hospitalization occurred in 1990 (13.4%) patients with NAFLD and 9899 (7.2%) controls during 94,852 and 1,083,713 person-years of follow-up, respectively. The rate of severe bacterial infections per 1000 person-years was higher in patients with NAFLD (21.0, 95% CI 20.1–21.9) than controls (9.1, 95% CI 9.0–9.3) irrespective of comorbidities, including components related to the metabolic syndrome (fully adjusted HR 1.9, 95% CI 1.8–2.0). The result was similar when additionally including cirrhosis as a time-varying covariate in the model (HR 1.8, 95% CI 1.7–1.9). Moreover, patients with NAFLD had a higher rate of infections of any severity (fully adjusted HR 1.5, 95% CI 1.4–1.5) and infection-related mortality (fully adjusted HR 1.8, 95% CI 1.6–2.2) compared to controls. The ten-year cumulative incidence of severe bacterial infections was 16.6% (95% CI 15.8–17.4) in NAFLD and 8.0% (95% CI 7.8–8.2) in controls.

**Conclusion:** NAFLD was associated with incident severe bacterial infections, infections of any severity, and infection-related mortality, independently of components associated with the metabolic syndrome. Increased clinical vigilance of bacterial infections in NAFLD may diminish the risk of premature death.

**TOP-081**

The growing global burden of non-alcoholic fatty liver disease (NAFLD) among teenagers

Zobair Younossi1,2,3, James Paik1,2,4, Shira Zelber-Sagi5, Jeffrey Lazarus5, Dipam Shah1,7, Leyla Deavila1,2, Huong Pham1, Pegah Golabkhani1,2,3,8, Janus Ong9, Saleh Alqahtani10, Linda Henry1,2,3,8, Inova Health System, Betty and Guy Beatty Center for Integrated Research, Falls Church, United States; Inova Health System, Inova Medicine, Falls Church, United States; The Global NASH Council, Washington, United States; University of Barcelona, Barcelona Institute for Global Health (ISGlobal), Barcelona, Spain; Inova Fairfax Medical Campus, Center for Liver Disease, Department of Medicine, Falls Church, United States; University of the Philippines, College of Medicine, Manila, Philippines; King Faisal Specialist Hospital and Research Center, Riyadh, Saudi Arabia

E-mail: zobair.younossi@inova.org

**Background and aim:** NAFLD affects all age groups and all countries. Our aim was to assess NAFLD-related prevalence and liver mortality among teenagers (10–19 years) using the Global Burden of Disease (GBD) dataset.
Method: We analyzed data from 21 GBD regions and countries. GBD modelled NAFLD prevalence based on population-based studies that report NAFLD (ultrasound or imaging). NAFLD-related liver mortality rates (cirrhosis and liver cancer) per 100,000 are reported. The socio-demographic index (SDI) was used as a summary measure as it quantifies each country’s rank in the socio-economic development spectrum. Countries are divided into 5 equal groups (quantile) according to their SDI scores. Trend lines were assessed by annual percent change (APC) calculated by using Joinpoint regression model.

Results: In 2019, the highest NAFLD prevalence among teenagers was observed in the North Africa and the Middle East region (5.71%), led by Egypt (8.68%), Qatar (8.04%) and Saudi Arabia (7.53%). In this group, the second highest prevalence was observed in Latin America (2.81%), led by Mexico (3.01%) and El Salvador (2.94%). This was followed by Southern Sub-Saharan Africa (2.76%), led by Swaziland (3.17%) and South Africa (3.04%), and East Asia (2.63%), led by Taiwan (3.27%) and China (2.63%). Across SDI quantiles, the prevalence was highest in the middle SDI quintile (2.96%) while the prevalence was lowest in the low SDI quintile (1.70%) groups. In contrast, the liver-death rate (per 100,000) was lowest in the high SDI quintile (0.009) and highest in the low SDI quintile (0.041) groups. From 1990 to 2019, the global NAFLD prevalence increased from 1.84% (19.37 million prevalent cases) to 2.31% (29.16 million prevalent cases) with an APC of +0.80% [95% confidence interval, 0.78%-0.82%] (Figure). In contrast, during the same period, NAFLD-related liver deaths among teenagers remained low and unchanged (400 to 404 cases). From 2010 to 2019, the highest increase in NAFLD prevalence among teenagers was seen in the low-middle SDI quantile (APC = +1.04% [0.95%–1.14%]), followed by those in low SDI quintile (APC = +0.74% [1.09%–1.28%]) and high SDI quintile (APC = +0.25% [0.17%–0.33%]).

Conclusion: The global prevalence of NAFLD among teenagers is increasing. Although death rates are low, it is expected that the growing prevalence of NAFLD among young populations will drive future liver mortality. Regional and global policies should address NAFLD as an important non-communicable disease.

TOP-082

Identification of a new gene signature that accurately predicts the risk of hepatic decompensation in non-alcoholic fatty liver disease

Maria Jimenez Ramos1, Timothy Kendall1, Jessica Minnier2,3, Lucia Bandiera4,5, Jonathan Fallowfield1.
1University of Edinburgh, Centre for Inflammation Research, Edinburgh, United Kingdom; 2Oregon Health and Sciences University, OHSU-PSU School of Public Health, Portland, United States; 3Oregon Health and Sciences University, Knight Cancer Institute Biostatistics Shared Resource, Portland, United States; 4Edinburgh University, Institute for Bioengineering, Edinburgh, United Kingdom; 5University of Edinburgh, Centre for Engineering Biology, Edinburgh, United Kingdom

E-mail: jonathan.fallowfield@ed.ac.uk

Background and aims: The global burden of non-alcoholic fatty liver disease (NAFLD) continues to rise, magnifying the unmet need for tools to enable patient stratification and prognostication. The use of molecular features to predict patient outcomes is unexplored. Using SteatoSITE (https://steatosite.com/), a national-level resource containing integrated time-stamped pathological, transcriptomic and clinical outcome data from NAFLD patients, we aimed to identify genes associated with a higher risk of hepatic decompensation events in patients with advanced fibrotic NAFLD.

Method: Hepatic bulk RNA-sequencing data from needle biopsies showing NASH-CRN stage F3/F4 fibrosis (n = 226) was compared with samples showing stage F0/F1 fibrosis (n = 295). We performed differential gene expression analysis to identify genes with potential to predict a composite outcome of hepatic decompensation events. Ten runs of the 10-fold cross-validated LASSO-penalised Cox regression was used for feature reduction and subsequent development of a model to subdivide patients into high- and low-risk prognostic groups. We evaluated both groups with Kaplan-Meier (K-M) curves and log-rank test. A time-dependent receiver operating characteristic (ROC) curve was used to evaluate the model predictive ability.

Results: Advanced fibrosis stages (F3/F4) were predictive of subsequent decompensation (p < 0.0001). We identified 1127 dysregulated genes when comparing F3/F4 and F0/F1 patients. When performing the LASSO Cox regression model with these differentially expressed genes, 15 were associated with decompensation events, some of which could translate to circulating biomarkers based on initial analysis using the TexSEC (Translation of tissue gene expression to secretome) tool. Furthermore, there are biologically plausible links to hepatic decompensation for several of the 15-gene panel such as DPEP1 (implicated in acute kidney injury), CXCL1 (a potential biomarker for acute-on-chronic liver failure), CLEC4M (a pathogen-recognition receptor involved in peripheral immune surveillance in liver) and CTGF (a multigain fibrogenic master switch and tractable therapeutic target). The generated risk scores were positively associated with decompensation events and the K-M curves delineate clear prognostic separation into high-risk and low-risk groups (p < 0.0001). The measured performance by areas under the ROC curve (AUROCs) were 0.86, 0.81 and 0.83 for 1, 3 and 5 years, respectively.

Conclusion: We have identified a 15-gene signature that predicts the risk of decompensation in patients with advanced NAFLD. Further validation is required in a suitable NAFLD cohort with integrated pathology, transcriptomics and clinical outcomes. This data provides new insights into the pathobiology of NAFLD and sheds light on new potential biomarkers and therapeutic targets.

TOP-088

Altered gut barrier integrity as a mediator of host-microbiome interactions in diabetic patients with advanced Non-alcoholic fatty liver disease

Robert Forlano1, Laura Martinez-Gili1, Jesus Miguens Blanco1, Charlotte Skinner1, Mark Thursz1, Julian Marchesi1, Benjamin H. Mullish1, Pinelopi Manousoiu1, 1Imperial college London, Liver unit, Department of Metabolism, Digestion and Reproduction, London, United Kingdom

E-mail: r.forlano@imperial.ac.uk

Background and aims: Aberration of the complex crosstalk between the intestine and the liver, so-called the “gut-liver axis,” has been to be a contributory factor in the development and progression of liver disease in patients with Non-alcoholic fatty liver disease (NAFLD).

Method: Consecutive patients with T2DM were screened for liver disease by bloods, ultrasound and liver stiffness measurements (LSM). Elevated LSM was defined as LSM ≥ 8.1 kPa. Microbiota composition was analysed in stools by 16S rRNA gene sequencing, while metabolites were measured by liquid chromatography-mass spectrometry. Microbiome signatures were analysed in the whole
population (unmatched), as well as in subsets matched for metabolic factors (NAFLD vs non-NAFLD and elevated vs normal LSM). An in-vitro model of gut permeability was set up using monolayers of Madin-Darby canine kidney cells. Permeability was estimated by trans-epithelial electric resistance (TEER) on epithelial volt/ohm meter. Faecal water was derived by stool samples, while E. faecalis spent medium and phosphate-buffered saline were used as positive and negative controls.

**Results:** Overall, stools from 89 patients were analysed: 17 (17%) had normal liver, 54 (55%) NAFLD and normal LSM and 17 (17%) NAFLD and elevated LSM. Only three ASV were different across unmatched groups: Anaeroplasma and Escherichia/Shigella ASV were higher, and Butyricicoccus ASV lower in those with normal liver (Fig. 1A). In the matched groups, Butyricicoccus ASV was significantly higher in those with NAFLD vs non NAFLD (Fig. 1B). Among those with NAFLD, Butyricicoccus ASV was significantly higher in those with normal LSM vs those with elevated LSM (Figure 1C). Overall, 12 stool samples were used for the gut permeability. Faecal water from patients with NAFLD and elevated LSM (n = 4) caused the greatest drop in the TEER vs those with normal liver (n = 5), suggesting a leaky monolayer (Fig. 1D). Clinically, TEER correlated inversely with BMI (p = 0.029) and waist (p = 0.019) and positively with LSM (p = 0.009) and AST (p = 0.036). Fecal valerate was significantly lower in those with elevated LSM, compared to normal liver (0.28 vs 0.47 mmol/l, p = 0.007) (Fig. 1E).

**Conclusion:** In patients with NAFLD, a greater abundance of butyrate-producing bacteria in patients with NAFLD may represent an adaptive response to depleted pectin-degrading bacteria. In those with advanced liver disease, such adaptation may fail and translate into leakier gut and lower production of short-chain fatty acids. Restoring butyrate-producing bacteria could represent a valuable target to treat the disease.
Background and aims: The systematic screening for non-alcoholic fatty liver disease (NAFLD)-related advanced fibrosis (AF) is currently recommended in high-risk population such as patients with type 2 diabetes (T2D) and/or obesity. However, there are limited prospective data from patients enrolled and systematically assessed using transient elastography (TE) in diabetology. Therefore, we aimed to examine the utility of non-invasive tests (NITs) and the prevalence of AF in a prospectively recruited population in diabetology.

Method: This is a multicenter prospective study (NAFLD-Care: NCT04435054), including patients with T2D and/or obesity and NAFLD, age between 40–80 years old and BMI <40 kg/m^2, enrolled in a systematic screening for NAFLD-related AF in four diabetology departments in France from October 2020 to November 2022. All patients underwent a standardized research visit with fasting labs including Fibrotest® and liver assessment by TE using a FibroScan®. All other causes of liver disease were systematically excluded. The presence of AF was determined after assessment in hepatology by either histological fibrosis stage ≥F3 or overt imaging diagnosis of cirrhosis or concordant TE ≥8 kPa and Fibrotest® ≥F3 according to EASL guidelines.

Results: Of 487 patients screened, 461 met eligibility. The mean age and BMI were 59.5 years (± 9.8) and 32.7 kg/m^2 (± 4.1), 46% were female, 75.5% had obesity, 87.4% had T2D, 72.2% were treated for dyslipidemia and 67.9% had hypertension. Among them, 55.5% had a female, 75.5% had obesity, 87.4% had T2D, 72.2% were treated for diabetology.

Conclusions: This prospective community-based cohort study included 326 participants who underwent liver biopsy and CT at baseline, with serial vibration-controlled transient elastography (VCTE) every 1 or 2 years. Fibrosis progression was defined as either an increase in liver stiffness measurement (LSM) more than 20% compared to baseline for patients with advanced fibrosis (≥F3) or an LSM more than 9.6 kPa for patients with fibrosis stage 0 to 2. Axial muscles of the third lumbar vertebral level CT image were analyzed with DeepCatch software. Skeletal muscle areas (SMAs) were categorized by predetermined Hounsfield Unit (HU) thresholds as normal-attenuation muscle area (NAMA; >30 to <150 HU), low-attenuation muscle area (LAMA; ≥8 to <30 HU), and intermuscular adipose tissue (IMAT; ≥30 HU). NAMA, LAMA, and IMAT were associated with higher odds of fibrosis progression (HR, 1.37; 95% CI, 1.13–1.67). NAMA, LAMA, and IMAT were associated with higher odds of fibrosis progression (HR, 1.37; 95% CI, 1.13–1.67). NAMA also showed an increased dose-dependent risk of progression (HR, 1.37; 95% CI, 1.06–1.77), while NAMA did not (HR, 1.05; 95% CI, 0.78–1.42).

Conclusion: Increased low quality muscle mass, but not decreased normal-quality muscle mass, predicts fibrosis progression in patients with biopsy-proven NAFLD. Evaluation of the severity of myosteatosis may help select subjects requiring closer monitoring and early intervention to alleviate fibrosis progression.

THU-411
Low-quality muscle mass predicts fibrosis progression in a prospective biopsy-proven non-alcoholic fatty liver disease cohort

Sae Kyung Jou1, Yong Jin Jung1, Won Kim1. 1Seoul National University Seoul Metropolitan Government Boramae Medical Center, Internal Medicine, Seoul, Korea, Rep. of South
E-mail: wonshiri@yahoo.com

Background and aims: Muscle quality rather than muscle mass has been suggested to play a pivotal role in the deterioration of non-alcoholic fatty liver disease (NAFLD). The muscle quality map developed for computed tomography (CT) images can separately assess normal-quality muscle mass, low-quality muscle mass, and intermuscular adipose tissue. We evaluated the predictive role of each skeletal muscle mass compared by muscle quality in fibrosis progression up to advanced fibrosis in a NAFLD cohort.

Method: This prospective community-based cohort study included 326 participants who underwent liver biopsy and CT at baseline, with serial vibration-controlled transient elastography (VCTE) every 1 or 2 years. Fibrosis progression was defined as either an increase in liver stiffness measurement (LSM) more than 20% compared to baseline for patients with advanced fibrosis (≥F3) or an LSM more than 9.6 kPa for patients with fibrosis stage 0 to 2. Axial muscles of the third lumbar vertebral level CT image were analyzed with DeepCatch software. Skeletal muscle areas (SMAs) were categorized by predetermined Hounsfield Unit (HU) thresholds as normal-attenuation muscle area (NAMA; >30 to <150 HU), low-attenuation muscle area (LAMA; ≥8 to <30 HU), and intermuscular adipose tissue (IMAT; ≥30 HU). NAMA, LAMA, and IMAT were associated with higher odds of fibrosis progression (HR, 1.37; 95% CI, 1.06–1.77), while NAMA did not (HR, 1.05; 95% CI, 0.78–1.42).

Conclusion: Increased low quality muscle mass, but not decreased normal-quality muscle mass, predicts fibrosis progression in patients with biopsy-proven NAFLD. Evaluation of the severity of myosteatosis may help select subjects requiring closer monitoring and early intervention to alleviate fibrosis progression.
single-centre patient cohorts. The aim of this study was to assess incident comorbidities, and long-term outcomes/mortality in this cohort and seek predictors of adverse outcomes.

**Method:** Participants with biopsy proven NAFLD with a minimum of 12 months follow-up were recruited from the Newcastle Hospitals between 1990–2018. Data was collected at clinical events and outcomes of interest included co-morbidities, disease progression and adverse liver events such as HCC, liver transplantation and death. Outcomes were explored using Kaplan Meier log-rank test and Cox regression analysis. All cases were censored prior to the COVID19 pandemic to avoid this as a potential confounder.

**Results:** 605 patients (57% male; age 52 ± 13 years; 47.5% T2DM; BMI 34.7 ± 5.6 kg/m²) were included with a mean follow-up time of 11.8 ± 7.3 years. 116 (19.2%) had cirrhosis at baseline, with 50 (10.2%) cases progressing to cirrhosis during follow-up (mean time to cirrhosis diagnosis 10.0 ± 7.0 years). Incidence of metabolic co-morbidities (T2DM, HTN and MetS) increased over follow-up. 24 (4.0%) participants were diagnosed with HCC and 10 patients received a liver transplant. 112 patients (18.5%) died (mean age at death 64 ± 13 years and mean time to death 10.1 ± 6.0 years). Liver disease was the most common cause of death (28.6%), followed by cardiovascular disease (20.5%) and extra-hepatic malignancy (20.5%). Factors associated with all-cause mortality included fibrosis stage at baseline (aHR 8.31, 95% CI 4.31–16.01), T2DM (aHR 1.98, 95% CI 1.25–3.14), IHD (aHR 2.31, 95% CI 1.27–4.20) and “high risk” FIB-4 (aHR 10.02, 95% CI 6.14–16.35).

**Conclusion:** Liver related mortality was found to be the most common cause of death in a large, single centre cohort of NAFLD patients from the U.K. Factors which predicted adverse outcomes included T2DM, IHD, baseline fibrosis stage and “high risk” FIB-4 scores.

---

**THU-413**

Deep dive analysis into the screening failure reasons: combined data from multiple therapeutic clinical trials including more than 5000 patients (in collaboration with NAIL-NIT consortium)

Jörn Schattenberg¹, Julie Dubourg², Mazen Noureddin³, Naim Alkhouri⁴, Vlad Ratziu⁵, Michael Charlton⁶, Sophie Jeannin Megnien², Stephen Harrison⁷.

¹Metabolic Liver Research Program, University Medical Center of the Johannes Gutenberg-University, Mainz, Germany, Germany; ²Summit Clinical Research, San Antonio, United States; ³Houston Methodist Hospital, Houston, United States; ⁴Arizona Liver Health, Chandler, United States; ⁵Institute for Cardiometabolism and Nutrition, France; ⁶UChicago Medicine, Chicago, United States; ⁷University of Oxford, United Kingdom

**E-mail:** jdubourg@summitclinicalresearch.com

**Background and aims:** High screen failure (SF) rates in clinical trials for non-alcoholic steatohepatitis (NASH) are a major challenge and pose a high burden for patients, study centers and sponsors. We aimed to describe the main reasons for SF across multiple studies and compare the characteristics of patients meeting the liver biopsy eligibility criteria versus those who failed.

**Method:** We combined screening data from 7 ongoing non-cirrhotic NASH phase 2 trials. The percentage of patients failing to meet potential eligibility were assessed using common thresholds for non-invasive tests (NITs). Predictors of NASH, non-alcoholic fatty liver disease activity score (NAS) ≥4 and at least fibrosis stage 2, were examined using logistic regression and excluding patients with cirrhosis.

**Results:** 4808 patients with laboratory results were included. Among them: 1169 (24%) had AST ≤20 IU/L, 248 (5%) had platelets <150 G/L, 189 (4%) had glycated hemoglobin (HbA1c) >9.5%, 185 (4%) had eGFR <60 ml/min, 172 (4%) had total bilirubin >1.3 mg/dL, and 37 (1%) had AST and/or ALT >200 U/L. 2389 patients underwent a magnetic resonance imaging estimated proton density fat fraction (MRI-PDFF).
382 (16%) of them had a liver fat content (LFC) <8%. 2259 patients underwent a biopsy of which 924 (41%) had no NASH with 910 (98%) of those failing the histology criteria for the absence of ballooning. Among the patients with NASH, 135 (10%) had a NAS <4. Among the 2259 patients with biopsy, 1355 (60%) did not meet the common biopsy eligibility criteria (NASH + NAS ≥ 4 + Fibrosis 2 or 3), including 104 (5%) patients with cirrhosis. The patients meeting biopsy eligibility criteria were older with higher HbA1c, liver enzymes, FIB-4 and FAST levels (Table). Among 166 patients with AST <20 IU/L at screening and having underwent a liver biopsy, 147 (89%) did not meet the eligibility criteria.

Causes of death in patients with biopsy-proven NAFLD at time of death were more common than death in liver-related causes. Different management strategies and goals according to fibrosis stage at time of diagnosis can be implemented in patient counselling to improve prognosis.

**THU-414**

**Causes of death by fibrosis stage in 959 biopsy-proven NAFLD patients**

Ying Shang1, Camilla Akbari1, Maja Dodd1, Patrik Nasr1,2, Johan Vessby1, Fredrik Rorsman1, Stergios Kechagias2, Per Stal1, Mattias Ekstedt1, Hannes Hagström1. 1Department of Medicine, Huddinge, Karolinska Institutet, Stockholm, Sweden; 2Department of Gastroenterology and Hepatology and Department of Health, Medicine, and Caring Sciences, Linköping University, Linköping, Sweden; 3Dept of Gastroenterology and Hepatology, Uppsala University Hospital, SE-751 85 Uppsala, Sweden; E-mail: ying.shang@ki.se

**Background and aims:** Causes of death in patients with non-alcoholic fatty liver disease (NAFLD) may differ based on the fibrosis stage at diagnosis. Our aim was to assess the distribution of different causes of death by fibrosis stage in patients with biopsy-proven NAFLD.

**Method:** We conducted a retrospective cohort of 959 biopsy-proven patients with NAFLD enrolled from three university hospitals in Sweden between 1974 and 2020. Causes of death were classified by ICD codes from the Swedish Causes of Death Register until the end of 2021. Liver-related deaths were defined as hepatocellular carcinoma, cirrhosis, decompensated cirrhosis, or liver failure.

**Results:** Among 959 patients (mean age at biopsy 49.5 years, 61.7% male), 335 (34.9%) died during a median follow-up of 17.9 years (IQR 8.0–28.5). Mean age at death was 74.6 years and 52.7% were male. Of these, 75 (33.8%) patients in F0, 120 (32.4%) in F1, 69 (32.7%) in F2, 45 (45%) in F3, and 26 (47.3%) in F4 died. Liver-related mortality was the leading cause of death for patients with F4 (53.9%), followed by extrahepatic cancer (15.4%) and respiratory diseases (11.5%) (Figure). In non-cirrhotic patients with NAFLD (F0-F3), liver-related mortality increased with the severity of fibrosis stage (6.8% in F0, 10.8% in F1, 14.5% in F2, 17.8% in F3). However, these patients’ death attributable to cardiovascular diseases and extrahepatic cancers were more common than death in liver-related causes.

**Conclusion:** In patients with NAFLD and cirrhosis at diagnosis, liver disease is the most common cause of death. In patients with no or non-cirrhotic fibrosis, cardiovascular and extrahepatic cancer death were more common than liver-related death. Different management strategies and goals according to fibrosis stage at time of diagnosis can be implemented in patient counselling to improve prognosis.

**THU-415**

**Glucose and lipid metabolism alterations after an oral lipid meal in patients with non-alcoholic fatty liver disease carrying the PNPLA3 rs738409 polymorphism**

Chiara Rosso1, Fabrizia Carli2, Francesca Saba1, Gian Paolo Caviglia1, Samantha Pezzica1, Patrizia Infelise2, Angelo Armandi1, Marta Guariglia1, Daphne D’Amato1, Maria Lorena Abate1, Antonella Olivero1, Nuria Pérez Diaz del Campo1, Gabriele Castelnuovo3, Federico Salomone1, Giorgio Maria Saracco1, Roberto Gambino1, Elisabetta Bugianesi1, Amalia Gastaldelli2.

1University of Turin, Department of Medical Sciences, Italy; 2Institute of Clinical Physiology, CNR, Pisa, Cardiometabolic Risk Unit, Italy; 3Azienda Sanitaria Provinciale di Catania, U.O.C. di Gastroenterology, Italy; E-mail: chiara.rosso@unito.it

**Background and aims:** In subjects with non-alcoholic fatty liver disease (NAFLD), hepatic fat accumulation is the result of insulin resistance (IR) and the impairment of hepatic glucose and lipid metabolism. In addition, the rs738409 C>T patain-like phospholipase domain-containing 3 (PNPLA3) polymorphism is one of the main predisposing factors for the onset and progression of NAFLD and hepatic fibrosis. Here, we aimed to assess if PNPLA3 rs738409 polymorphism may affect both glucose and lipid metabolism in a
group of non-diabetic subjects with biopsy-proven NAFLD who underwent an oral lipid meal coupled with tracers.

**Method:** We have studied glucose and lipid metabolism after a lipid load (200 ml dairy cream and egg yolk) in 20 subjects with biopsy proven NAFLD (18 male; median age 41 years, range: 23–57) and 9 healthy controls (CT). Tracers (6, 2H2-glucose and 2H5-glycerol) were infused for 120 min before meal, and 240 min after lipid load to evaluate glucose metabolism (endogenous glucose production [EGP] and glucose clearance[GlucClear]) and lipolysis. Throughout the test, we measured glucose, insulin (INS), free fatty acids (FFAs) composition, triglyceride (TG) and cholesterol profile. IR components were derived from tracers as follow: hepatic IR (Hep-IR = EGP × INS), adipose tissue IR (Lipo-IR = lipolysis × INS or AT-IR = FFAs × INS). Genotyping was performed by allelic discrimination assay. The mean value of the area under the curve (mAUC) was calculated for each variable.

**Results:** Prevalence of PNPLA3 rs738409 G minor allele was 75% (15/20) in NAFLD patients and 44% (4/9) in CT (p = 0.116). During fasting, EGP, lipolysis and GC were similar in both groups even if NAFLD subjects were more insulin resistant than CT (Hep-IR: 88 vs. 52, p = 0.004; Lipo-IR 24 vs. 13, p = 0.011; AT-IR: 5.1 vs. 4.4, p = 0.043). When we compared NAFLD patients carrying the PNPLA3 G risk allele with those carrying the CC genotype, we showed no differences in fasting EGP, lipolysis, GC and IR components. Conversely, during lipid load, lipolysis was more suppressed in subjects who carried the PNPLA3 CC genotype and in CT. Moreover, lipid meal reduced GlucClear with respect to baseline in CC and CG but not in GG carriers. Cholesterol profile did not change during meal in CT vs. NAFLD. Conversely, in all subjects FFAs and TG concentrations increased during the last hour (180–240 min) and TG levels were slightly higher in NAFLD subjects who carried the PNPLA3 CC genotype compared to those carrying the G minor allele, reflecting TG retention in the hepatocytes.

**Conclusion:** NAFLD patients carrying the PNPLA3 rs738409 G minor allele show an altered lipid but not glucose metabolism after an oral lipid meal. The implications of these results should be further explored.

Funded by Horizon2020 under grant agreement no.634413, EPoS

**THU-416**

**Patatin-like phospholipase domain-containing 3 (PNPLA3) risk allele increases rate of progression to end-stage liver disease outcomes and decreases survival rate over time irrespective of degree of fibrosis**

Javier Armisen1, Jenny Blau2, Nellie Fernando3, Monika Hun4, Mitra Rauschecker5, Linda Wertevik3, Ola Fjellstrom1, Dirk Paul5, Bibi Carlson5, Nils Svangård1, AstraZeneca. Early Development, Cardiovascular, Renal and Metabolism, BioPharmaceuticals, RandD, Cambridge, United Kingdom; 2AstraZeneca. Early Development, Cardiovascular, Renal and Metabolism, BioPharmaceuticals, RandD, United States; 3AstraZeneca, AI and Advanced Analytics, Data Science and Artificial Intelligence, RandD, Cambridge, United Kingdom; 4AstraZeneca, AI and Advanced Analytics, Data Science and Artificial Intelligence, RandD, Sweden; 5AstraZeneca, Early Development, Cardiovascular, Renal and Metabolism, BioPharmaceuticals, RandD, Sweden; 6AstraZeneca, Centre for Genomics Research, Discovery Sciences, RandD, United Kingdom

E-mail: javier.armisengarrido@astrazeneca.com

**Background and aims:** Non-alcoholic fatty liver disease (NAFLD) is the most common cause of chronic liver disease. Progression to Non-alcoholic steatohepatitis (NASH), can lead to cirrhosis, hepatocellular carcinoma (HCC), end-stage liver disease and death. The severity of hepatic fibrosis is the most important predictor of liver-related mortality. Among known risk factors increasing the risk of progression are genetic factors. The strongest genetic risk factor is a single-nucleotide polymorphism (rs738409) in the PNPLA3 gene I148M. The 148M allele has been associated with increased hepatic triglyceride accumulation, liver injury and fibrosis. The aim of the study was to evaluate the characteristics and progression rates to outcomes among homozygous PNPLA3 148MM risk allele carriers as compared to heterozygous carriers (PNPLA3 148IM) and non-risk allele carriers (PNPLA3 148II) utilizing the well-characterized longitudinal biopsy-confirmed NashBio cohort.

**Method:** A Cox proportional hazards model was used to determine the effect of the PNPLA3 risk allele (148MM) on liver outcomes including cirrhosis, HCC and transplant as compared with 148IM and 148II. Survival analysis was performed with adjustments for confounders including age, BMI, gender, T2DM, and fibrosis stage, censored at study drop out or death.

**Results:** The NashBio cohort (n = 1508 evaluable patients, median age 48) included biopsy-confirmed NAFL or NASH (n = 117 526 271 for Fibrosis stage = 0–1, 2–3, 4 respectively) and PNPLA3 genotypes (n = 133 509 866 PNPLA3 148MM, IM, and II, respectively) with longitudinal electronic health record follow-up over a median of 49 months (range 0–23 years). PNPLA3 148MM had a more rapid progression to end-stage liver disease outcomes when compared to 148IM and 148II individuals with a hazard ratio = 1.6 (95% CI 1.01–2.56; p = 0.05). Predicted survival analyses highlighted nearly a two-fold increase in liver events in PNPLA3 148MM over 148II at 20 years (22 vs 12%, respectively; p = 0.0079). Even after stratification of patients according to fibrosis severity, PNPLA3 148MM patients had an increased risk of liver related events compared to PNPLA3 148II patients.

**Figure:**

**Conclusion:** Biopsy-confirmed NASH homozygous PNPLA3 148MM risk allele carriers progress to liver-related outcomes significantly faster than PNPLA3 148II and 148IM carriers, adjusted for age, gender, BMI, diabetes status, and fibrosis stage.

**THU-417**

**A risk prediction model for hepatocellular carcinoma for non-alcoholic fatty liver disease without cirrhosis**

Gi-Ae Kim1, Yewan Park1, Jui Jung1, Jaeil Kim2, Han Chu Lee4, 1Kyung Hee University Hospital, Kyung Hee University, Department of Internal Medicine, Seoul, Korea, Rep. of South; 2Korea University, Department of Biostatistics, Korea, Rep. of South; 3Asan Medical Center, University of Ulsan College of Medicine, Health Screening and Promotion Center, Korea, Rep. of South; 4Asan Medical Center, University of Ulsan College of Medicine, Department of Gastroenterology, Korea, Rep. of South

E-mail: hch@amc.seoul.kr

**Background and aims:** Non-alcoholic fatty liver disease (NAFLD) is becoming a leading cause of hepatocellular carcinoma (HCC) and burden of NAFLD-related HCC is on the rise. We aimed to develop and validate an HCC risk prediction model for NAFLD patients without cirrhosis using clinical factors widely available.
Method: A nationwide cohort of non-cirrhotic NAFLD patients in Korea were recruited to develop a risk prediction model and its internal validation (n = 409,988, derivation cohort). A model using a simplified point system was developed by Cox proportional hazard model and k-fold cross-validation assessed the accuracy, discrimination, and calibration of the model. The model was externally validated using a hospital cohort recruited from Asan Medical Center (n = 8721, external validation cohort).

Results: The 10-year cumulative HCC incidence rates were 0.21% and 0.20% in the derivation and external validation cohorts. In the derivation cohort, an 11-point HCC risk prediction model for non-cirrhotic NAFLD was developed, using six independent risk factors of age, sex, diabetes, obesity, serum alanine aminotransferase level, and gamma-glutamyl transferase level (c-index 0.75). The average area under receiver operating curves (AUROCs) of the model was 0.72 at 5-year and 0.75 at 10-year. In the external validation cohort, the c-index of the model was 0.82 and the AUROCs were 0.79 [95% confidence interval (CI), 0.59–0.95] at 5-year and 0.84 (95% CI, 0.73–0.94) at 10-year. The calibration was satisfactory. Risk stratification categorized patients into minimal (0–1), low (2–6), and moderate (≥7) risk groups.

Conclusion: A novel HCC risk prediction model targeting non-cirrhotic NAFLD patients was developed and validated with a fair prediction performance. The model is expected to serve as a simple and reliable tool to assess HCC risk.

THU-418
Histological classifications versus liver-related events: results from the multicentric, European, hepatic outcomes and survival fatty liver registry (HOTSURFR) study
Vlad Ratziu1, Javier Ampuero2, Jerome Boursier3, Stergios Kechagias4, Salvatore Petta2, Frances Hagnsetroem3, Jorn Schattenberg2, Lisa Belin4, Stacy Cyrille6, Frederic Charlotte6, Leila Kara9, Pierre Bedossa10, Sorbonne Universite, France; 2Hospital Universitario Virgen del Rocío de Sevilla, Spain; 3University Hospital of Angers, France; 4Linköping University, Sweden; 5Université degli Studi di Palermo, Italy; 6Karolinska University Hospital, Sweden; 7Mainz Universität, Germany; 8Assistance Publique Hôpitaux de Paris, France; 9ICAM, France; 10Liverpark, France
E-mail: vlad.ratziu@inserm.fr

Background and aims: NASH trials assume that histological classifications predict hepatic events. We evaluated the diagnostic performance of the new European EPOS staging and SAF grading systems.

Method: Pts from 7 European centers biopsied <2011 for suspected NAFLD and with long-term follow-up were scored by the NASCHRIN and the EPOS7 tier (1 minimal fibrosis, 2 porta/portal fibrosis, 3: early bridging, 4:advanced bridging, 5 early cirrhosis, 6 advanced cirrhosis) fibrosis staging systems by a central pathologist. Activity was scored by NAS and SAF grading. Hepatic morbimortality (HMM) was a composite of liver-related death, occurrence of cirrhosis, cirrhosis decompensation events. Overall mortality, primary liver cancer (PLC), cardiovascular events (CVE) and extraphepatic malignancies (EHM) were recorded. Median follow-up was calculated by reverse Kaplan-Meier. Incidence rates were compared using log-rank test and univariate and multivariate Cox proportional hazard models were used to estimate hazard ratios (HR) for each outcome.

Results: 711 patients were included: 63% males, mean age 52 yrs, BMI 30.1 kg/m², diabetes 36%, arterial hypertension 59%, dyslipidemia 54%, daily alcohol 0–5 g; 84%, 5–20/30 g: 13%, moderate (20/30–50 g): 3%, active smokers 19%. NAS CRN stages were: F0:45%, F1:24%, F2:11%, F3:14%, F4:6%. EPOS stages were: 0–48%, 1:20%, 2:11.5%, 3:6.5%, 4.4%, 5:6%, 6:4%. Median follow-up was 11.12 yrs (0.1–20), 84 pts died (11.8%), 92 pts developed HMM (12.9%), 32 PLC (4.5%), 72 CVE (10.1%) and 80 EHM (11.3%). The 5 and 10 yr incidence of HMM was 4.8% 95% CI [3.2–6.4] and 12.7% 95% CI [10–15], and that of all-cause death 2.5% 95% CI [1.6–4.1] and 9.3% 95% CI [7–11.5]. In multivariable analysis, age, diabetes, arterial hypertension and moderate alcohol consumption were associated with an increased risk of HMM.

After adjustment for clinical variables and NAS, fibrosis stage was associated with HMM: HRs for NAS CRN: stage 1: 3.06; stage2: 11.04; stage3: 21.1; stage 4: 21.2 vs stage 0. For EPOS: stage 1: 2.3; stage 2: 8.3; stage 3: 19.8: stage 4: 18.1; stage5+6: 21.7 vs stage 0. Both staging systems had similar calibration and discrimination Harrell’s C index was 0.84 and AUROCs for cumulative incidence of HMM at 5 yrs was 0.83 and at 10 yrs 0.86. Both were significantly associated with overall survival, PLC, CVE and EHM. Histological activity by SAF was associated with HMM starting grade 2 (p < 0.001). Steatohepatitis stage 2–4 (but not 0–1) by EPOS and cirrhosis (5–6 by EPOS) were significantly associated with HMM. Only cirrhosis was associated with CVE. Baseline Fib4 risk strata were significantly associated with HMM, overall survival, PLC, cardiovascular events but not EHM.

Conclusion: This large multicentric cohort demonstrated the prognostic value of the EPOS classification. Fibrosis starting stage 1 (NAS CRN) or stage 2 (EPOS) and activity grade predicted hepatic events. (supported by a grant from Gilead Sciences)

THU-419
GL0034 (Utrexglutide), a novel, long acting, glucagon-like peptide 1 receptor agonist (GLP-1 RA), results of a phase 1 study in healthy individuals
Rajamannar Thennati1, Vinod Burade2, Muthukumaran Natarajan1, Pradeep Shahi1, Ravishankara Nagaraja1, Satish Panchal1, Sudeep Agrawal1, Bernard Jandrain3, Thierry Duvauclle3, Richard E. Pratley3, Bernard Thorens3, Tina Viibselb4, Sun Pharmaceutical Industries Ltd, High Impact Innovations-Sustainable Health Solutions (HISHS), Vadodara, India; 2Academic Hospital of Liège, Clinical Pharmacology Unit, AIT Co, Nutrition and Metabolic Disorders, Liège, Belgium; 3Phaster1, Paris, France; 4AdventHealth Translational Research Institute, Orlando, United States; 5University of Lausanne, Center for Integrative Genomics, Lausanne, Switzerland; 6University of Copenhagen, Clinical Research, Steno Diabetes Center, Copenhagen, Denmark
E-mail: rajamannar.thennati@sunpharma.com

Background and aims: GL0034 (GL) is a potent glucagon-like peptide 1 receptor agonist under development for the treatment of metabolic disorders and NAFLD/NASH. In in vivo preclinical studies GL attenuates NAFLD/NASH-relevant pathways of steatosis, liver injury and inflammation. Here, we present NAFLD/NASH relevant pharmacodynamic (PD) and safety results of a multiple ascending dose phase 1 study in healthy individuals.

Method: A randomized, double-blind, placebo (PBO)-controlled study was conducted to evaluate the safety, tolerability and PD of multiple ascending doses of GL. Healthy individuals (N = 12) with BMI 18 to 28 kg/m² were randomized (9:3) to subcutaneous GL or PBO. Individuals received weekly dose of GL for a total period of eight weeks. First, they received doses of 450 mcg over two weeks, then 900 mcg over the next two weeks and finally 1520 mcg over four weeks. Biomarker measurements included, body weight, glycated haemoglobin A1c (HbA1c), liver enzymes (alanine transaminase (ALT), aspartate aminotransferase (AST), gamma glutamyl transferase (GGT)) and lipid profiles (triglycerides (TG), total cholesterol (TC), high-density lipoprotein (HDL) and low-density lipoprotein (LDL)).

Results: GL was generally well tolerated and related adverse effects were mainly gastrointestinal with dose-dependent nausea, vomiting and decreased appetite however adverse events became less frequent over time despite increased dosing. Clinically meaningful changes in the body weight, HbA1c and lipid profile were observed when compared to baseline (Table). HDL increase at EOS (Table) and trends towards lower ALT, AST and GGT were observed vs PBO (Table).

Journal of Hepatology 2023 vol. 78(S1) | S101–S123 S607

POSTER PRESENTATIONS
**Background and aims**: Ultra-processed food (UPF) intake is associated with cardiovascular disease, poor metabolic health, and mortality. Consumption of UPFs and prevalent non-alcoholic fatty liver disease (NAFLD) have increased in parallel over recent years, but little is known about the association between the two. We performed a cross-sectional, retrospective, observational study to examine the relationship between consumption of UPFs and presence of liver steatosis and fibrosis in Framingham Heart Study (FHS) participants.

**Method**: We evaluated FHS participants from the 2016–2019 exam cycle who completed vibration-controlled transient elastography and had valid dietary data (n = 2507, mean age 55 years, 55.6% female). Participants with missing covariate data and excessive alcohol use were excluded from the analysis. Diet was assessed via the self-administered semi-quantitative Harvard food frequency questionnaire and was categorized by level of food processing via the NOVA system, which groups food items by level of industrial processing. We used multivariable-adjusted logistic regression models to evaluate the association of energy-adjusted UPF intake (per 1 standard deviation unit and by quintile) with imaging-defined hepatic steatosis (Controlled Attenuation Parameter ≥ 290 dB/m), fibrosis (Liver Stiffness Measurement [LSM] ≥ 8.2 kPa), and hepatic steatosis with fibrosis (CAP ≥ 290 dB/m and LSM ≥ 8.2 kPa); separate models for each outcome. Our primary model adjusted for age, sex, smoking, alcohol intake, physical activity and intake of remaining NOVA levels. Additional models adjusted for diet quality index or body mass index (BMI).

**Results**: Prevalence of hepatic steatosis, fibrosis, and steatosis with fibrosis was 29.72%, 9.77% and 5.42%, respectively. We observed a statistically significant positive association of UPF consumption with presence of hepatic steatosis (OR 1.33 [95% CI 1.21, 1.46]) per SD-increase, i.e. 2.3 servings/day), fibrosis (OR 1.15 [1.01, 1.31]) and hepatic steatosis with fibrosis (OR 1.24 [1.06, 1.47]; Table). Associations were similar when accounting for an index of diet quality (Table). When accounting for BMI, the association between UPF consumption and hepatic steatosis remained significant (OR 1.13...
Background and aims: Non-alcoholic fatty liver disease (NAFLD) can develop in persons without obesity. PNPLA3 genetic variant is associated with NAFLD, cirrhosis, and hepatocellular carcinoma (HCC) but its association with non-liver outcomes is unknown. We investigated the association between PNPLA3 genetic variants and mortality and risk of liver and non-liver outcomes among NAFLD patients with and without obesity.

Method: We conducted a retrospective cohort study of NAFLD patients with PNPLA3 data available. NAFLD was defined using imaging, transient elastography, or biopsy without other liver diseases. We excluded patients with baseline cirrhosis or cancer, underweight, histrionic surgery, or missing data on body mass index (BMI). The primary outcome is the association between PNPLA3-rs738409 genotype and incident (hazard ratio [HR] and 95% confidence interval [CI]) cirrhosis, liver-related events (LREs) (ascites, variceal bleeding, hepatic encephalopathy, or HCC), cardiovascular disease (CVD), diabetes (DM), cancers, and mortality among obese and non-obese NAFLD patients without prevalent outcomes. The multivariable model was adjusted for age, sex, and genetic principal components 1–10 to account for race/ethnicity. Analyses of the total population were also adjusted for body mass index category.

Results: A total of 3039 patients with NAFLD: 259 lean, 652 overweight, and 2128 obese, followed for a median of 54.7 months and total follow-up of 15311 person-years were studied. 84.1% were Caucasian, 6.4% African American, and 3.3% Asian. PNPLA3 genotype was CC, CG, and GG in 52.7%, 38.1%, and 9.2% of patients overall; 43.2%, 38.0%, and 8.7% of obese patients; and 51.4%, 38.3%, and 10.3% of lean/overweight patients (p > 0.05). NAFLD patients with PNPLA3 GG but not those with CG genotype had higher incidence of cirrhosis compared to patients with CC genotype. PNPLA3 GG was significantly associated with LREs in obese but not in non-obese NAFLD. PNPLA3 genetic variants were not associated with all-cause mortality or incidence of CVD, DM, or cancer.

Conclusion: Among patients with NAFLD, PNPLA3 GG but not CG genotype was associated with higher incidence of cirrhosis in non-obese and obese patients and with LREs in obese patients. Clinical trials of NAFLD treatment should stratify for PNPLA3 genotype.
Background and aims: Prognosis of NAFLD can be difficult to predict without liver biopsy. Previous studies have been focused on assessing the prognostic performance of non-invasive fibrosis scoring systems ascertained at NAFLD diagnosis (baseline). The aim of this study was to examine whether adding time-varying variables for these scores improves prediction of long-term outcomes in NAFLD patients.

Method: This is a retrospective cohort study of 2290 NAFLD patients diagnosed at the Seoul National University Hospital between January 2001 and December 2016. Primary outcomes were overall mortality, composite liver-related outcomes (liver transplant, cirrhosis, hepatocellular carcinoma), and composite cardiovascular outcomes (myocardial infarction, ischemic stroke, heart failure, peripheral artery disease). Multivariable Cox regression models with baseline and time-varying values of the fibrosis scoring systems including fibrosis-4 index (FIB-4) (high risk for advanced fibrosis: >2.67; intermediate risk: 1.30–2.67; low risk:<1.30) and NAFLD fibrosis score (NFS) (high-risk: >0.676; intermediate risk: −1.455–0.676; low-risk:<−1.455) were fit to the data separately, to assess the association between baseline/current value of these scores at the visit and the primary outcomes.

Results: The median follow-up was 10.4 years. During follow-up, 217 deaths, 132 liver-related outcomes, and 320 cardiovascular events occurred. In the multivariable Cox regression models with baseline score considered, higher baseline NFS (high-versus low-risk group) was associated with higher risk of mortality (adjusted hazard ratio (aHR) = 2.72, 95% Confidence Interval (CI): 1.38–5.37), liver-related outcomes (aHR = 3.49, 95%CI: 1.21–10.07), and cardiovascular events (aHR = 1.12, 95%CI: 0.59–2.12). Similar findings were observed for the association of baseline FIB-4 (high-versus low-risk group) with mortality (aHR = 2.56, 95%CI: 1.48–4.42), liver-related outcomes (aHR = 11.38, 95%CI: 6.04–21.45), and cardiovascular events (aHR = 1.10, 95%CI: 0.62–1.95). In models with time-varying scores considered, stronger association was observed. For NFS, higher current value (high-versus low-risk group) was associated with higher risk of mortality (aHR = 2.89, 95%CI: 1.59–5.26), liver-related outcomes (aHR = 6.36, 95%CI: 2.52–16.09), and cardiovascular events (aHR = 1.18, 95%CI: 0.66–2.10). For FIB-4, higher current value (high-versus low-risk group) was associated with higher mortality (aHR = 2.81, 95%CI: 1.66–4.76), liver-related outcomes (aHR = 14.55, 95%CI: 7.47–28.34), and cardiovascular events (aHR = 1.24, 95%CI: 0.71–2.19).

Conclusion: Current values of FIB-4 and NFS were associated with long-term outcomes. In addition to the baseline measurement, a routine monitoring on these scores is important in predicting prognosis of NAFLD patients.

THU-423
Long-term prognosis of patients with non-alcoholic fatty liver disease: a retrospective cohort study to understand the impact of surrogate disease end points on long-term outcomes in South Korea
Sungwon Chung1, Min Kyung Park1, Xiao Zhang2, Tongtong Wang2, Thomas Jemielita2, Gail Fernandes2, Samuel Engel2, Heejoon Jang1,3, Yun Bin Lee1, Eun Ju Cho1, Jeonghoon Lee1, Su Jong Yu1, Thomas Jemielita2, Gail Fernandes 2, Samuel Engel 2, Heejoon Jang 1,3, 1Seoul National University College of Medicine, Department of Internal Medicine and Liver Research Institute, Korea, Rep. of South Korea, 2Seoul Metropolitan Government Seoul National University Boramae Medical Center, Department of Internal Medicine, Korea, Rep. of South Korea, E-mail: yoonjun@snu.ac.kr

Table (abstract: THU-422).
THU-424
Prevalence of extrahepatic manifestations in non-alcoholic fatty liver disease in lean individuals compared to non-lean individuals
Majd Aboua,1 Claire Faulkner,1 Pooja Rangan,2 Vincent Chen,1 Cheng Han Ng3, Fang Li3, Karin Wijarnpreecha4-7. 1The university of arizona college of medicine-phoenix, Phoenix, United States; 2The university of arizona college of medicine-phoenix, division of clinical data analytics and decision support, Phoenix, United States; 3University of michigan health system, division of gastroenterology and hepatology, department of internal medicine, Ann arbor, United States; 4Jong loo lin school of medicine, Singapore, Singapore; 5The university of texas health science center at houston, school of biomedical informatics, Houston, United States; 6The university of arizona college of medicine-phoenix, Department of medicine, Division of gastroenterology and hepatology, Phoenix, United States; 7Banner-university medical center phoenix, Department of internal medicine, Division of gastroenterology and hepatology, Phoenix, United States
E-mail: aboua@arizona.edu

Background and aims: Non-alcoholic Fatty Liver Disease (NAFLD) has increased in prevalence worldwide in recent years. Data from multi-center study regarding NAFLD in lean individuals are lacking and whether they have higher prevalence of cardiovascular disease (CVD), cirrhosis, and extrahepatic manifestations than non-lean patients with NAFLD still inconclusive. Thus, we conducted a multi-center study to estimate the prevalence of cirrhosis and extrahepatic manifestations among NAFLD.

Method: A multi-state health system based study was conducted on NAFLD patients seen at the Banner Health System, from 2012 to 2022 using ICD Code. Patients with other causes of liver disease, alcohol-related diseases, underweight, baseline uncompensated cirrhosis, cancer, prior bariatric surgery, or missing data on race, BMI, aspartate and alanine aminotransferase, and platelet were excluded. Patients were defined as lean, overweight, class obesity I, and class obesity II-III. The primary outcomes are the prevalence of cirrhosis, CVD, diabetes mellitus (DM), and chronic kidney disease (CKD) among lean versus non-lean patients. We performed a multivariable logistic regression analysis to determine the risk of disease prevalence adjusted for multiple confounders.

Results: Of the 51 452 patients in the cohort, 9.60 % were lean, 23.73 % were overweight, 28.97 % were obese class I, and 37.70 % were obese class II-III. The median age was 52 years with 63.33 % White, 27.96 % Hispanic, 3.45 % Black, 2.31 % Native American/Alaskan, and 0.97 % Asian/Pacific Islander. Prevalence of DM was 25.54 % in lean and 40.06 % in non-lean individuals. In the multivariate analysis, patients who were overweight, obese class I, or obese class II-III patients had lower % in non-lean individuals. In the multivariate analysis, patients who were overweight, obese class I, or obese class II-III patients had lower % in non-lean individuals.

Conclusion: In this large cohort of patients with NAFLD, lean persons with NAFLD had higher prevalence of CVD than non-lean persons despite lower prevalence of DM. Intervention to optimize CVD risk is warranted in lean patients with NAFLD.

THU-425
De novo lipogenesis discriminates advanced hepatic fibrosis after an oral glucose load in non-obese subjects with non-alcoholic fatty liver disease
Chiara Rosso1, Fabrizia Carli2, Angelo Armandi1, Samantha Pezzica2, Patrizia Infrilise2, Francesca Saba1, Gian Paolo Caviglia1, Marta Guariglia1, Nuria Pérez Diaz del Campo1, Gabriele Castelnovu1, Amina Abdul1, Maria Lorena Abate1, Federico Salomone1, Antonella Olivero1, Giorgio Maria Saracco1, Roberto Gambino1, Amalia Gasalde1, Elisabetta Bugianesi1. 1University of Turin, Department of Medical Sciences, Italy; 2Institute of Clinical Physiology, CNR, Cardiometabolic Risk Unit, Italy; 3Azienda Sanitaria Provinciale di Catania, U.O.C. of Gastroenterology, Italy
E-mail: chiara.rosso@unito.it

Background and aims: Elevated free fatty acid (FFA) flux and hepatic triglycerides accumulation after a mixed meal are characteristic features of non-alcoholic fatty liver disease (NAFLD). De novo lipogenesis (DNL) is up to 3-fold higher in NAFLD compared to healthy controls. Under DNL stimulation, the production of saturated FFA is increased and leads to oxidative stress, inflammation thus enhancing hepatic fibrogenesis. Here, we used a marker of DNL (DNLi) to evaluate its relationship with hepatic fibrosis in a group of non-diabetic subjects with biopsy-proven NAFLD who underwent an oral glucose load.

Method: We have studied glucose and lipid metabolism during fasting in 45 non-diabetic subjects with biopsy proven NAFLD (35 male; median age 41 years, range: 23–57). Among them, 25 patients underwent a double tracers oral glucose tolerance test (dtOGTT). Tracers (6, 6-2H2-glucose and 2H5-glycerol) were used to assess glucose and lipid metabolism (lipolysis). Throughout the study we measured glucose, insulin (INS), free fatty acids (FFAs) composition, triglyceride (TG), oxidized low density lipoprotein (ox-LDL) and cholesterol profile. DNLi was derived as the ratio palmitic/linoleic acid. The area under the curve (AUC) was calculated for each variable.

Results: Overall, fasting DNLi was associated with BMI (r = 0.31, p = 0.04), TG levels (r = 0.29, p = 0.05) and FFAs levels (r = 0.36, p = 0.002). Among FFAs, DNLi significantly correlated with palmitic acid (p < 0.001), stearic acid (p < 0.001) and oleic acid (p < 0.001). Concerning liver histology, fasting DNLi correlated with the degree of hepatic steatosis (r = 0.34, p = 0.027) and showed a stepwise increase in patients with stages B and C.

Table (abstract: THU-424).

<table>
<thead>
<tr>
<th>BMI category</th>
<th>Any CVD</th>
<th>Coronary artery disease</th>
<th>Peripheral artery disease</th>
<th>Cerebrovascular accident</th>
<th>Congestive heart failure</th>
<th>Cirrhosis</th>
<th>CKD stage ≥3</th>
<th>Type II DM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lean</td>
<td>OR (95 % CI)</td>
<td>p value</td>
<td>OR (95 % CI)</td>
<td>p value</td>
<td>OR (95 % CI)</td>
<td>p value</td>
<td>OR (95 % CI)</td>
<td>p value</td>
</tr>
<tr>
<td>Overweight</td>
<td>0.73 (0.67–0.80)</td>
<td>&lt;0.001</td>
<td>0.77 (0.70–0.85)</td>
<td>&lt;0.001</td>
<td>0.75 (0.68–0.82)</td>
<td>&lt;0.001</td>
<td>0.65 (0.57–0.73)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Obesity class I</td>
<td>0.73 (0.66–0.80)</td>
<td>&lt;0.001</td>
<td>0.82 (0.74–0.89)</td>
<td>&lt;0.001</td>
<td>0.67 (0.60–0.75)</td>
<td>&lt;0.001</td>
<td>0.72 (0.64–0.87)</td>
<td>0.032</td>
</tr>
<tr>
<td>Obesity class II-III</td>
<td>0.78 (0.71–0.85)</td>
<td>&lt;0.001</td>
<td>0.84 (0.76–0.92)</td>
<td>&lt;0.001</td>
<td>0.60 (0.54–0.68)</td>
<td>&lt;0.001</td>
<td>0.98 (0.88–1.02)</td>
<td>0.732</td>
</tr>
</tbody>
</table>

Abbreviations: CI, confidence interval; OR, odds ratio.
*OR adjusted for age, sex, smoking status, hypertension, dyslipidemia, DM, and aspirin and statin use.

For Type II DM, OR was adjusted with the same confounders excluding DM.

Journal of Hepatology 2023 vol. 78(S1) | S101–S1213 S611
increased from F0/F1 to F2 to F3/F4 (median values from 1.06 to 1.13 to 1.31, respectively). Throughout the OGTT, the AUC-DNLi inversely correlated with AUC-GluClear \((r = -0.45, p = 0.05)\). During the first 60 min of OGTT, TG levels increased by 8% in subjects with F3-F4 compared to those with F0-F2 \((p = 0.09)\) despite elevated insulin levels, suggesting a significant contribution of DNLi. Accordingly, the AUC-DNLi significantly correlated with AUC-INS, AUC-TG and with the AUC-LDLox \((r = 0.47, p = 0.044; r = 0.43, p = 0.05; r = 0.44, p = 0.05\), respectively) underlying the contribution of oxidative stress in promoting hepatic fibrogenesis.

**Conclusion:** Oral glucose load is associated with changes in DNL and hepatic triglyceride synthesis contributing to liver fibrogenesis in patients with NAFLD.

Funded by Horizon2020 under grant agreement no.634413, EPoS

**THU-426**

A social media listening study of patients' experiences toward NAFLD (LISTEN-NAFLD)

Jeffrey Lazarus1,2, William Alazawi3, Ron Basuroy4, Laurent Castera5, Dmitrii Estulin6, Yiannoula Koulla7, Preethy Prasad4, Manuel Romero Gomez8,9, Vincent Wai-Sun Wong10, Jörn Schattenberg11, Barcelona Institute for Global Health (ISGlobal), Barcelona, Spain; 12CUNY Graduate School of Public Health and Health Policy (CUNY SPH), New York, United States; 2Barts Liver Centre, Blizard Institute, Queen Mary University London, United Kingdom; 4Nordic Nordisk, Copenhagen, Denmark; 5Hospital Beaujon AP-HP, Paris, France; 6Nordic Nordisk, Zurich, Switzerland; 7European Liver Patient's Association, Cyprus; 8Digestive Diseases Department and Ciberehd, Virgen del Rocio University Hospital, Seville, Spain; 9Institute of Biomedicine of Seville (HUVR/CSIC/US), University of Seville, Spain; 10The Chinese University of Hong Kong, Hong Kong; 11Metabolic Liver Research Program, Department of Medicine, University Medical Center Mainz, Germany

E-mail: Jeffrey.Lazarus@isglobal.org

**Background and aims:** Patients increasingly use social media to share and access health-related information and experiences. Social listening is a mixed-method approach that identifies and assesses what is being said about a topic on social media platforms. This study used social listening to gain patient-centric insights into NAFLD, a liver disease with increasing prevalence and healthcare system burden.

**Method:** Data from blogs, forums, and social media platforms including Twitter, Facebook, and YouTube were collected using pre-defined keywords through licensed aggregator tools for 8 countries (Brazil, China, France, Germany, Japan, South Korea, Spain, UK), from Nov 2020 to Nov 2022. Manual and automated algorithms were used to filter the dataset, and thematic analysis was used to summarise country-specific data.

**Results:** Country-specific random samples of data (~10 000 posts for all countries) were manually reviewed to identify a total of 1600 relevant posts for in-depth analysis (balanced for country representation). Patient journey posts \((n = 1479)\) were mainly about ongoing disease management \((72%, 1061/1479)\), diagnosis and tests \((30%, 734/1479)\), and causes and risk factors \((36% 534/1479)\). Dietary changes \((55%, 588/1061)\), exercise \((39%, 417/1061)\) and weight loss methods \((25%, 268/1061)\) were the most frequently discussed management techniques. The key diagnostic tests mentioned were ultrasound \((31%, 170/553)\), blood tests \((24%, 130/553)\) and liver function tests \((16%, 91/553)\). Unhealthy diet \((39%, 208/534)\), overweight/obesity \((32%, 169/534)\) and harmful effects of medication \((12%, 65/534)\) were perceived as the key causes leading to the condition. 12% \((192/1600)\) discussed the impact of the disease on quality of life. Emotional analysis \((84%, 1338/1600)\) revealed patients were worried \((20%, 266/1338)\) and frustrated \((19%, 252/1338)\) about their condition, but they were also hopeful \((14%, 186/1338)\) and determined \((20%, 273/1338)\) to improve their health. In 19% \((311/1600)\) of conversations, an unmet need was highlighted, especially the need to access knowledgeable HCPs \((16%, 51/311)\), driven by European countries. Other needs were better education \((25%, 79/311)\) and management options \((13%, 40/311)\), driven by Asian countries.

**Conclusion:** This social media listening study highlights the experiences of people living with NAFLD, including perceived challenges, coping strategies and unmet needs. Insights from social media can help us improve communication and patient care through education and support.

**THU-427**

Genetic risk factors for NAFLD and clinically significant fibrosis in persons living with HIV

Eduardo Vilar Gomez1, Samer Gawrieh1, Tiebing Liang1, Jordan Lake2, Susanna Naggie3, Tinsay Woreta4, Jennifer Price5, Richard Sterling6, Sonya Heath1, Holly King1, Laura Wilson5, James Tonascia1, Meena Bansal10, Kathleen Corey1, Rohit Loomba12, Mark S. Sulkowski13, Naga Chalasani1, Indiana University School of Medicine, Indianapolis, United States; 2Duke Clinical Research Institute, Durham, United States; 3Johns Hopkins Hospital, Baltimore, United States; 4University of California San Francisco Parnassus Campus, San Francisco, United States; 5Virginia Commonwealth University, Richmond, United States; 6University of Alabama at Birmingham, Birmingham, United States; 7Johns Hopkins Bloomberg School of Public Health, Baltimore, United States; 8Johns Hopkins University, Baltimore, United States; 9Cahn School of Medicine at Mount Sinai, New York, United States; 10Harvard Medical School, Boston, United States; 11Medical Center, San Diego, United States; 12The Johns Hopkins Hospital, Baltimore, United States

E-mail: nchalasa@iu.edu

**Background and aims:** The role of genetic risk variants in modulating the risk and severity of NAFLD has been extensively studied in general populations but not in persons with HIV (PWH) with NAFLD (HIV-NAFLD). We investigated the associations between candidate gene variants and risk of HIV-NAFLD and clinically significant fibrosis (CSF) in PWH.

**Method:** PWH prospectively enrolled in US multicenter studies underwent detailed phenotyping including VCTE for controlled attenuation parameter (CAP) and liver stiffness measurement (LSM). Participants with history of excessive alcohol use or other...
Several genetic variants influence risk of NAFLD and CSF. The second harmonic generation/two-photon excitation fluorescence (SHG/TPEF) microscopy with artificial intelligence analyses can provide automated quantitative assessment of fibrosis features on a continuous scale, called qFibrosis. We used this approach to gain insight into the impact of lifestyle intervention intensity on fibrosis in NAFLD.

**Method:** Unstained sections from 72 liver biopsies (paired: baseline and end-of-treatment) from 36 NAFLD patients who received routine lifestyle intervention (RLI, n = 24) or strengthen lifestyle intervention (SLI, n = 12) were examined. Fibrosis regression was determined by pathological reading. Liver fibrosis (qFibrosis) were quantified by SHG/TPEF microscopy. Collagen parameters were quantified from the five regions, including portal tract (PT), peri-PT, Zone 2, central vein (CV) and peri-CV, which were identified from the SHG/TPEF images.

**Results:** 21% (5/24) and 50% (6/12) of patients had fibrosis regression for RLI group and SLI group, respectively. 50% of patients had fibrosis no change for both RLI and SLI groups. Numerical analysis showed that fibrosis progression tended to no change or regression in NAFLD patients after lifestyle interventions, and this phenomenon was more pronounced in the SLI group. Among the patients with fibrosis regression, compared with the RLI group, the fibrosis index of SLI group was reduced more (p < 0.001) in the PT, peri-CV and CV regions, but increased more (p < 0.001) in zone 2 region. In patients with no change in the fibrosis outcome of conventional pathology, we found a more significant regression in zone 2 region in the SLI group than the RLI group.

**Conclusion:** With enhanced lifestyle intervention, we can see a more pronounced regression of fibrosis, mainly in the portal and central vein segments for the regression patients. Digital pathology provides new insights into lifestyle intervention-induced fibrosis regression, which are not captured by current staging systems.
**THU-429**

Societal costs and labor market affiliation of histologically confirmed non-alcoholic steatohepatitis—A Danish register-based study

Jan Håkon Rudolfsen1, Lise Lotte Gluud2, Henning Grønbæk3,4, Majken Jensen3, Mogens Vibe Berg6,7, Jens Olsen1, Peter Bo Poulsen8, Nanna Hovelsø9, Nikolaj Gregersen9, Anne Bloch Thomsen9, Peter Jepsen3,4, Incentive, Holte, Denmark; 2Copenhagen University Hospital Hvidovre, Gastro Unit, Copenhagen, Denmark; 3Aarhus University Hospital, Department of Hepatology and Gastroenterology, Denmark; 4University of Aarhus, Department of Clinical Medicine, Aarhus, Denmark; 6University of Copenhagen, Department of Public Health, Section of Epidemiology, Copenhagen, Denmark; 7Aalborg University Campus Copenhagen, Department of Clinical Medicine, Aalborg, Denmark; 9Pfizer Denmark Aps, Health and Value, Ballerup, Denmark; 8Pfizer Denmark Aps, Medical Affairs, Ballerup, Denmark

E-mail: peterbo.poulsen@pfizer.com

**Background and aims:** Non-alcoholic steatohepatitis (NASH) is associated with increased risk of cirrhosis, hepatocellular carcinoma, cardiovascular diseases and type 2 diabetes. Evidence on the burden of disease of NASH is limited. This population-based register study examines the healthcare costs, use of healthcare services, labor market affiliation and survival of NASH patients compared to individuals without liver disease.

**Method:** Patients with biopsy-confirmed NASH and corresponding hospital-diagnosed liver disease from 1997 to 2021 were identified in the Danish National Pathology Register and the Danish National Patient Register. Patients were matched 1:5 with liver disease-free comparators. Outcomes were costs associated with healthcare services, contacts with hospital care, use of home care services, production loss measured by wage differences (NASH patients vs. comparators), incidence of long-term sick leave, weeks of unemployment, early retirement, and survival. All outcomes were estimated based on data from national Danish registers. Patients were followed for 16 years-five years before and 11 years after diagnosis. Excess costs of NASH were calculated as the difference in mean costs for the NASH group and the comparators.

**Results:** 1039 NASH patients were identified (total population in Denmark (2021): 5 840 000). In the year leading up to diagnosis, a NASH patient generated €6318 in excess costs of healthcare services on average, and total costs in that year were 4.1 times higher than for the average comparator. Within a 10-year window, starting a year before diagnosis, the corresponding excess costs of NASH was €41 998 (2.9 times higher than the comparators) and with 4.4-fold (95% CI 3.18–6.06) higher hazard of early retirement. The NASH patients had significantly lower income than comparators from five year before start of study until nine years after diagnosis (t-test, p < 0.05), and 2.4-fold (95% CI 1.80–3.25) higher mortality hazard than comparators.

**Conclusion:** There are substantial excess societal costs associated with NASH. Patients exit the labour market earlier and have higher mortality than their comparators without liver disease.

**THU-430**

Prevalence and mortality of non-alcoholic fatty liver disease (NAFLD) in non-diabetics, pre-diabetics, and diabetics in the United States

James Paik1,1,2, Ameeta Kumar3, Reem Al-Shabeeb4, Katherine Eberly3, Nagashree Gundu Rao2,4, Zobair Younossi1,2,3,1

1Inova Health System, Betty and Guy Beatty Center for Integrated Research, Falls Church, United States; 2Inova Health System, Inova Health System, Falls Church, United States; 3Inova Fairfax Medical Campus, Center for Liver Disease, Department of Medicine, Falls Church, United States; 4Inova Health System, Division of Endocrinology, Inova Medicine Services, Falls Church, United States

E-mail: zobair.younossi@inova.org

**Background and aims:** Type 2 diabetes (T2D) with NAFLD is associated with adverse outcomes. Lacking is knowledge on the prevalence and outcomes of NAFLD among pre-diabetes (Pre-D) and non-diabetics (ND) which we have assessed here.

**Method:** NHANES III and mortality data (thru 2019) via National death index were used. NAFLD was defined by ultrasound, absence of other liver diseases, and excess alcohol use. Pre-D was defined as fasting glucose of 100–125 mg/dL or HbA1c level of 5.7%–6.4% without T2D. ND was defined as not having T2D or Pre-D. Metabolically healthy (MH) was defined if all following criteria were absent: waist circumference of ≥102 cm (men) or ≥88 cm (women); blood pressure (BP) ≥130/85 mm Hg or using BP-lowering agents; blood lipid (total cholesterol) ≥200 mg/dL; low-density lipoprotein (LDL) ≥100 mg/dL; triglycerides ≥150 mg/dL; and high-density lipoprotein (HDL) ≥40 mg/dL. Pre-D and ND were then categorized as either MH or metabolically unhealthy (MU). Prevalence was calculated by prevalence ratios (PR) and 95% confidence intervals (CI).

**Results:** Figure: (abstract: THU-429): Annual total costs healthcare services (hospital care, primary care, prescription medication and home care) for NASH patients and a matched group of liver disease-free comparators. Period 0 start at date of diagnosis; period length was one year. Excess costs are the difference in costs between NASH patients and the comparators.
**Background and aims:** The pathophysiology of lean non-alcoholic fatty liver disease (NAFLD) remains unclear and is associated to have more diverse pathogenic mechanisms than obese NAFLD. We aimed to investigate the characteristics of genetic- or metabolic-associated lean NAFLD in a community-based cohort.

**Method:** A total of 10 345 health check-up participants enrolled. Lean individuals were categorized according to the body mass index cut-off of 23 kg/m². Single nucleotide polymorphism was analyzed using Genotyping Arrays. Anthropometric measurements of waist circumference, total fat mass, and lean mass were included.

**Results:** The prevalence of lean NAFLD was 21.6% among total NAFLD subjects, and proportion of lean NAFLD was 18.5% in lean subjects (<23 kg/m²). Prevalence of metabolic syndrome and diabetes among lean NAFLD was 12.4% and 10.4%, respectively. Around 20.1% of lean NAFLD seems to be associated with metabolic-associated. Homozygous minor allele (GG) of PNPLA3 (rs738409) and heterozygous minor allele (CT, TT) of TM6SF2 (rs58542926) associated with lean NAFLD. However, the prevalence of fatty liver was not associated with the genetic variants of MBOAT7 (rs641797), HSD17B13 (rs72613567), MARC1 (rs2642438), or AGXT2 (rs2291702) in lean individuals. Around 32.1% of lean NAFLD seems to be associated with PNPLA3 or TM6SF2 genetic variation. Multivariable risk factor modeling analysis showed that the metabolic risk factors, genetic risk variants, and waist circumference were independent risk factor for lean NAFLD.

**Conclusion:** Further studies on risk factors beyond central obesity, metabolic syndrome, and genetic risk factors are needed to understanding the pathogenesis of lean NAFLD.

---

**Table:** (abstract: THU-430): Factors Associated with Mortality Among NAFLD subjects, Stratified by Diabetes group

<table>
<thead>
<tr>
<th></th>
<th>ND with MH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HR (95% CI)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1.38 (0.90–2.13)</td>
</tr>
<tr>
<td>High C-reactive protein</td>
<td>1.49 (0.54–4.12)</td>
</tr>
<tr>
<td>Cardiovascular Diseases</td>
<td>2.10 (1.35–3.26)</td>
</tr>
<tr>
<td>High FIB4 ≥2.67</td>
<td>1.76 (0.93–3.35)</td>
</tr>
<tr>
<td>Chronic Kidney Diseases</td>
<td>1.39 (0.79–2.42)</td>
</tr>
<tr>
<td>Sarcopenia</td>
<td>2.68 (2.00–3.60)</td>
</tr>
<tr>
<td>Aged 20–39</td>
<td>Reference</td>
</tr>
<tr>
<td>Aged 40–59</td>
<td>16.29 (2.67–99.37)</td>
</tr>
<tr>
<td>Aged 60–74</td>
<td>858.91 (99.05–7448.05)</td>
</tr>
<tr>
<td>Male</td>
<td>7.05 (2.29–21.71)</td>
</tr>
<tr>
<td>Non-Hispanic White</td>
<td>0.38 (0.12–1.22)</td>
</tr>
<tr>
<td>Low income</td>
<td>0.35 (0.07–1.69)</td>
</tr>
<tr>
<td>Active smoker</td>
<td>18.06 (1.78–86.36)</td>
</tr>
</tbody>
</table>

|                  | ND without MH |
|                  | HR (95% CI) |
|                  | 1.44 (1.08–1.90) |
|                  | 3.42 (1.23–9.51) |
|                  | 2.13 (1.17–3.87) |
|                  | 2.80 (0.91–8.60) |
|                  | 1.53 (1.15–2.03) |
|                  | Reference |
|                  | 3.21 (1.78–5.79) |
|                  | 19.33 (9.93–37.63) |
| Male             | 1.62 (1.17–2.24) |
| Non-Hispanic White | 1.44 (0.91–2.28) |
| Low income       | 1.42 (1.00–2.02) |
| Active smoker    | 2.03 (1.43–2.88) |

|                  | Prediabetes |
|                  | HR (95% CI) |
|                  | 1.96 (1.29–2.96) |
|                  | 1.43 (1.02–2.01) |
|                  | 1.14 (0.83–1.55) |
|                  | 1.28 (0.91–1.81) |
|                  | 1.55 (1.09–2.19) |

|                  | T2D         |
|                  | HR (95% CI) |
|                  | 1.43 (1.08–2.37) |
|                  | 2.05 (1.23–3.39) |
|                  | 2.04 (1.38–3.03) |
|                  | 1.58 (1.08–2.30) |
|                  | 1.91 (1.22–2.98) |
|                  | Reference |
|                  | 3.08 (1.39–6.82) |
|                  | 14.7 (6.62–32.66) |
| Male             | 1.10 (0.75–1.41) |
| Non-Hispanic White | 1.96 (1.29–2.96) |
| Low income       | 1.73 (1.22–2.45) |
| Active smoker    | 1.84 (1.08–3.13) |

Models were adjusted for age, sex, race, income, education, smoking, physical activity, healthy eating. Bold p < .05
Background and aims: Non-alcoholic fatty liver disease (NAFLD) is the most prevalent form of chronic liver disease, affecting 25% of the population. It can progress to non-alcoholic steatohepatitis (NASH), a severe condition characterized by fibrosis, that can lead to cirrhosis, and even liver cancer, requiring a liver transplant. Accurate diagnosis of NAFLD/NASH progression requires think biopsy, and there is currently no effective drug treatment. PNPLA3 (patatin-like phospholipase domain-containing 3), an enzyme involved in lipid metabolism, is one of the protein genes linked to NAFLD. The expression of PNPLA3 is associated with NAFLD, and its accumulation leads to larger lipid droplets, a hallmark of NASH steatosis. Finding new targets to halt NAFLD progression is crucial, and PNPLA3 may be a promising candidate, however its role is unknown in other tissues. This study aimed to compare PNPLA3 protein levels in different tissues from patients with and without NASH, including liver, subcutaneous adipose tissue (SAT), and visceral adipose tissue (VAT).

Method: Samples included liver, SAT, and VAT from n = 98 patients with morbid obesity candidates to receive bariatric surgery. During the procedure, tissue biopsies were performed, from which we performed histological analyses, protein extraction and subsequent western blot to explore PNPLA3 protein levels. Semi-targeted lipidomics was performed to quantify the concentration of triglycerides and glycerophospholipids.

Results: We found significative differences in PNPLA3 protein levels in the liver samples of NASH patients compared to those without NASH (Figure A). Also, patients with NASH showed a more prominent expression around the fibrotic areas (Figure B: a: fibrosis, b: PNPLA3 protein shown by immunohistochemistry). Lipid content was significantly higher in the hepatic tissue from patients with NASH (Figure C), triglycerides were significantly increased, meanwhile glycerophospholipids were significantly decreased. Adipose tissue levels of PNPLA3 protein were not significantly different between the studied groups (Figure D), nor the distribution among the tissue (Figure E; a: fibrosis shown by Masson's Trichrome, b: PNPLA3 immunohistochemistry in adipose tissue). On the other side, lipid content in VAT was significantly different between NASH and non-NASH patients, meanwhile in SAT there were no differences in total lipid content between NASH and non-NASH patients (Figure D).

Conclusion: PNPLA3 protein levels were significantly increased in the hepatic tissue of patients with NASH and was present in higher quantities around areas of fibrosis. This was correlated with an increased total lipid content. In contrast, no significant differences in PNPLA3 protein levels or localization were observed in adipose tissue between NASH and non-NASH patients, however lipid content in VAT was significantly decreased in NASH patients.
significantly different from the low risk identified with CC. Risk stratification for NAFLD in Japan is best accomplished by integrating significantly different from the low risk identified with CC. Risk stratification for NAFLD in Japan is best accomplished by integrating

**THU-434**

**Pilot results for a multidisciplinary community metabolic liver clinic**

Theresa Hydes1,2, Cyril Sieberhagen2, Mike Merrimen3, Louise Millard1, David Riley1, Daniel Cuthbertson1,2. 1University of Liverpool, United Kingdom; 2Liverpool University NHS Hospitals Foundation Trust, United Kingdom; 3Millbrook Medical Centre, United Kingdom

E-mail: therasa@doctors.org.uk

**Background and aims:** Non-alcoholic fatty liver disease (NAFLD) affects over 1 in 4 people in the UK, with an increased prevalence in areas of deprivation. Most patients with NAFLD do not have significant liver fibrosis and are best managed in the community. Thorough screening and optimisation of cardiometabolic disease is vital, as metabolic disease increases the risk of liver fibrosis and hepatocellular carcinoma, and NAFLD is associated with increased risk of diabetes, chronic kidney disease and cardiovascular disease. We aimed to pilot a community metabolic liver clinic in an area of high deprivation to examine feasibility, burden of undetected disease and the potential for meaningful intervention (lifestyle/pharmacological).

**Method:** Four pilot clinics ran in a large primary care centre in the Northwest of England October-November 2022. Adults who had type 2 diabetes or a body mass index ≥25 (without a prior diagnosis of cirrhosis or another cause of chronic liver disease), were invited via text message to book a clinic appointment and attend for bloods. The clinic proforma was designed by a multidisciplinary team (general practitioners/hepatologists/diabetologists/patients) informed by national guidelines, consisting of an assessment (history/anthropometrics/fibroscan/review of bloods) and management section (education/lifestyle/pharmacological). Personalised written feedback using traffic light systems and lifestyle recommendations were integrated into the proforma which was uploaded to the primary care electronic medical records and shared with each patient. Any complex cases were reviewed in a virtual multi-disciplinary team meeting.

**Results:** Of 24 patients booked in, 19 attended (79.2%). The clinic took 30 minutes including administration time. There was a high burden of known underlying cardiometabolic disease (table 1). In total 73.7% of individuals had a controlled attenuation parameter score >275 dB/m and 31.6% of individuals had a fibroscan score of ≥8 kPa at which point a full liver screen was requested and referral to secondary care was made. The clinic generated the following outputs: (i) Lifestyle intervention: brief alcohol intervention 15.8%; smoking cessation advice 5.3%, referral to community lifestyle hub (free pass to leisure centre/weight management class) offered and accepted by patient; (ii) Onward referral: diabetes secondary care clinic 26.3%; (ii) Pharmacological intervention: escalation of glucose-lowering therapy 57.9%; statin initiation or dose titration 10.5%; (iii) Pharmacological intervention: escalation of glucose-lowering therapy 57.9%; statin initiation or dose titration 10.5%. Written feedback from patients identified that all patients thought the clinic was useful, 100% said the clinic and written information helped them better understand their results and health conditions and 93% said the clinic and written information would prompt lifestyle changes.

**Conclusion:** A thorough cardiometabolic assessment for patients with, and at risk of NAFLD, can be performed within 30 minutes in a primary care setting and generates high levels of intervention which is likely to impact future clinical outcomes. A combined form for medical assessment and personalised feedback of individual risk and management is associated with high levels of patient satisfaction.

**THU-435**

**Influence of chronotype and adherence to the Mediterranean diet on the risk of liver fibrosis in patients with non-alcoholic fatty liver disease**

Gabriele Castelnovo1, Gian Paolo Caviglia1, Chiara Rosso1, Nuria Pérez Diaz del Campo1, Angelo Armand1,2, Marta Guariglia1, Amina Abulde1, Daphne D’Amato1, Kamela Giini1, Irene Poggiolini1, Antonella Oliviero1, Maria Lorena Abate1, Giorgio Maria Saracco1, Elisabetta Bugianesi1,3,1 University of Turin, Department of Medical Sciences, Turin, Italy; 2University Medical Center of the Johannes Gutenberg-University, I. Department of Medicine, Mainz, Germany; 3Città della Salute e della Scienza-Molinet Hospital, Gastroenterology Unit, Turin, Italy

E-mail: gabriele.castelnovo@unito.it

**Background and aims:** Late chronotype, i.e. an individual’s aptitude to perform daily activities late in the day, has been associated with low adherence to the Mediterranean diet (MedDiet) and metabolic syndrome. The aim of this work was to investigate the potential association between chronotype and adherence to MedDiet with the risk of significant (F≥2) and severe (F≥3) liver fibrosis in individuals with non-alcoholic fatty liver disease (NAFLD).

**Method:** A total of 156 patients with a diagnosis of NAFLD by ultrasound were consecutively enrolled. All patients underwent liver stiffness measurement (FibroScan® S30). F≥2 and F≥3 were defined by liver stiffness values ≥7.1 kPa and ≥8.8 kPa, respectively. The chronotype (MSFc) was defined by the Munich Chronotype Questionnaire (MCTQ) as the mid-sleep on free days (MSF) corrected for sleep debt on working days, and was expressed as h:min. To carry out the analyses, we defined early, intermediate and late chronotype by splitting the MSFsc into tertiles, evaluating the effect of tertile one versus tertile two + three. In addition, mid-sleep on workdays (MSW) was recorded. The adherence to the MedDiet was assessed by the Mediterranean diet score (MDS).

**Results:** Median age was 52 (43–62) years; 60.8 % of participants were male. Median body mass index (BMI) was 29.5 (26–32) kg/m². The principal comorbidities were type-2 diabetes mellitus (T2DM) (n = 38; 24.3 %), arterial hypertension (n = 79; 50.6 %), dyslipidemia (n = 99; 63.4 %), obstructive sleep apnea (OSAS) (n = 8; 5.1%) and depression (n = 7; 4.4 %). Overall, 22 (13.9 %) patients had F≥2, while 15 (9.5 %) had F≥3. Most subjects (67.9 %) had intermediate or...
late chronotype and showed higher MSF (p < 0.001) and MSW (p < 0.001) compared to those with early chronotype. Remarkably, at logistic regression analysis adjusted for MDS, sex, age, BMI, T2DM, OSAS, arterial hypertension, dyslipidemia, and depression, only intermediate late chronotype (OR = 6.8, 95% CI 1.3–35.3, p = 0.022), MDS (OR = 0.7, 95% CI 0.5–0.9, p = 0.025) and T2DM (OR = 6.4, 95% CI 1.9–20.9, p = 0.002) resulted significantly and independently associated to F≥2. Similarly, in a logistic regression model adjusted for the same variables, only intermediate late chronotype (OR = 20.4, 95% CI 1.4–282.9, p = 0.024), MDS (OR = 0.6, 95% CI 0.4–0.9, p = 0.015) and T2DM (OR = 20.2, 95% CI 3.9–102.4, p < 0.001) resulted significantly and independently associated to F≥3.

Conclusion: We observed that intermediate late chronotype and low adherence to MedDiet were associated with both significant and severe liver fibrosis in patients with NAFLD. Future research is needed to better understand the multidisciplinary management of this complex disease.

TUH-436
Relationship of hepcidin levels to metabolic factors, anthropometric indicators of adiposity and disease severity in NAFLD patients
Claudia Cravo 1, Cristiane Villela-Nogueira 1, Ana Carolina Cardoso 1, Fernanda Calçado 1, Guilherme Rezende 1, Frederico Campos Ferreira 1, Joao Marcello de Araujo Neto 1, Jorge Eduardo Pinto 1, 2, Henrique Sergio Coelho 1, 3, Renata Perez 1, 4, Nathalie Leite 1, 4
1 Universidade Federal do Rio de Janeiro, Brazil; 2 Hospital Universitário Pedro Ernesto-UNERJ, Brazil; 3 Hospital São Lucas/Rede DASA, Brazil; 4 For Institute for Research and Education (IDOR), Rio de Janeiro, Brazil
E-mail: nathalieleite@gmail.com

Background and aims: Non-alcoholic fatty liver disease (NAFLD) affects approximately 25% of the world’s western population. Both iron and lipid metabolism seem to play a role in NAFLD pathogenesis. We aimed to investigate the association between hepcidin levels, ferritin levels and iron overload with body composition indices, metabolic risk factors and the presence of NASH with significant fibrosis (F≥2).

Method: It was a cross-sectional study in a cohort of patients with NAFLD in the outpatient clinic of our tertiary-care University Hospital. All participants gave written informed consent and the local Ethics Committee had previously approved the study protocol. Inclusion criteria were patients aged between 18 and 70 years, with NAFLD in the outpatient clinic of our tertiary-care University Hospital. All participants gave written informed consent, and the local Ethics Committee had previously approved the study protocol. The majority of this cohort was male (63.1%) and the median age was 54 ± 9 years. The prevalence of HS and AF was 77.8% (n = 116) and 12.8% (n = 29), respectively. The majority of these individuals were identified to have NAFLD (n = 104, 89.7%). The mean VAS and TTO index scores in the entire cohort were 71.9 ± 18.4 and 0.85 ± 0.21, respectively. People with T2DM and HS (TTO: 0.92 ± 0.13 vs. 0.83 ± 0.22, p = 0.037) and/or AF (VAS: 74.8 ± 16.4 vs. 59.9 ± 21.3, p < 0.001; TTO: 0.88 ± 0.17 vs. 0.71 ± 0.29, p = 0.001) had an overall lower HRQL in comparison to those without HS and/or AF. The most strongly affected dimensions were mobility (p = 0.001), usual activities (p = 0.032) and pain/discomfort (p = 0.027) in people with T2DM and AF

Results: 162 patients were included (73% female (F), age 54 ± 9 y); 78% had type 2 diabetes (T2DM), 66% were obese. Both hepcidin and ferritin levels varied according to gender (F: 18.9 vs M: 31.8 p = 0.001; F: 131 vs M: 280 p < 0.001) and to different anthropometric indicators of adiposity. Higher hepcidin and ferritin levels were found in participants with elevated neck circumference and body adiposity index, whereas lower levels of both iron regulators were found in those with the highest values of visceral adiposity index (VAI). T2DM was the only metabolic risk factor significantly associated with lower hepcidin levels (20.1 vs. 34.3; p = 0.007). On liver biopsy, 24% had NASH (NAS≥4) and significant fibrosis (F≥2); 19% had siderosis. Patients with NAS and F≥2 were less likely to have obesity (51% vs. 71%; p = 0.025) but had higher baseline levels of HbA1c (7.6 vs. 6.6; p = 0.018) and liver enzymes (AST: 31 vs. 25; p = 0.031; ALT 51 vs. 41; p = 0.05; GGT 62 vs. 46; p = 0.001). Regarding iron parameters, those patients with NASH and F≥2 had significant lower hepcidin levels (18.7 vs 25.4; p = 0.039). On multivariate logistic regression, hepcidin levels were independently associated with NASH with F≥2 (OR: 0.975; 95% CI: 0.955–0.996, p = 0.020) in models hierarchically-adjusted for ferritin levels, iron overload on liver biopsy, age, gender, BMI, diagnosis of arterial hypertension or type 2 diabetes, liver enzymes and parameters of lipid profile and glycemic control.

Conclusion: Our results suggest an association of active and progressing NASH with lower hepcidin levels. There is no association between NAFLD severity with other iron laboratory and histologic parameters. Lower levels of hepcidin are also found in participants with T2DM and those with the highest values of VAI which, through the mechanisms of insulin resistance and ectopic fat deposition, play an important role in the NAFLD development and progression.

TUH-437
Impairment of health-related quality of life among people with type 2 diabetes and advanced fibrosis
Maurice Michel 1, Michelle Doll 1, Angelo Armandi 1, Christian Labenz 1, Peter Galle 2, Jörn Schattenberg 2
1 Metabolic Liver Research Program, I. Department of Medicine, University Medical Center Mainz, Mainz, Germany
E-mail: maurice.michel@unimedizin-mainz.de

Background and aims: People living with type 2 diabetes mellitus (T2DM) show a high prevalence of non-alcoholic fatty liver disease (NAFLD) and hepatic fibrosis. Their health-related quality of life (HRQL) is affected by multiple in part overlapping factors and aggravated by metabolic comorbidities and fibrosis stage. However, the association of advanced fibrosis (AF) and HRQL in people with T2DM in secondary care remains poorly established. Therefore, the aim of this prospective study was to investigate the effect of AF on the HRQL in people with T2DM.

Method: A total of 149 individuals with T2DM treated at a secondary care diabetes outpatient clinic within the German disease management program (DMP) were included in the final analysis. Vibration-controlled transient elastography (VCTE) was used to non-invasively define hepatic steatosis (HS) and AF. A controlled attenuation parameter (CAP) of ≥275 dB/m and a liver stiffness measurement (LSM) of ≥12 kPa were used to define HS and AF, respectively. The EQ-5D-3L questionnaire was used to assess HRQL. This questionnaire contains five dimensions, and a visual analogue scale (VAS). Using country-specific value sets, an index value (time trade-off, TTO), that summarises overall HRQL, was obtained. Uni- and multivariable linear regression models were used to identify independent clinical predictors of impaired HRQL (VAS, TTO).

Results: The majority of this cohort was male (63.1%) and the median age was 67 (IQR 59; 71). The prevalence of HS and AF was 77.8% (n = 116) and 12.8% (n = 29), respectively. The majority of these individuals were identified to have NAFLD (n = 104, 89.7%). The mean VAS and TTO index scores in the entire cohort were 71.9 ± 18.4 and 0.85 ± 0.21, respectively. People with T2DM and HS (TTO: 0.92 ± 0.13 vs. 0.83 ± 0.22, p = 0.037) and/or AF (VAS: 74.8 ± 16.4 vs. 59.9 ± 21.3, p < 0.001; TTO: 0.88 ± 0.17 vs. 0.71 ± 0.29, p = 0.001) had an overall lower HRQL in comparison to those without HS and/or AF. The most strongly affected dimensions were mobility (p = 0.001), usual activities (p = 0.032) and pain/discomfort (p = 0.027) in people with T2DM and AF

Figure 1. Obesity (VAS: beta -0.247, p = 0.005; TTO: beta -0.225, p = 0.012), AF (VAS: beta -0.222, p = 0.011; TTO: beta -0.171, p = 0.049) and age (VAS: beta -0.171, p = 0.046) remained independent predictors of a poor HRQL. In turn, T2DM-related comorbidities and HS did not remain predictive of an impaired HRQL.
The impact of glycemic control on progressive forms of non-alcoholic fatty liver disease: combined data from multiple clinical trials including more than 5000 patients (in collaboration with NAIL-NIT consortium)

Mazen Noureddin¹, Julie Dubourg², Jörn Schattenberg³, Michael Charlton⁴, Stephen Harrison⁵, Naim Alkhouri⁶, Sophie Jeannin Megnien⁷, Vlad Ratziu⁸, Houston Methodist Hospital, Houston, United States; ²Summit Clinical Research, San Antonio, United States; ³University of Oxford, United Kingdom, ⁴Arizona Liver Health, Chandler, United States; ⁵UChicago Medicine, Chicago, United States; ⁶Arizona Liver Health, Chandler, United States; ⁷Summit Clinical Research, United States; ⁸Institute for Cardiometabolism and Nutrition, France
E-mail: jdubourg@summitclinicalresearch.com

Background and aims: Type 2 diabetes mellitus (T2DM) is a well-known risk factor for non-alcoholic steatohepatitis (NASH) and liver fibrosis but whether glycemic control is an important predictor is not well known. Glycated hemoglobin (HbA1c), a measure of glycemic control has been identified as an independent risk factor of cardiovascular outcomes, independent of T2DM status. We aimed to describe patients’ characteristics and liver histology across different groups of HbA1c level.

Method: We combined screening data from 6 ongoing biopsy-proven therapeutic NASH trials (>5000 patients). Patients were classified into 4 groups according to their HbA1c. At-risk NASH was defined as NASH with a non-alcoholic fatty liver disease activity score of at least 4 and a fibrosis stage of 2 (F2) or 3 (F3). The descriptive analyses were repeated in a subset of patients with recorded status of T2DM. Patients with HbA1c ≥ 6.5% were reclassified as having undiagnosed T2DM. Univariate linear and logistic regressions were performed.

Results: 2177 patients with liver histology and HbA1c data were included. The liver histology results and patients’ characteristics in each group are shown in the Table. The proportion of NASH and at-risk NASH patients increased with each HbA1c group (p < 0.01). Lipid parameters (LDL and triglycerides) were associated with HbA1c level.

Conclusion: HbA1c level as a surrogate of glycemic control appears to be an independent risk factor of NASH and at-risk NASH, in diabetic patients. Additional studies are needed to further confirm the independent association of HbA1c with NASH severity.

Glycated hemoglobin as an independent predictor of hepatocyte ballooning in non-alcoholic steatohepatitis: combined data from multiple clinical trials including more than 5000 patients (in collaboration with NAIL-NIT consortium)

Stephen Harrison¹, Julie Dubourg², Sophie Jeannin Megnien², Jörn Schattenberg³, Vlad Ratziu⁴, Michael Charlton⁵, Naim Alkhouri⁶, Mazen Noureddin⁷, University of Oxford, United Kingdom; ²Summit Clinical Research, United States; ³University Medical Center Mainz, Germany; ⁴Institute for Cardiometabolism and Nutrition, France; ⁵UChicago Medicine, Chicago, United States; ⁶Arizona Liver Health, Chandler, United States; ⁷Houston Methodist Hospital, Houston, United States
E-mail: jdubourg@summitclinicalresearch.com

Background and aims: One of the major challenges in non-alcoholic steatohepatitis (NASH) drug development is liver histology, serving both as primary end point for conditional approval and as eligibility criteria. The failure to meet the histologic criteria is a major contributor of the high screen failure rate in non-cirrhotic NASH trials. There is a high inter- and intra-reader variability for all histologic features, though the hepatocyte ballooning remains the highest hurdle. We aimed to describe the main reasons for histologic failure across multiple phase 2 trials and to explore the predictors of hepatocyte ballooning.

Method: We combined screening data from 6 ongoing non-cirrhotic NASH phase 2 trials. We detailed the histologic features for NASH and fibrosis (table). Predictors of hepatocyte ballooning were examined using logistic regression in a subset of patients with at least stage 2 fibrosis, a non-alcoholic fatty liver disease activity score (NAS) of at least 3 and at least 1 point in inflammation and 1 point in steatosis (table). This subset was aimed to reduce the biases for the presence or absence of steatosis.

Conclusion: HbA1c level as a surrogate of glycemic control appears to be an independent risk factor of NASH and at-risk NASH, in diabetic patients. Additional studies are needed to further confirm the independent association of HbA1c with NASH severity.
absence of hepatocyte ballooning in a population susceptible of having more severe NASH.

<table>
<thead>
<tr>
<th>Histologic results</th>
<th>F0-F1</th>
<th>F2- F3</th>
<th>F4</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>F0-Hispanic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic missing</td>
<td>607</td>
<td>418</td>
<td>20</td>
<td>775</td>
</tr>
<tr>
<td>No ballooning</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>No steatosis</td>
<td>66</td>
<td>5</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>≥2 histologic features missing</td>
<td>72</td>
<td>6</td>
<td>3</td>
<td>13</td>
</tr>
</tbody>
</table>

No NASH

<table>
<thead>
<tr>
<th>N=1020</th>
<th>1135</th>
<th>104</th>
<th>2259</th>
</tr>
</thead>
<tbody>
<tr>
<td>739 (72%)</td>
<td>159 (14%)</td>
<td>26 (25%)</td>
<td>924 (41%)</td>
</tr>
</tbody>
</table>

1 histologic feature missing

<table>
<thead>
<tr>
<th>N = 1020</th>
<th>1135</th>
<th>104</th>
<th>2259</th>
</tr>
</thead>
<tbody>
<tr>
<td>607 (82%)</td>
<td>418</td>
<td>20</td>
<td>775 (84%)</td>
</tr>
</tbody>
</table>

No ballooning

<table>
<thead>
<tr>
<th>N = 1020</th>
<th>1135</th>
<th>104</th>
<th>2259</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 (1%)</td>
<td>3 (2%)</td>
<td>0</td>
<td>7 (0.5%)</td>
</tr>
</tbody>
</table>

No steatosis

<table>
<thead>
<tr>
<th>N = 1020</th>
<th>1135</th>
<th>104</th>
<th>2259</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>3 (2%)</td>
<td>3</td>
<td>6 (0.5%)</td>
</tr>
</tbody>
</table>

≥2 histologic features missing

<table>
<thead>
<tr>
<th>N = 1020</th>
<th>1135</th>
<th>104</th>
<th>2259</th>
</tr>
</thead>
<tbody>
<tr>
<td>128 (17%)</td>
<td>5 (3%)</td>
<td>3</td>
<td>136 (15%)</td>
</tr>
</tbody>
</table>

Liver fibrosis is associated with cardiovascular disease burden amongst patients with non-alcoholic steatohepatitis: the unCoVer-NASH longitudinal cohort study

Kathleen Corey1, Anurag Mehta2, Kamal Kant Mangla3, Abhishek Shankar Chandramouli4, Ahsan Shoeb Patel5, Sharat Varma6, Elisabetta Bugianesi7, MGH Fatty Liver Program, Massachusetts General Hospital, United States; 2VCU Health Pauley Heart Center, United States; 3Novo Nordisk A/S, Denmark; 4Novo Nordisk Service Center India Pvt Ltd, India; 5Department of Medical Sciences, University of Torino, Italy

E-mail: kkmm@novonordisk.com

Background and aims: Cardiovascular (CV) disease (CVD) burden in patients with non-alcoholic steatohepatitis (NASH) is incompletely understood. The unCoVer-NASH longitudinal cohort study assessed baseline CVD burden and subsequent CV events in patients with NASH stratified by Fibrosis-4 Index (FIB-4) using real-world de-identified US healthcare data from a federated network (TriNetX).

Method: Patients were identified using the International Classification of Diseases code (ICD-10-CM) for NASH from October 2015-June 2022 and required ≥1 FIB-4 measurement(s) calculated from data obtained 180 days prior to, or 30 days after, NASH diagnosis (index date) and ≥12 months of data prior to index date (baseline period). FIB-4 score categories were low (<1.3), intermediate (1.30–2.67) and high (≥2.67). Exclusion criteria included baseline evidence of cirrhosis, viral hepatitis, human immunodeficiency virus, liver-related complications and alcohol use disorder. Data analysed were baseline characteristics, CVD prevalence and risk of CV events(s) in follow-up (index date to end of enrolment, death or study end) amongst patients with no history of respective CV event(s) during baseline. For CV risk, cumulative incidence was plotted, incidence rate (IR) was presented per 100 person-years (PY) and hazard ratios (HR) were calculated using Cox proportional hazard models (crude and adjusted for CV risk factors [age, sex, type 2 diabetes (T2D), chronic kidney disease, obesity, hyperlipidaemia, hypertension]).

Results: Of 717 patients included, those with high FIB-4 (N = 102) vs intermediate (N = 201) and low (N = 414) were older (60 vs 57 and 44 years), less likely to have obesity (38% vs 45% and 54%), more likely to have T2D (50% vs 45% and 36%) and be female (71% vs 54% and 57%). The most prevalent CVD phenotypes in all FIB-4 groups (high, intermediate and low FIB-4, respectively) were ischaemic heart disease (18%, 17%, 11%), cerebrovascular disease (16%, 7%, 8%) and heart failure (10%, 9%, 6%). Cumulative incidence of any CV event increased with FIB-4 score (Figure). IRs for any CV event were 24.6, 17.2 and 10.4 per 100 PY for high, intermediate and low FIB-4, respectively. HRs (95% confidence interval) for high and intermediate vs low FIB-4 were 3.43 (2.21, 5.31); p < 0.0001 and 1.53 (1.02, 2.29); p = 0.04 and remained significant for high vs low FIB-4 after adjustment for CV risk factors, similar to results for individual CV events.

Conclusion: CVD prevalence and incidence in patients with NASH was associated with baseline FIB-4 score, indicating higher CV burden as fibrosis worsens. CV risk with high vs low FIB-4 was significantly higher even after adjusting for CV risk factors. Patients with intermediate FIB-4 had an increased incidence of CV event(s) relative to those with low FIB-4 and should be monitored and managed; further research around CV risk in this group may be needed.
Background and aims: Type 2 diabetes (T2D) is an independent risk factor for non-alcoholic fatty liver disease (NAFLD) development, progression to fibrosis and end-stage liver disease. EASL guidelines recommend looking for NAFLD in all people with T2D and calculating surrogate markers of fibrosis for all people with NAFLD. PRELUDE-1 (Trial ID: ISRCTN14585543) is a study evaluating the feasibility and acceptability of adding fibrosis-4 (FIB-4) scoring to the annual T2D review and direct access to community or secondary care transient elastography assessment for individuals with FIB-4 ≥1.3. We sought to determine the extent of liver fibrosis scoring in primary care prior to commencing the study.

Method: We performed an anonymised retrospective data capture of all adults with T2D registered at seven primary care practices in England who were enrolled in PRELUDE-1. Practices were invited to join the study with key inclusion criteria: practice size >4000 and 85% completion of T2D annual review. Patient-level data included selected SNOMED CT codes for demographics, pathology (including alanine transaminase (ALT), aspartate aminotransferase (AST), platelet count and Fib-4 score) and diagnostic data.

Results: Across the initial 7 primary care sites (4 in Bristol and 3 in London), there were a total of 5987 individuals with type 2 diabetes. 47% were female with mean age 60.9 years, 45% of South Asian ethnicity, 32% White, 16% Black and 7% other. NAFLD and NASH were coded for 491 (8.2%) and 12 (0.2%) people with T2D respectively. 65% (n=3862) of the cohort had a coded ALT result in their primary care record; male mean 35.9 IU/L and female mean 25.5 IU/L. Only 26 individuals (0.4%) had a FIB-4 score coded in their primary care records. The complete dataset from the enrolled seven sites will be presented.

Conclusion: Despite current EASL guidance and increasing primary care physician awareness of NAFLD, few people with T2D have a coded diagnosis of NAFLD or surrogate markers of fibrosis despite recognition as an at risk population. New ways of working are needed to raise awareness and recognition of people with T2D and liver disease in primary care.

THU-442
A machine learning-based classification of adult-onset diabetes identifies patients at risk for liver-related complications
Lukas Otero Sanchez1, Clara-Yongxiang Zhan1, Carolina Gomes Da Silveira Cauduro2, Laurence Crenier3, Hassane Njimi4, Gael Englebert5, Antonella Putignano2, Antonia Lepida2, Delphine Degré2, Nathalie Boon2, Thierry Gustot2, Pierre Deltenre3, Astrid Marot6, Jacques Deviere2, Christophe Moreno7, Miriam Cnop8, Eric Trépo9, 1Erasme Hospital, Brussels, Department of Gastroenterology, Hepatopancreatology and digestive Oncology, Brussels, Belgium; 2Erasme Hospital, Department of Gastroenterology, Hepatopancreatology and digestive Oncology, Brussels, Belgium; 3Erasme Hospital, Endocrinology, Belgium; 4Université Libre de Bruxelles, Statistics, Belgium; 5Clinique Saint-Luc, Gastroenterology, Bouge, Belgium; 6Université Catholique de Louvain, Viroir, Gastroenterology, Belgium; E-mail: lukas.otero.sanchez@ulb.be

Background and aims: Diabetes mellitus is a major risk factor for fatty liver disease development and progression. A novel machine learning method identified five clusters of patients with diabetes, with different characteristics and risk of diabetic complications using six clinical and biological variables. We evaluated whether this new classification could identify individuals with an increased risk of liver-related complications.

Method: We used a prospective cohort of patients with a diagnosis of type 1 or type 2 diabetes without evidence of advanced fibrosis at baseline recruited between 2000 and 2020. We assessed the risk of each diabetic cluster of developing liver-related complications, using competing risk analyses.

Results: We included 1068 patients, of whom 162 (15.2%) were determined to be in the severe autoimmune diabetes (SAID) subgroup, 266 (24.9%) were severe insulin-deficient diabetes (SIDD), 55 (5.2%) were severe insulin-resistant diabetes (SIRD), 359 (33.6%) were mild obesity-related diabetes (MOD), and 186 (17.4%) were in the mild age-related diabetes (MARD) subgroup. In multivariable analysis, patients in the SIRD cluster and those with excessive alcohol consumption at baseline had the highest risk for liver-related events. The SIRD cluster, excessive alcohol consumption, and hypertension were independently associated with clinically significant fibrosis. Using a simplified classification, patients assigned to severe and mild insulin-resistant groups had a 3- and 2-fold greater risk, respectively, of developing significant fibrosis compared to the insulin-deficient group.

Conclusion: A novel clustering classification adequately stratifies the risk of liver-related events and liver fibrosis in a diabetes population. Our results also underline the impact of the severity of insulin resistance and alcohol consumption as key prognostic risk factors for liver-related complications. CIF, cumulative incidence function; SAID, Severe autoimmune diabetes; SIDD, Severe insulin-deficient diabetes; SIRD, Severe insulin-resistant diabetes; MOD, Mild obesity-related diabetes; MARD, Mild age-related diabetes

Figure: Time to clinically significant fibrosis by cluster
Background and aims: Several global data suggest that Non-Alcoholic Fatty Liver Disease (NAFLD) prevalence increases with age. However, the Rotterdam study showed decreasing prevalence of NAFLD with increasing age among older adults. To further explore NAFLD in older persons we evaluated the prevalence of NAFLD in a large group of older Australians (who were sufficiently healthy to be enrolled in a primary prevention clinical trial). We also aimed to determine factors associated with NAFLD in this group including markers of frailty and social disadvantage.

Method: We included participants involved in the ASPREE (ASPIrin in Reducing Events in the Elderly) randomised-controlled trial that enrolled 16 703 community-dwelling Australian participants aged 70 years or older without independence-limiting physical disability, dementia, or cardiovascular disease. Detailed anthropometric, biochemical, and questionnaire data were collected at baseline. We calculated the Fatty Liver Index (FLI), a composite score based on gamma-glutamyl transferase, triglycerides, abdominal circumference, and BMI. Using a score ≥60 to define NAFLD, we identified NAFLD prevalence as well as associations via logistic regression analysis.

Results: Data from 7757 (mean age 75.0 ± 4.21 years, 47.1% male) participants were analysed. We excluded 8946 participants for not meeting standard NAFLD inclusion criteria or delayed/missing data. The overall prevalence of NAFLD was 37.7% and this decreased with age (Figure 1) (p < 0.001). In logistic regression analysis of NAFLD (FLI≥60, n = 2314) vs no-NAFLD (FLI <30, n = 1755), age (OR 0.93; 95% CI 0.92–0.94; p < 0.001), male gender (OR 2.69; 95% CI 2.34–3.09; p < 0.001), diabetes (OR 4.19; 95% CI 3.25–5.39; p < 0.001), chronic kidney disease (OR 1.51; 95% CI 1.28–1.77), and hypertension (OR 1.75; 95% CI 1.50–2.05; p < 0.001) were all significantly associated with NAFLD. Additionally, multiple markers of frailty and social disadvantage were significantly associated with NAFLD, including low gait speed (OR 1.62, 95% CI 1.27–2.07; p < 0.001) and worsening frailty using the Fried Frailty Index (OR 1.29; 95% CI 1.10–1.51; p = 0.002 for pre-frail participants; OR 2.08; 95% CI 1.19–3.62; p = 0.01 for frail participants). Completing more than 12 years of education (OR 0.72; 95% CI 0.63–0.83; p < 0.001) and being in the top half of an Australian composite measure of advantage and disadvantage (IRSAD) (OR 0.80; 95% CI 0.70–0.92; p = 0.002) appeared to be protective.

Conclusion: Similar to the Rotterdam study we found a decreasing prevalence of NAFLD with increasing age. In addition, our study shows important novel associations between NAFLD in older persons and worsening physical function and frailty, as well as an inverse association between NAFLD and markers of social advantage.

Background and aims: The natural history of advanced fibrosis in non-alcoholic fatty liver disease (NAFLD) might behave differently compared to other CLD. We aim to describe the natural history of stable and strictly compensated NAFLD patients with advanced fibrosis.

Method: Patients at the Antwerp University Hospital diagnosed between 03/2006 and 11/2021 with a biopsy proven NAFLD and fibrosis F3 or F4 were retrospectively collected. Available clinical follow-up time needed to be ≥12 months after the histological confirmation of advanced fibrosis. Only strictly and stable compensated patients were included, defined as baseline Child Pugh score ≤87, the absence of prior hepatic decompensation, or development thereof within 12 m after biopsy. Hepatic decompensation was defined as variceal bleed (VB), overt hepatic encephalopathy (HE) or ascites needing large volume paracentesis (LVP). The following clinically relevant events were collected as well: hepatocellular carcinoma (HCC) or death.

Results: 100 out of 185 patients met the inclusion criteria (56 F3; 44 F4), with a mean follow-up time of 264 (56–864) weeks. First decompensation events were noted in 16 (16%) patients during follow-up distributed as LVP/HE/VB with n = 11/6/4 patients respectively (figure 1), 5 patients experienced >1 event. Mean time to first decompensation was respectively 238/195/155 weeks. Compared to patients without decompensation, decompensated patients had at baseline (i.e. at time of biopsy) significantly higher age (64 ± 8 ± 6.6 vs. 58 ± 10; p = 0.029), lower platelet count (159 ± 53 vs. 213 ± 80 10^3/L; p = 0.011), higher serum Na-MELD (9.88 ± 2.42 vs. 7.85 ± 2.81; p = 0.008), higher predicted Hepatic Venous Pressure Gradient (HVPG-3P model) (11.56 ± 1.75 vs.10.01 ± 2.69 mmHg; p = 0.029). HVPG (measured in 66/100) was insignificantly higher (9.95 ± 2.42 vs. 7.85 ± 2.81; p = 0.008), higher predicted Hepatic Venous Pressure Gradient (HVPG-3P model) (11.56 ± 1.75 vs.10.01 ± 2.69 mmHg; p = 0.029). 4 cases developed HCC with a mean follow-up time of 733 weeks and 15 deaths (3 liver-related) were noted with a mean follow-up time of 221 (75–733) weeks. Of these cases 1/4 and 8/15 experienced prior decompensation.
Conclusion: In this large single centre cohort of NAFLD patients with advanced fibrosis and strictly compensated disease with a mean follow-up of >5 years, roughly 1/6 patients developed a first decompensating event. Ascites needing LVP was the most frequent decompensation event. Age, sodium, platelets and GGT and use of NSBB at baseline were associated with decompensation. About a 1/3 of patients with decompensation had F3 fibrosis and about 1/2 a baseline HVPG of <10 mmHg.

THU-445
The impact of Clostridium difficile on mortality and outcomes in patients with NAFLD vs. NASH
Ankoor Patel1, Gaurav Pathak2, Alexander Chen1, Carlos Minacapelli2, Carolyn Catalano2, Vinod Rustgi1,1 Rutgers-Robert Wood Johnson Medical School, Medicine, New Brunswick, United States, 2Robert Wood Johnson Medical School, Dept of Gastroenterology and Hepatology, New Brunswick, United States
E-mail: ahp60@rwjms.rutgers.edu

Background and aims: Clostridium difficile (C. Diff) infection (CDI) is the most common cause of infectious nosocomial diarrhea among adults in developed countries. The rate of CDI has increased over the last few decades and is associated with significant mortality and morbidity. NAFLD is the most common chronic liver disease due to the increasing prevalence of obesity and other metabolic diseases. Several studies show a correlation between NAFLD and bacterial infections; however, outcomes in patients with NAFLD/NASH and CDI are limited. Using the National Inpatient Sample (NIS), our study evaluated outcomes, including mortality and complications, length of stay (LOS), and costs among patients with NAFLD/NASH and CDI.

Method: We performed a retrospective cohort study using the National Inpatient Sample (NIS) from 2015 to 2017. Patients with C. Difficile infection, NAFLD, and NASH were identified using ICD-10 codes. Patients with diagnoses of both NAFLD and NASH were excluded. Primary outcomes included mortality, length of stay, total hospitalization costs. Secondary outcomes included AKI, pneumonia, respiratory failure, ventilatory dependence, acute pulmonary embolism, intestinal perforation, peritonitis, toxic megacolon, acute liver failure, liver failure, liver cancer. Multivariate logistic regression analysis was used to compare the two groups.

Results: A total of 761,175 patients with CDI were included and 11,335 (1.49%) had NAFLD and 4365 (0.57%) had NASH. The NASH cohort had a higher degree of comorbidities (CCI mean, CDI and NASH, CDI only, CDI and NAFLD, 6.33 vs 5.12 vs 3.40; p < 0.001). Patients hospitalized for CDI with NASH had an increased risk of mortality compared to those with NAFLD and those without NASH or NAFLD (CDI and NASH vs CDI and NAFLD vs CDI only, 7.11% vs 2.61% vs 6.36%). Patients with CDI and NASH were at increased risk for liver related complications, including liver failure and liver cancer, acute kidney injury, and septic shock (p < 0.001) compared to patients with CDI only.

Conclusion: Patients with NASH have a higher rate of mortality, AKI, septic shock, and liver-related complications following CDI.
Background and aims: Non-alcoholic fatty liver disease (NAFLD) causes both liver and cardiovascular morbidity and mortality. While many studies suggest worse clinical outcomes for sarcopenic patients with cirrhosis, few data are available on sarcopenia in NAFLD patients with early liver disease. Our aim is to assess sarcopenia against fibrosis stage and clinical outcomes in patients with NAFLD.

Method: We consecutively enrolled NAFLD patients followed up in the specialist clinic at Imperial College Healthcare NHS Trust, London, UK. NAFLD was diagnosed either clinically or based on histology. We collected anthropometric, biochemical parameters, medical history and cardiovascular risk factors. For the evaluation of sarcopenia, we performed bioimpedance analysis (BIA), 5 times sit-to-stand test (5STST) and handgrip strength test (HST). As suggested in literature, poor performances were considered 5STST >15 sec, and HST <27 kg (5STST) and handgrip measurement were available in the whole cohort, while 22 of 130 (17%) were below the HST cutoff, 40 [34–39 kg] (34% [26–60]), while muscle mass was 54 [47–60] kg [62% [56–70]]. Furthermore, 22 of 130 (17%) were below the HST cutoff, while 19 out of 70 [28%] had a 5STST >15 sec. Poor HST was associated with lower muscle mass measured with BIA. In terms of severity of liver disease, 51 (41%) showed LSM >8 kPa, while cirrhosis as a combination of clinical parameters (LSM, bloods and imaging) or on histology.

Results: Overall, 130 NAFLD patients were included, with median age 58 [50–67] years and BMI 29.9 [26.8–34.6] kg/m². 86 (67%) were males, 101 (79%) had type 2 diabetes mellitus and 73 [57%] hypertension. BIA and handgrip measurement were available in the whole cohort, while 5STST only in 70 patients (54%). As per BIA, absolute fat mass was 28 [20–40] kg [34 [26–34] %], while muscle mass was 54 [47–65] kg [62% [56–70]]. Furthermore, 22 of 130 (17%) were below the HST cutoff, while 19 out of 70 [28%] had a 5STST >15 sec. Poor HST was associated with lower muscle mass measured with BIA. In terms of severity of liver disease, 51 (41%) showed LSM >8 kPa, while 7 (5%) had cirrhosis. Previous history of MACE was positive in 19 (15%) patients. On multivariate analysis, 5STST >15sec was significantly associated with LSM >8 kPa (OR 6.7, 95%CI: 1.3–33.9; p = 0.004). Moreover, while no association was found at multivariate analysis between MACE and LSM >8 kPa (p = 0.04), multivariate analysis between MACE and 5STST >15 was significantly related to history of MACE (OR 5.4, 95%CI: 1.1–26.3; p = 0.04).

Conclusion: Poor performance at 5STST was associated both with significant liver fibrosis and MACE. In contrast, HST was not related with MACE. The 5STST could be integrated into the cardiovascular risk stratification of NAFLD patients.

THU-446
Poor performance at five times sit-to-stand test, but not at handgrip test, is related to significant liver fibrosis and correlates with major cardiovascular events in non-alcoholic fatty liver disease patients

Giordano Sigon1, Roberta Forlano1, Benjamin H. Mallish1, Jian Huang1, Michael Yee2, Robert D. Goldin3, Mark Thurnz2, Pinelopi Manousou1.
1Liver Unit/Division of Digestive Diseases, Department of Metabolism, Digestion and Reproduction, Faculty of Medicine, Imperial College London, London, United Kingdom, United Kingdom; 2Section of Endocrinology and Metabolic Medicine, St Mary’s Hospital, Imperial College NHS Trust, London, United Kingdom, London, United Kingdom; 3Department of Cellular Pathology, Faculty of Medicine, Imperial College London, London, United Kingdom, London, United Kingdom
E-mail: gio.sigon@virgilio.it

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is a major cause of liver-related morbidity and mortality. The British Association for the Study of the Liver (BASL) and British Society of Gastroenterology (BSG) NAFLD Special Interest Group (SIG) recently published Quality Standards for NAFLD management which includes auditable key performance indicators (KPIs) of good clinical care. This national audit, endorsed by BASL and BSG, aimed to benchmark the care in UK hospitals for patients with NAFLD against these KPIs and compared practice in 2012 with 2022.

Method: An electronic survey was designed by BASL/BSG NAFLD SIG and published and distributed via BASL and BSG webpages, mailing lists and twitter accounts. Participating hospitals collected retrospective data from all new NAFLD patients reviewed in outpatient clinic in the month of March 2019 and March 2022.

Results: Data relating to KPIs from 776 NAFLD patients (374 in 2019, 402 in 2022) in 34 hospitals covering all four UK countries were collected (Table 1). Mean age of audited population was 52.7 years, 55.2% were male and 63.4% were of White ethnicity. 85.3% of services reported established local liver disease assessment pathways, yet only 27.9% of patients with suspected NAFLD had non-invasive fibrosis assessment documented at point of referral to secondary care. In secondary care, non-invasive tests were used or liver biopsy was conducted in 79.1% of patients. 34.6% of patients without non-invasive fibrosis assessment at point of referral to secondary care had low-risk of advanced fibrosis (low FIB4 or NAFLD Fibrosis score, Fibroscan <8 kPa). There was considerable variation in the assessment cardiometabolic risk factors including obesity (73.2%), type 2 diabetes (T2DM) (33%), hypertension (19.3%) and smoking (54%). Giving appropriate diet and lifestyle advice to address cardiometabolic risk was poorly performed. Only 9.1% of NAFLD patients at increased cardiovascular risk (T2DM and/or QRISK3 >10%) were advised statin treatment in line with NICE guidelines. Significant improvements in several KPIs were identified between 2019–2022: non-invasive fibrosis assessment at referral increased 20.8% to 35.1% (p < 0.0001), statin recommendations increased from 4.3% to 12.5% (p = 0.012) and providing patient information material regarding NAFLD increased from 11.6% to 24.5% (p < 0.001).

Conclusion: This national audit of NAFLD management in the UK has identified significant variation and areas for improvement, particularly in fibrosis risk assessment prior to secondary care referral and management of associated cardiometabolic risk factors. Improvements from 2019 to 2022 gives cause for optimism but further work is needed to drive changes in service delivery and patient care.

References

Odds ratio 95% confidence interval p value
Age 1.1 0.9–1.2 0.52
Male gender 1.2 0.9–1.1 0.83
Type 2 diabetes mellitus 5.8 0.5–60.3 0.14
Statin 3.1 0.5–20.6 0.24
Cirrhosis 3.4 0.4–30.3 0.24
5STST >15 5.4 1.1–26.3 0.04

5STST: five times sit-to-stand test.
Figure: Logistic regression for history of major cardiovascular event.
Background and aims: Non-alcoholic fatty liver disease (NAFLD) is highly prevalent among subjects with metabolic syndrome. Obesity, as estimated by body mass index (BMI) is a modifiable risk factor for both NAFLD and cardiovascular disease (CVD), including arterial hypertension (HTN). Herein, we explored to which extent NAFLD mediates the association between obesity and arterial hypertension.

Method: A two-step approach was used. First, we included cross-sectional data (1392 adults aged 29.4 ± 5.1 years) from the Bogalusa Heart Study (BHS) that was designed to assess the early natural history of CVD in a cohort of young adults in a semirural community. NAFLD was assessed using the fatty liver index (FLI). Liver fibrosis was estimated using the NAFLD fibrosis score. To replicate the findings, we included data from the National Health and Nutrition Examination Survey (2017–2018 cycle, NHANES). NAFLD was defined by the controlled attenuation parameter (CAP >268 dB/m) obtained via transient elastography (non-NAFLD = 1876; NAFLD = 1483). Liver fibrosis was defined based on stiffness measurements (n = 3359 subjects). Variables were log-transformed as they showed non-normal distribution according to Q-Q plots. Causal mediation analysis were performed using generalized structural models (GSEM) to examine the causal role of liver steatosis and fibrosis in the relation between obesity and hypertension. Results were adjusted for relevant demographic, anthropometric, clinical, and biochemical variables including age, sex, ethnics, and impaired fasting glucose, or type 2 diabetes.

Results: In the BHS, HTN was associated with NAFLD (OR: 1.70, 95% CI: 1.29–2.25; p = 0.008) and BMI (OR: 1.06, 95% CI: 1.02–1.09; p = 2.4E–3) after adjusting for relevant confounders. Significant effects were also found for systolic (SBP) and diastolic (DBP) blood pressure, and heart rate (HR). These findings were replicated in NHANES survey. Specifically, HTN was associated with NAFLD (OR: 1.39, 95% CI: 1.01–1.92) and BMI (OR: 6.43, 95% CI: 2.80–14.8). In the BHS, causal mediation analysis showed that significant indirect effects of BMI on HTN, SBP, DBP, and HR through FLI gradation explain up to 88%, 91%, 93%, and 100% of the total effect, respectively. In NHANES, these indirect effects also explain a significant proportion of the total effects (HTN = 51%, SBP = 60.4%, HR = 100%, and pulse pressure = 88%). Liver fibrosis mediated the effect of BMI on SBP (52%).

Conclusion: NAFLD mediates a substantial proportion of the effect of obesity on the presence of arterial hypertension. This conclusion has important clinical implications in both NAFLD and hypertension management.

THU-449
Nutritional behavior and food pattern are sex-specific with higher salt intake and consumption of ultra-processed foods in a large cohort of NAFLD patients

Monika Rau1, Julia Jerzynski1, Bianca Heller1, Florian P. Reiter1, Hans Benno Leicht1, Ina Berghärm2, Peter Heuschmann3, Andreas Geier1, University Hospital Würzburg, Department of Internal Medicine II, Germany; 2University of Vienna, Department of Nutritional Sciences, Molecular Nutritional Science, Austria; 3University of Würzburg, Institute of Clinical Epidemiology and Biometry, Germany

E-mail: rau_m@ukw.de

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is the leading cause of chronic liver disease. “Western” dietary patterns with high salt content and ultra-processed foods (UPF) are generally linked to hepatic inflammation in NAFLD, but scarce information exists on its particular impact on NAFLD disease stage. Aim of this study is to analyze food pattern and specific nutritional behavior in NAFLD patients as a first step in specific nutritional intervention.

Method: Prospectively, 310 clinically characterized NAFLD patients were included (04/21–11/22) in this single center study at a tertiary hospital. All patients completed a nutrition questionnaire based on FFQ (DEGS2) including 53 food groups for the calculation of dietary sodium consumption/day (DSC). UPF consumption was classified by NOVA food classification. Nutritional behavior was assessed by questionnaires such as SINU-Salt, the Intuitive Eating Scale-2 and the Adult Eating Behaviour Questionnaire.

Results: Slightly more women (57%) than men (43%) were included in this study with an average age of 52.7 for men and 52.3 for women. Men had significantly higher consumption of UPF (708 ± 464 kcal/d) compared to women (478 kcal/d ± 554), but women had higher meal frequency per day. Higher UPF consumption was associated with higher DSC. Mean daily salt intake in the study cohort was 7 g/d. Men had higher DSC (8.3 g/d vs 6.1 g/d in women) and had different behavior with significantly lower salt awareness in everyday life. Furthermore, men had different nutritional behavior with lower agreement to slowness in eating and satiety responsiveness but higher consent to eating for physical rather than emotional reasons. Nutritional behavior with high responsiveness on hunger and satiety cues (as a positive feedback signal) was linked to milder disease phenotype with lower ALT, AST, GGT, Ferritin, and lower DSC in this cohort. NAFLD patients with higher DSC (>5 g/d) had a significantly higher serum ALT, GGT and ferritin compared to low DSC (<5 g/d) (ALT: 1.65 vs 1.30U/L; p = 0.001). Patients with high DSC (>5 g/d) had higher weight and more steatosis by CAP (153.2 vs. 116.7 dB/m; p <0.001) compared to low DSC.

Conclusion: Consumption of ultra-processed food, daily salt intake and nutritional behavior is sex-specific in a large cohort of NAFLD patients. High daily salt intake is linked to higher liver enzymes and more pronounced liver steatosis. The findings of this study represent the basis for a prospective interventional trial.

References
resistance. Its occurrence with Non-alcoholic fatty liver disease (NAFLD) has been reported to be associated with more severe fibrosis. Little data is available regarding the prevalence of DIOS in those with NAFLD. This study aimed to evaluate the prevalence of histologic hepatic iron overload in adults with biopsy-proven NAFLD, and to determine the correlation between serum ferritin and hepatic iron overload.

Method: This single center, retrospective study included adult patients (≥18 years old) with biopsy-proven NAFLD between 01/01/2010–31/12/2019. The electronic medical record was used to assess detailed data on patient demographics, biochemistry, and clinical parameters. NAFLD is defined as ≥5% steatosis in the absence of any co-factors for liver disease. For the purpose of this study, DIOS is defined by histological evidence of iron deposits on Perl’s stain in the presence of any component of the metabolic syndrome (hypertension, type 2 diabetes mellitus, dyslipidemia).

Results: In total 224 patients were included in this study, with mean age 52.3 years and the majority female (64.7%). Forty-one (19.2%) patients had evidence of histologic iron overload, n = 39 (17.4%) fulfilling diagnosis for DIOS. Those with DIOS were more likely to be male (56.4% vs 38.0%, p = 0.002), leaner (body mass index [BMI] 34.9 vs 38.0 kg/m², p = 0.01) and had higher serum ferritin (329 vs 94 micrograms/L, p < 0.001) and transferrin saturation (29.7% vs 21.5%, p < 0.001). Ferritin >1000 micrograms/L (odds ratio [OR] 7.60, 95% confidence interval [CI] 1.26–45.86, p = 0.027) and transferrin saturation as continuous variables (OR 1.06, 95% CI 1.01–1.11, p = 0.017) were independent predictors for histological iron overload after adjusting for age, gender, and BMI on multivariate logistic regression analysis. There was a statistically significant but weak correlation between serum ferritin and hepatocellular iron content (Spearman’s ρ = 0.378, 95% CI 0.213–0.523, p < 0.001) and reticuloendothelial cell compartment iron content (Spearman’s ρ = 0.341, 95% CI 0.172–0.491, p < 0.001). DIOS was not an independent predictor for fibrosis on multivariable linear regression analysis or F3–4 fibrosis on logistic regression analysis.

Conclusion: Prevalence of DIOS is nearly 20% in those with biopsy-proven NAFLD. While higher levels of ferritin and transferrin saturation were associated with DIOS, most patients with DIOS had ferritin <500 micrograms/L and transferrin saturation <45%, limiting the ability of these parameters to predict DIOS. Hepatic iron overload did not predict presence of advanced fibrosis/cirrhosis in this cohort.

THU-451
Effect of PNPLA3 (rs738409 C > G) and TM6SF2 (rs58542926 C > T) polymorphisms on the prognosis of non-alcoholic fatty liver disease (NAFLD) in patients with type-2 Diabetes Mellitus
Natália Lavrado1, Claudia Regina Cardoso1, Natalia Wajbrot2, Paulo Henrique França3, Gil Salleia, Nathalie Leiteb, Cristiane Villeta-Nogueiria, 1Federal University of Rio de Janeiro, School of Medicine, Internal Medicine Division, Rio de Janeiro, Brazil; 2Federal University of Rio de Janeiro, Hepatology Division, Brazil; 3Universidade de Joinville, Brazil E-mail: crisvilletanogm@gmail.com

Background and aims: The impact of the association of genetic polymorphisms in the progression of liver disease in patients with type-2 Diabetes Mellitus (T2DM) and NAFLD is still under debate. We aimed to evaluate the effect of PNPLA3 and TM6SF2 alleles in the prognosis of liver and extrahepatic outcomes in a cohort of T2DM patients with NAFLD.

Method: T2DM individuals with NAFLD had the PNPLA3 (rs738409 C > G) and TM6SF2 (rs58542926 C > T) genotypes determined. Each polymorphism was categorized into two groups considering the presence of at least one or none risk allele. We evaluated the impact of harbouring at least one risk allele (G or T) from each polymorphism regarding the occurrence of the following outcomes: cirrhosis, esophageal or gastric varices, hepatocellular carcinoma, major cardiovascular events (MACE), extrahepatic cancer and death. Multivariate analysis evaluated the associations between PNPLA3 and TM6SF2 alleles and the outcomes. Several hierarchical models were built to assess the association, independently of confounding factors: model (1) only polymorphism (PNPLA3 or TM6SF2) as the main covariate, (2) model 1 plus age and gender, (3) model 2 plus hypertension, dyslipidemia, use of insulin, smoking history, alcohol consumption, body mass index, glycated haemoglobin and gamma-glutamyl transpeptidase. Results were presented as odds ratios with their 95% confidence intervals, and a 2-tailed p value <0.05 was regarded as significant.

Results: 407 T2DM with NAFLD (mean age 62 ± 10 years, 67% women) were followed for 66 ± 19 months. Frequencies of the genotypes’ categories were: PNPLA3 CC 44.2% and CG+GG 55.8%; TM6SF2 CC 87.5% and CT+TT 12.5%. Forty-seven (11.5%) patients had cirrhosis and esophageal or gastric varices were found in 16 (3.9%) patients. Hepatocellular carcinoma was diagnosed prospectively in 7 (1.7%) patients. Regarding extrahepatic outcomes, 43 (10.6%) patients had extrahepatic cancer, and MACE occurred in 103 (25.3%) patients. Sixty-four (15.7%) participants died during follow-up, the leading causes being cardiovascular (42.2%) and infection (32.8%). Having at least one G allele of PNPLA3 independently increased the risk of developing cirrhosis (OR 12.33/95% CI 3.58–42.38; p < 0.001) and esophageal or gastric varices (OR 13.24/95% CI 1.49–117.52; p = 0.02), and decreased the risk of having hepatocancer (OR 0.41/95% CI 0.18–0.90; p = 0.02). There was no association between the G allele of PNPLA3 and hepatocellular carcinoma, MACE or death. Regarding the T allele of TM6SF2, none of the analyses showed results with statistical significance.

Conclusion: T2DM NAFLD patients harbouring at least one minor allele of PNPLA3 rs738409 polymorphism have a worse prognosis regarding liver disease and should be followed carefully due to the higher odds of disease progression.

THU-452
Interferon gamma-induced protein 10 levels increase across the spectrum of liver disease and are associated with insulin resistant components in subjects with non-alcoholic fatty liver disease
Marta Guariglia1, Chiara Rosso2, Fabrizia Carli3, Gian Paolo Caviglia1, Agnolo Armando1,4, Eleonora Dileo1, Nuria Pérez Diaz del Campo1, Gabriele Castelnuovo1, Maria Lorena Abate1, Antonella Olivero1, Daphne D’Amato1, Amina Abdulle1, Irene Poggiolini1, Davide Ribaldone1,4, Giorgio Maria Saracco1,4, Amalia Gastaldelli2, Elisabetta Bugianesi1,4,1, University of Turin, Department of medical science, Turin, Italy; 2Institute of Clinical Physiology, CNR, Carbohydrate Metabolic Risk Unit, Pisa, Italy; 3University medical center of the Johannes Gutenberg-University, 4Department of medicine, Mainz, Germany; 4Città della salute e della scienza- Molinette Hospital, Gastroenterology Unit, Turin, Italy. E-mail: marta.guariglia@unito.it

Background and aims: The most important determinant of the progression of non-alcoholic fatty liver disease (NAFLD) to non-alcoholic steatohepatitis (NASH) and fibrosis is insulin resistance (IR). Interferon gamma-induced protein 10 (IP-10), a proinflammatory chemokine, plays a crucial role in inflammatory diseases but its interaction with IR in the setting of NAFLD is not clear.

Method: We analysed data from 200 patients with biopsy proven NAFLD (M/F 121/79; mean age 47 ± 12). A subgroup of 46 non-diabetic NAFLD subjects underwent tracers studies (6, 6 -d2-gucose and [2H5 ] glycerol). Tracers enrichment was determined by GC-MS and data were used to calculate hepatic (Hep)-IR and adipose tissue (AT)-IR components. Serum IP-10 levels were assessed by Bio-Plex (BioRad Laboratories).

Results: Overall, 81/200 (40.5 %) patients had F ≥2 and 151/200 (75.5 %) had NASH. The prevalence of type 2 diabetes was 27.5 % and 47.5 % of the patients were obese. IP-10 levels significantly increased across lean to overweight to obese subjects (p = 0.009), showed a stepwise
increase according to the stages of hepatic fibrosis (p = 0.006) and were significantly higher in patients with NASH compared to those with NAFL (457 pg/ml vs 383 pg/ml, p = 0.039). Moreover, IP-10 levels were increased in diabetic compared to non-diabetic patients (491 pg/ml vs 393 pg/ml, p = 0.021) and showed a significant correlation with HOMA-IR (r = 0.30, p = 0.006). In the subgroup of non-obese, non-diabetic NAFLD patients who underwent tracers’ studies, IP-10 levels showed a significant correlation with both Hep-IR and AT-IR (r = 0.32, p = 0.030 and r = 0.33, p = 0.049, respectively). At multivariate analysis, IP-10 was independently associated to the degree of hepatic fibrosis (r = 0.3, p = 0.05).

**Conclusion:** IP-10 may be involved in the complex pathogenesis of NAFLD. Further studies are needed to demonstrate its causality in determining liver damage.

This research has been supported by the Italian MIUR under the programme ‘Dipartimenti di Eccellenza 2018–2022’, n. D15D18000410001 and by EU/EPPA-IM2 under g.a. no. 777377, LITMUS

**THU-453 Stigma in NAFLD and NASH: a global survey of patients and providers**

Zobair Younossi1,2, Yusuf Yilmaz3, 4, Jiao-Gao Fan6, Vincent Wai-Sun Wong7, Mohamed El Kassas8, Shira Zelber-Sagi9, Alina Allen10, Mary Renilla11, Ashwani Singal12, Stuart C. Gordon13, Michael Fuchs4, Wayne Eskridge13, Naim Alkhouri14, Khalid Alswat17, Hirokazu Takahashi18, Takumi Kawaguchi19, Jane Kanagan20, Ming-Hua Zheng21, Ajay Kumar Duseja22, Patrizia Burra23, Carine Carrieri Patrizia24, Marco Arrese25, Achim Kautz26, Janus Ong27, Laurent Castera28, Sven Fransce29, Marcelo Kugelmas30, Yuichiro Eguchi31, Sombat Treeprasertsuk32, Marien Ivan Castellanos Fernandez33, Manuel Romero Gomez34, Philip N. Newsome35, Kenneth Cusi36, Roshit Loomba37, Jörn Schattenberg38,39, Ming-Lung Yu40, Moises Diago41, Lynn Gerber42, Brian Lam2,3, Lisa Fornaresio42, Fatema Nader43, Linda Henry2,3,4, Andrei Racila2,3,4,3, Pegah Golabi3, Maria Stepanova1,3,4, Saleh Alqahtani4,4, Jeffrey Lazarus5,6, Innova Health System, Medicine Service Line, United States; 7Inova Health System, Department of Medicine, Center for Liver Diseases, United States; 8Beatty Liver and Obesity Research Program, Inova Health System, United States; 9Liver Disease Research Center, Department of Medicine, College of Medicine, King Saud University, Turkey; 10Rafec Tayyip Erdogan University, Department of Gastroenterology, Turkey; 11Xinhua Hospital, Shanghai Jiao Tong University School of Medicine, China; 12The Chinese Institute of Hong Kong, Department of Medicine and Therapeutics, Hong Kong; 13Cairo University, Endemic Medicine and Hepatogastroenterology Department, Egypt; 14Tel Aviv University, School of Public Health, Israel; 15Mayo Clinic, Department of Hepatology and Gastroenterology, United States; 16University of Chicago, College of Medicine, United States; 17University of South Dakota and Avera Transplant Institute, United States; 18Henry Ford Hospital, Department of Medicine, United States; 19Veteran’s Administration Medical Center, Department of Medicine, United States; 20Fatty Liver Foundation, United States; 21Arizona Liver Transplant Center, United States; 22King Saud University College of Medicine, Liver Research Unit, Saudi Arabia; 23Department of Hepatology, Diabetes, Metabolism and Endocrinology at Saga Medical School, Japan; 24Kurume University, Division of Gastroenterology, Department of Medicine, Japan; 25Chronic Liver Disease Foundation, United States; 26Chinese Academy of Medical Sciences and Peking Union Medical College, China; 27Postgraduate Institute of Medical Education and Research, Department of Hepatology, India; 28Padua University, Division of Gastroenterology and Hepatology, Italy; 29Aix Marseille Univ, INSERM, IRD, SESTIM, Sciences Économiques et Sociales de la Santé et Traitement de l’Information Médicale, Marseille, France; 30Pontificia Universidad Católica de Chile, Chile; 31Kautz5 gUG, Germany; 32University of the Philippines, College of Medicine, Philippines; 33Hospital Beaujon, Assistance Publique-Hôpitaux de Paris, University of Paris, France; 34Antwerp University Hospital, Belgium; 35South Denver Gastroenterology, United States; 36Saga University, Department of Hepatology, Liver Center, Japan; 37Chulalongkorn University, Division of Gastroenterology, Thailand; 38Instituto Nacional de Gastroenterología, La Habana, Cuba, Cuba; 39Institute of Biomedicine of Seville (HUVR/CSIC/US), Spain; 40University of Birmingham, United Kingdom; 41University of Florida, College of Medicine--Department of Endocrinology, United States; 42UC San Diego Medical Center, San Diego, CA, USA, United States; 43Metabolic Liver Research Program, Germany; 44University Medical Center of the Johannes Gutenberg-University, Germany; 45Baroeha Medical University Hospital, Kaohsiung Medical University, Taiwan; 46Hospital Univ. Gral de Valencia, Spain; 47Johns Hopkins University, Department of Cardiac Surgery, United States; 48Center for Outcomes Research in Liver Disease, United States; 49King Faisal Specialist Hospital and Research Center, Saudi Arabia; 50Barcelona Institute for Global Health, Spain

E-mail: zobair.younossi@inova.org

**Background and aims:** Patients with fatty liver disease may experience stigmatization due to the disease or associated comorbidities. Aim: To understand stigma among NAFLD patients and providers.

**Method:** Members of the Global NASH Council created two surveys about experiences and attitudes toward NAFLD and related terms: a 68-item patient and a 41-item provider survey.

**Results:** The surveys were completed by 475 NAFLD patients [12 countries; 58% USA, 20% Middle East/North Africa (MENA), 20% East Asia (EA)] and 555 providers [63% GI/hepatologists, 14 countries; 28% USA, 44% MENA, 25% EA]. Of all patients, 71% ever disclosed having NAFLD/NASH to family/friends; the most used words were “fatty liver” and “NAFLD or NASH” (35–54%), while “metabolic disease” or “MAFLD” were rarely used (never by 83–88%). There were 46% who reported experiencing stigma or discrimination (at least sometimes) due to obesity/overweight vs. 17% due to NAFLD (Figure). The greatest social-emotional burden among NAFLD patients was feeling partially to blame for their liver disease (69% agree) and others believing that they do not eat properly (58% agree). Providers believed that lack of patient motivation (70%) and training in effective communication (62%) were the biggest obstacles to weight loss discussions. Furthermore, provider discomfort was related to perceived patients’ lack of willpower for lifestyle changes and taking care of their diabetes (45–40% providers; 13–17% USA vs. 64–70% MENA, 31–67% EA). Regarding how various diagnostic terms are perceived by patients, there were no substantial differences between “NAFLD,” “fatty liver disease (FLD),” “NASH,” or “MAFLD”: the most popular response was being neither comfortable nor uncomfortable with either term (47%–57%), with some greater discomfort with FLD among U.S. patients (45% uncomfortable). Among providers, 42% (49% USA, 43% MENA, 32% EA) believed that the term “fatty” in the name is stigmatizing, while 38% believed that the term “non-alcoholic” is stigmatizing, more commonly in MENA (47%). Also, 38% of the providers reported the term “FLD” as being stigmatizing (47% USA, 40% MENA, 24% EA). Finally, 54% of the providers (41% USA, 48% MENA, 52% EA) believe that a name change may reduce stigma.
Figure: (abstract: THU-454).

**Conclusion:** Perception of NAFLD stigma varies according to patients, providers, geographic location and sub-specialty. NAFLD patients reported the term obesity to be more stigmatizing than NAFLD.

**THU-454**

**Effects of a one-month consumption of different non-alcoholic beers on metabolic and liver health in young men**

Henriette Kreimeyer¹, Svenja Sydor², Lara Kaiser³, Cagatay Toskal¹, Anja Figge¹, Jan Best¹, Josef Pospiech¹, Oliver Götze¹, Jan-Peter Sowa³, Mustafa Özcürümez², Ali Canbay¹, Lars Behmann¹, Paul Manka¹.

¹Universitätsklinikum Knappschaftskrankenhaus Bochum Langendreer, Germany
E-mail: henriette.kreimeyer@gmail.com

**Background and aims:** The amount of alcohol that can be consumed healthily without causing harm is currently under discussion.

Recently, the gender-specific limit for daily alcohol consumption has been further reduced. Non-alcoholic alternatives to regular beer are often promoted. However, data on the effects of non-alcoholic beer on liver health are lacking. We investigated the influence of different non-alcoholic beer beverages [Pilsner (PI), wheat beer (WB), lemon-lime flavored drink/mixed drink (MD), and water (WA) as control] on fatty degeneration and liver damage and effects on glucose and lipid metabolism.

**Method:** In this monocentric, randomized, multi-arm study, 48 healthy young men were evaluated for serum markers of liver injury, glucose, and lipid metabolism. In addition, liver status was assessed by transient elastography, including measurement of the controlled attenuation parameter (CAP). Blood samples were collected at the beginning and end of a four-week period, during which the subjects were required to consume two 330 ml bottles of each beverage daily.

**Results:** Deterioration of glucose metabolism markers was observed in all groups compared to controls. Insulin and c-peptide increased significantly in the WB group, while fasting glucose increased in the MB group, and HbA1c increased in the PI group. Triglyceride levels increased in the MB and WB groups and decreased in the WA and PI groups, but not significantly. HDL showed a significant increase in the WA group. Liver enzymes showed a substantial increase in the MB group, while transient elastography results showed no differences. M30, an apoptosis marker, showed a significant decrease in liver damage in the WA and PI groups.

**Conclusion:** Four weeks of alcohol-free beverage consumption altered several serum parameters associated with glucose, liver, and lipid metabolism in this cohort of healthy young men. In addition, consumption of mixed beer was associated with more significant liver inflammation.
Background and aims: Non-alcoholic fatty liver disease (NAFLD) may be associated with cognitive dysfunction due to metabolic micro-ischemic encephalopathy. We aimed to identify the prevalence of cognitive impairment in an obese cohort, assess the association to biopsy-proven NAFLD, and describe the nature of the impairment.

Method: Liver biopsy and basic cognitive testing with Continuous Reaction Time test (CRT), Portosystemic Encephalopathy-Syndrome test (PSE), and Stroop EncephalApp were performed in all. A representative sub-group further underwent Repeatable Battery for the Assessment of Neuropsychological Status (RBANS). Cognitive impairment was defined as ≥2 abnormal basic cognitive tests or abnormal RBANS.

Results: We included 180 persons with BMI >35 kg/m, 72 % women, age 46 ± 12 years, 54 % had NAFLD, and 24 % had steatohepatitis. Eight percent were impaired as defined by CRT, PSE, and Stroop, and 41 % by RBANS. Executive functions and memory were the most affected domains. Male gender, the use of 2 or more psychoactive medications, and low LDL were risk factors (table). There was no correlation to BMI, NAFLD severity, or other metabolic co-morbidities. The few with advanced liver fibrosis performed worse in PSE.

Conclusion: Cognitive impairment was frequent in our obese cohort; not associated with NAFLD severity; and differed from hepatic encephalopathy by severely impacting immediate and late memory. Cognitive impairment was frequent in our obese cohort; with advanced liver fibrosis performed worse in PSE. The few domains. Male gender, the use of 2 or more psychoactive medications, and low LDL were risk factors (table). There was no correlation to BMI, NAFLD severity, or other metabolic co-morbidities. The few with advanced liver fibrosis performed worse in PSE.

Figure: (abstract: THU-455): Regression analysis of the association between impaired cognition and possible predictor variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>OR</th>
<th>95 % CI</th>
<th>p value</th>
<th>OR</th>
<th>95 % CI</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex (Male)</td>
<td>3.46</td>
<td>1.61–7.44</td>
<td>0.002</td>
<td>3.67</td>
<td>1.32–10.27</td>
<td>0.013</td>
</tr>
<tr>
<td>Age (years)</td>
<td>1.00</td>
<td>0.97–1.03</td>
<td>0.93</td>
<td>0.96</td>
<td>0.93–1.00</td>
<td>0.051</td>
</tr>
<tr>
<td>Education (years)</td>
<td>0.84</td>
<td>0.72–0.96</td>
<td>0.013</td>
<td>0.86</td>
<td>0.72–1.02</td>
<td>0.077</td>
</tr>
<tr>
<td>Steatohepatits, NASH (Yes)</td>
<td>1.13</td>
<td>0.48–2.64</td>
<td>0.778</td>
<td>0.96</td>
<td>0.72–1.02</td>
<td>0.39</td>
</tr>
<tr>
<td>Severe fibrosis, F3–4 (Yes)</td>
<td>2.99</td>
<td>0.80–11.2</td>
<td>0.100</td>
<td>2.95</td>
<td>0.60–14.3</td>
<td>0.181</td>
</tr>
<tr>
<td>Ammonia ion (μmol/L)</td>
<td>1.05</td>
<td>1.00–11.1</td>
<td>0.069</td>
<td>0.59</td>
<td>0.37–0.96</td>
<td>0.035</td>
</tr>
<tr>
<td>CRP (mg/L)</td>
<td>0.98</td>
<td>0.93–1.04</td>
<td>0.55</td>
<td>0.97</td>
<td>0.684</td>
<td>0.48</td>
</tr>
<tr>
<td>AST (U/L)</td>
<td>1.00</td>
<td>0.70–1.01</td>
<td>0.39</td>
<td>0.97</td>
<td>0.684</td>
<td>0.48</td>
</tr>
<tr>
<td>Type 2-diabetes (Yes)</td>
<td>1.31</td>
<td>0.57–2.99</td>
<td>0.528</td>
<td>0.97</td>
<td>0.684</td>
<td>0.48</td>
</tr>
<tr>
<td>HOMA-IR (mmol/mol)</td>
<td>1.00</td>
<td>0.96–1.04</td>
<td>0.97</td>
<td>0.97</td>
<td>0.684</td>
<td>0.48</td>
</tr>
<tr>
<td>Lipid-lowering drugs (Yes)</td>
<td>0.83</td>
<td>0.34–1.99</td>
<td>0.684</td>
<td>0.97</td>
<td>0.684</td>
<td>0.48</td>
</tr>
<tr>
<td>Triglycerides (mmol/L)</td>
<td>0.65</td>
<td>0.38–1.09</td>
<td>0.11</td>
<td>0.59</td>
<td>0.37–0.96</td>
<td>0.035</td>
</tr>
<tr>
<td>HDL cholesterol (mmol/L)</td>
<td>0.58</td>
<td>0.39–0.86</td>
<td>0.007</td>
<td>0.59</td>
<td>0.37–0.96</td>
<td>0.035</td>
</tr>
<tr>
<td>LDL cholesterol (mmol/L)</td>
<td>0.81</td>
<td>0.21–3.15</td>
<td>0.76</td>
<td>0.81</td>
<td>0.21–3.15</td>
<td>0.76</td>
</tr>
<tr>
<td>Sleep Apnoea (Yes)</td>
<td>1.98</td>
<td>0.89–4.44</td>
<td>0.096</td>
<td>1.98</td>
<td>0.89–4.44</td>
<td>0.096</td>
</tr>
<tr>
<td>Hypertension (Yes)</td>
<td>1.31</td>
<td>0.62–2.74</td>
<td>0.48</td>
<td>1.31</td>
<td>0.62–2.74</td>
<td>0.48</td>
</tr>
<tr>
<td>&gt;2 types of psychoactive meds</td>
<td>1.94</td>
<td>0.62–6.07</td>
<td>0.25</td>
<td>5.24</td>
<td>1.34–20.4</td>
<td>0.017</td>
</tr>
<tr>
<td>Major depression inventory</td>
<td>1.01</td>
<td>0.97–1.04</td>
<td>0.67</td>
<td>1.01</td>
<td>0.97–1.04</td>
<td>0.67</td>
</tr>
</tbody>
</table>

HOMA-IR, homeostatic model assessment for insulin resistance; AST, aspartate aminotransferase; LDL, low-density lipoprotein; HDL, high-density lipoprotein cholesterol; CRP, C-reactive protein; psychoactive medication are antidepressants, antipsychotics, morphine or analogues.
Non-alcoholic fatty liver disease (NAFLD) is associated with an increased risk of type 2 diabetes mellitus

Sven H. Loosen1, Tom Lüdde1, Christoph Roderburg1. 1University Hospital Düsseldorf, Medical Faculty of Heinrich Heine University Düsseldorf, Clinic for Gastroenterology, Hepatology and Infectious Diseases, Düsseldorf, Germany

E-mail: christoph.roderburg@med.uni-duesseldorf.de

Background and aims: Non-alcoholic fatty liver disease (NAFLD) has become the most common liver disease worldwide and represents the leading cause of liver-related morbidity and mortality. Its all cause mortality is often driven by co-existing metabolic disease such as type 2 diabetes mellitus (T2DM), which share many pathophysiological characteristics. The risk of developing T2DM among NAFLD patients in Germany is only poorly described. Here, we evaluated the risk of T2DM development in a large cohort of primary care patients in Germany.

Method: A cohort of 17,245 NAFLD patients and a propensity score matched cohort of equal size were identified from the Disease Analyzer database (IQVIA) between 2005 and 2020. The incidence of T2DM was evaluated as a function of NAFLD during a five years study period using Cox-regression models.

Results: Within 5 years of the index date, 18.8% and 11.7% of individuals with and without NAFLD were diagnosed with T2DM (p < 0.001, Figure 1). Regression analysis revealed a Hazard Ratio (HR) of 1.77 (95% CI: 1.68–1.88) for the development of T2DM among NAFLD patients in Germany. Subgroup analyses confirmed this association for all age groups (18–50, 51–60, 61–70, and >70 years), male and female patients, as well as normal weight (BMI <25 kg/m²), overweight (BMI 25–30 kg/m²) and obese (BMI ≥30 kg/m²) patients.

Conclusion: NAFLD is associated with developing extrahepatic malignancy, while MAFLD caused by overweight or obese demonstrated no association with developing extrahepatic malignancy. Categorizing MAFLD subgroup according to the positive definition criteria representing the phenotypes of metabolic disorders could help the stratification of the risk of extrahepatic malignancy in MAFLD.

Figure:

THU-457
Metabolic dysfunction-associated fatty liver disease is associated with increased risk of extrahaepatic malignancies: a nationwide cohort study

Min Kyung Park1, Hye-Sung Moon2, Sungwon Chung1, Sung Ho Won3, Yun Bin Lee1, Eun Ju Choi1, Jeong-Hoon Lee1, Su Jong Yu1, Jung-Hwan Yoon1, Yoon Jun Kim1. 1Seoul National University College of Medicine, Department of Internal Medicine and Liver Research Institute, Korea, Rep. of South; 2RexSoft Inc., Korea, Rep. of South; 3Seoul National University, Department of Public Health Sciences, Graduate School of Public Health, Korea, Rep. of South

E-mail: yoonjun@smu.ac.kr

Background and aims: Metabolic dysfunction-associated fatty liver disease (MAFLD), a new definition encompassing the entire liver disease associated with metabolic disorders, has been recently proposed. We aimed to analyze the long-term outcome of MAFLD by focusing on extrahepatic malignancy.

Method: We analyzed data from the National Health Insurance Service of Korea that includes 7,454,412 participants who participated health screening program in 2009. MAFLD was defined by an international expert consensus statement previously proposed. Participants were further categorized into four groups followed by the MAFLD definition: non-MAFLD, DM-MAFLD, overweight/obese-MAFLD, and lean-MAFLD. The primary outcome was the development of any primary extrahepatic malignancy. The Cox proportional hazard model was used, including adjustment for competing risks.

Results: Of the study subjects, 2,500,080 (33.5%) had MAFLD. During the median follow-up of 10.3 years (interquartile range, 10.1–10.6), 4,478,800 patients (9.0%) were diagnosed with primary extrahepatic malignancy. The MAFLD group had a higher overall risk of extrahepatic malignancy than non-MAFLD group (aSHR = 1.02; 95% CI = 1.02–1.03; P < 0.001).

Conclusion: This meta-analysis provides a necessary update on the longitudinal risks of clinical outcomes associated with NAFLD. While this study suggests that NAFLD is associated with an increased risk of disease outcomes and extra-hepatic complications, further research is required to understand the pathophysiology linking NAFLD with development of extra-hepatic disorders.

THU-458
Non-alcoholic fatty liver disease (NAFLD) is associated with an increased risk of type 2 diabetes mellitus

Sven H. Loosen1, Tom Lüdde1, Christoph Roderburg1. 1University Hospital Düsseldorf, Medical Faculty of Heinrich Heine University Düsseldorf, Clinic for Gastroenterology, Hepatology and Infectious Diseases, Düsseldorf, Germany

E-mail: christoph.roderburg@med.uni-duesseldorf.de

Background and aims: Non-alcoholic fatty liver disease (NAFLD) has become the most common liver disease worldwide and represents the leading cause of liver-related morbidity and mortality. Its all cause mortality is often driven by co-existing metabolic disease such as type 2 diabetes mellitus (T2DM), which share many pathophysiological characteristics. The risk of developing T2DM among NAFLD patients in Germany is only poorly described. Here, we evaluated the risk of T2DM development in a large cohort of primary care patients in Germany.

Method: A cohort of 17,245 NAFLD patients and a propensity score matched cohort of equal size were identified from the Disease Analyzer database (IQVIA) between 2005 and 2020. The incidence of T2DM was evaluated as a function of NAFLD during a five years study period using Cox-regression models.

Results: Within 5 years of the index date, 18.8% and 11.7% of individuals with and without NAFLD were diagnosed with T2DM (p < 0.001, Figure 1). Regression analysis revealed a Hazard Ratio (HR) of 1.77 (95% CI: 1.68–1.88) for the development of T2DM among NAFLD patients. Subgroup analyses confirmed this association for all age groups (18–50, 51–60, 61–70, and >70 years), male and female patients, as well as normal weight (BMI <25 kg/m²), overweight (BMI 25–30 kg/m²) and obese (BMI ≥30 kg/m²) patients.
Background and aims: Overlap between autoimmune hepatitis (AIH) and non-alcoholic fatty liver disease (NAFLD) has become increasingly common in recent years as NAFLD has emerged as the main cause of liver disease worldwide. AIH treatment includes steroids, which have adverse metabolic effects that can worsen NAFLD. No specific treatment guidelines are available to mitigate these effects or redefine treatment goals in the AIH/NAFLD overlap population. Previous data from our study cohort found that AIH/NAFLD overlap patients have lower rates of biochemical remission but have similar clinical outcomes, despite a treatment course that is less likely to adhere to AIH standard of care per AASLD guidelines. This new study aims to expand our understanding of this unique patient cohort by validating previous findings with a larger sample size as well as examining additional outcomes such as time to completion of steroid treatment, Fibrosis–4 (FIB4), and AST to Platelet Ratio Index (APRI) at additional defined time points (three months, one year, two years, and three years).

Method: This was a single-center, retrospective descriptive study examining biopsy proven AIH and AIH/NAFLD patients (2009–2019). Baseline and follow-up clinical and biochemical parameters, FIB-4, APRI and clinical outcomes (if off steroids, all-cause mortality, need for liver transplantation, or decompensated cirrhosis) at three months, one year, two years, and three years were recorded and compared using appropriate statistical testing for continuous (t-tests) and categorical variables (Chi-square, Fisher’s exact).

Results: A total of 123 patients (44.7% AIH/NAFLD and 55.3% AIH) were included. AIH patients had higher AST and ALT, FIB4, and APRI at baseline, but also greater improvement from baseline in transaminase levels at all time points (p < 0.001). AIH/NAFLD patients were more likely to be in biochemical remission (defined as normalization of AST and ALT) at three months (p = 0.007), but less likely at one year (p < 0.001), and three years (p = 0.011). Although AIH/NAFLD patients less frequently received AIH standard of care treatment (p < 0.001), those who did were then less likely to be off steroids (p < 0.011) at one year. No significant differences were seen in FIB4, APRI, all-cause mortality, need for liver transplantation, or incidence of decompensated cirrhosis at all future time points (three months, one year, two years, three years).

<table>
<thead>
<tr>
<th></th>
<th>AIH</th>
<th>AIH/NAFLD</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemical Remission, 3 months (%)</td>
<td>30 (46.2%)</td>
<td>37 (71.2%)</td>
<td>0.007*</td>
</tr>
<tr>
<td>Biochemical Remission, 1 year (%)</td>
<td>8 (13.3%)</td>
<td>25 (46.3%)</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Biochemical Remission, 2 years (%)</td>
<td>6 (12.0%)</td>
<td>13 (27.1%)</td>
<td>0.059</td>
</tr>
<tr>
<td>Biochemical Remission, 3 years (%)</td>
<td>4 (9.3%)</td>
<td>14 (31.1%)</td>
<td>0.011*</td>
</tr>
<tr>
<td>Off steroids, 3 months (%)</td>
<td>49 (84.5%)</td>
<td>30 (85.7%)</td>
<td>0.872</td>
</tr>
<tr>
<td>Off steroids, 1 year (%)</td>
<td>17 (31.5%)</td>
<td>20 (58.8%)</td>
<td>0.011*</td>
</tr>
<tr>
<td>Off steroids, 2 years (%)</td>
<td>9 (16.0%)</td>
<td>12 (37.5%)</td>
<td>0.089</td>
</tr>
<tr>
<td>Off steroids, 3 years (%)</td>
<td>7 (13.3%)</td>
<td>10 (31.2%)</td>
<td>0.212</td>
</tr>
</tbody>
</table>

Figure:
Conclusion: The results of this study support that while AIH/NAFLD patients have lower initial biochemical activity than those with AIH alone, biochemical response to treatment appears to be lower. Given that similar clinical outcomes were observed, this may indicate that AIH/NAFLD overlap may benefit from an alternative remission definition as well as unique treatment guidelines.

THU-461
Metabolic associated fatty liver disease: different impact of the three defining criteria on the hepatic and cardiovascular complications
Rosa Lombardi1,2, Jaqueline Currà2, Annalisa Cespiati1,2, Andrea Dalbeni1,2,2, Flavia Santomenna,1 Luca Colalopulo2, Francesca Alletto2, Giovanna Oberti2, Felice Cinque2, Daniel Smith2, Erika Fatta1, Cristina Bertelli1, Paola Dongiovanni1, David Sacerdotti1,4, Silvia Fargion2, Anna Ludovica Fraizzan2,1, Unit of Medicine and Metabolic Disease, Fondazione IRCCS Ca’ Granda Ospedale Maggiore Policlinico di Milan, Milan, Italy; 2Department of Pathophysiology and Transplantation, University of Milan, Milan, Italy; 3Division of General Medicine C, Department of Medicine, University and Azienda Ospedaliera Universitaria Integrata Verona, Verona, Italy; 4Liver Unit, Department of Medicine, University and Azienda Ospedaliera Universitaria Integrata di Verona, Verona, Italy; 5Translational and Clinical Research Institute, Faculty of Medical Sciences, Newcastle University, Newcastle upon Tyne, UK, United Kingdom; 6National Institute for Health Research (NIHR) Newcastle In Vitro Diagnostics Co-operative, Newcastle upon Tyne, UK; 7National Institute for Health Research, Newcastle University, Newcastle upon Tyne, UK, United Kingdom; 8NIHR Applied Research Collaboration North East and North Cumbria, Newcastle University, Newcastle upon Tyne, UK, United Kingdom; 9Translational and Clinical Research Institute, Faculty of Medical Sciences, Newcastle University, Newcastle upon Tyne, UK and Newcastle NIHR Biomedical Research Centre, Newcastle upon Tyne Hospitals NHS Trust, Newcastle upon Tyne, UK, United Kingdom; 10National Institute for Health Research (NIHR) Biomedical Research Centre, Newcastle upon Tyne Hospitals NHS Trust, Newcastle upon Tyne, UK, United Kingdom; 11UCM Digestive Diseases and Ciberedh, Virgen del Rocío University Hospital, Institute of Biomedicine of Seville, University of Seville, Seville, Spain, Spain
E-mail: rosalombardi@hotmail.it

Background and aims: Metabolic associated fatty liver disease (MAFLD) is defined by the presence of hepatic steatosis and one criterion among: (1) body mass index (BMI)>25 kg/m2; (2) type 2 diabetes (DM); (3) metabolic dysregulation in lean subjects (BMI<25). MAFLD exposes to hepatic and cardiovascular (CV) disease. Aim: to evaluate the different impact of each of the three features of MAFLD on the hepatic and CV disease.

Method: 688 subjects (69% males, mean age 53 ± 12 ys) were classified as MAFLD and enrolled in two Italian liver units. Liver disease was evaluated by ultrasound (US) to detect and grade hepatic steatosis and by Fibroscan to diagnose advanced fibrosis (≥F3) (liver stiffness measurement, LSM=8.2 kPa). CV disease was evaluated by carotid Doppler US and radiofrequency (carotid plaques; carotid stiffness as pulse wave velocity (PWV)).

Results: Eighty% of patients had BMI>25 without other metabolic alterations (obese, group 1), 2% had DM without other metabolic alterations (group 2), 13% had BMI>25+DM (group 3) and 5% had BMI>25 with metabolic dysregulation (lean, group 4). Because of the small number of pure DM, we considered group 2 and 3 together (BMI>25+DM, group 2a). By comparing group 1 and 4, obese and lean patients had the same severity of liver (severe steatosis 16% vs 12%, p = 0.63; advanced fibrosis 8% vs 3%, p = 0.49) and CV disease (plaques 30% vs 44%, p = 0.129; increases EAT 27% vs 33%, p = 0.53; PWV 7.8 ± 1.9 vs 7.9 ± 1.9 m/s, p = 0.77). When comparing patients with BMI>25+DM with simple obese or lean, an increased prevalence of severe steatosis was evident in this group vs the other two (30% vs 16%, p = 0.006; 30% vs 12%, p = 0.06) and ≥F3 (31% vs 8%, p < 0.001; 31% vs 3%, p < 0.001). As for CV disease, a higher prevalence of increased EAT (40% vs p = 0.02), carotid plaques (61% vs 30%, p < 0.001) and increased PWV values (8.7 ± 2 m/s vs 7.8 ± 1.9, p < 0.001) was seen in group BMI>25+DM compared only to pure obese, with superimposable results compared to lean subjects. In multivariate analysis (adjusted for age, sex, smoking and statins use), BMI>25+DM remained an independent risk factor for severe steatosis (OR = 2.4, CI 95% 1.5–4.1), ≥F3 (OR 3.6, CI 95% 1.9–6.6) and carotid plaques (OR 1.8, CI 95% 1.1–3.0).

Conclusion: Among all features of MAFLD, lean subjects with metabolic dysregulation present the same hepatic and cardiovascular alterations of obese subjects without DM and even the same CV alterations of patients with coexistence of obesity and DM. As expected, the coexistence of obesity and DM seems to play the major role in the onset of hepatic and CV damage. This stresses on the need of a careful screening for complications and metabolic alterations in MAFLD patients, even if lean.

THU-462
Histological and biopsychosocial predictors of quality of life in Spanish and UK cohorts of patients with non-alcoholic fatty liver disease
Jesús Funuyet-Salas1, Agustin Martin-Rodriguez2, María Angeles Pérez-San-Gregorio1, Luke Vale2,3,4,5, Manuel Romero Gomez7, Tomos Robinson2,4, Quentin Anstee4,6, Tomos Robinson2,4, Manuel Romero Gomez7, on behalf of the LITMUS consortium investigators. 1Department of Personality, Assessment, and Psychological Treatment, Faculty of Psychology, University of Seville, Seville, Spain, Spain; 2Health Economics Group, Population Health Sciences Institute, Faculty of Medical Sciences, Newcastle University, Newcastle upon Tyne, UK, United Kingdom; 3National Institute for Health Research (NIHR) Newcastle In Vitro Diagnostics Co-operative, Newcastle upon Tyne, UK, United Kingdom; 4NIHR Applied Research Collaboration North East and North Cumbria, Newcastle University, Newcastle upon Tyne, UK, United Kingdom; 5Translational and Clinical Research Institute, Faculty of Medical Sciences, Newcastle University, Newcastle upon Tyne, UK and Newcastle NIHR Biomedical Research Centre, Newcastle upon Tyne Hospitals NHS Trust, Newcastle upon Tyne, UK, United Kingdom; 6National Institute for Health Research (NIHR) Biomedical Research Centre, Newcastle upon Tyne Hospitals NHS Trust, Newcastle upon Tyne, UK, United Kingdom; 7NIHR Digestive Diseases and Ciberedh, Virgen del Rocío University Hospital, Institute of Biomedicine of Seville, University of Seville, Seville, Spain, Spain
E-mail: jfunuyet1@us.es

Background and aims: It is unclear what biopsychosocial factors affect the impact of non-alcoholic fatty liver disease (NAFLD) on quality of life (QoL), and if these factors are equally important between different nationalities. We sought to: 1) Compare QoL of NAFLD patients based on place of origin and liver severity; and 2) Identify which variables predict QoL in Spanish and UK patient cohorts.

Method: The total sample of 737 biopsy-proven NAFLD patients was evaluated using CLDQ-NAFLD. Five groups (G1, n = 513, Spain; G2, n = 224, UK; G3, n = 370, none/mild fibrosis; G4, n = 286, moderate fibrosis; G5, n = 81, severe fibrosis) were formed and a 2 × 3 factorial ANOVA (Snedecor’s F) was performed to analyse the influence of place of origin and liver severity on QoL. A logistic regression was used to determine the effects of NASH, fibrosis, body mass index (BMI), gender, age, education and employment status on QoL in both patient cohorts separately. Cohen’s d was used as an index of effect size.

Results: The strongest evidence of differences (medium effect size) were that, regardless of fibrosis stage, UK participants (G2) were more worried (p < 0.001, d = 0.53) than Spanish participants (G1). Regardless of place of origin, participants with severe fibrosis (G5) were more fatigued (p < 0.001, d = 0.54), had more symptomatic symptoms (p < 0.001, d = 0.50), more worry (p < 0.001, d = 0.51), and lower QoL (p < 0.001, d = 0.64) than those with none/mild fibrosis (G3). In addition, for Spanish participants, QoL reduced as BMI (OR = 0.94, 95% CI = 0.88–0.97, p = 0.002) increased. Lower QoL was also independently associated with female gender (OR = 0.30, 95% CI = 0.18–0.50, p < 0.001). For UK participants, QoL reduced as BMI (OR = 0.94, 95% CI = 0.89–1.00, p = 0.047) increased. Lower QoL was also associated with female gender (OR = 0.45, 95% CI = 0.22–0.91, p = 0.028), non-active employment status (OR = 0.34, 95% CI = 0.15–0.74, p = 0.007) and younger age (OR = 1.06, 95% CI = 1.03–1.10, p < 0.001).

Conclusion: QoL was mainly lower in UK than Spanish participants, and they had more worry about the liver disease. Higher fibrosis stage predicted lower QoL, mainly in the Spanish cohort. Female gender and higher BMI contributed to the impact on QoL in both cohorts and
Non-alcoholic fatty liver disease (NAFLD) is commonly associated with obesity, but it is increasingly being recognized in non-obese individuals, particularly in Asia. We aimed to clarify the frequency and clinical features of non-obese NAFLD using a health check-up cohort.

**Method:** A total of 1046 subjects underwent a quantitative evaluation of liver steatosis (attenuation: ATT) and fibrosis (shear wave elastography: SWE) using ARIETTA 850SE (Fujifilm Healthcare) in 2020. Among them, 7 with obvious chronic liver disease and 22 who consumed >60 g alcohol/day were excluded. Finally, 1017 subjects were enrolled. Non-obese was defined as BMI <25 kg/m². Based on previous studies, cut of values for steatosis were S1 (0.62), S2 (0.67), and S3 (0.73), and NAFLD was defined as ≥ 0.62 dB/cm/MHz. In addition, cut of values for fibrosis were F1 (1.26), F2 (1.51), and F3 (1.63), and NAFLD with fibrosis was defined as ATT ≥ 0.62 dB/cm/MHz and SWE ≥ 1.26 KPa.

**Results:** The overall prevalence of NAFLD was 36.9%, while those for obese and non-obese subjects were 59.6% and 29.1%, respectively. Despite having a relatively normal BMI, most non-obese NAFLD versus normal liver subjects had a large waist circumference (80.0% vs. 9.9%) and dyslipidemia (59.5% vs. 42.1%). Logistic regression analysis revealed that dyslipidemia (OR = 1.898), ALT level (OR = 1.045), and GGT level (OR = 0.994), and platelet count (OR = 1.037) were significantly associated with liver steatosis. Dyslipidemia was present in 36.7% of the non-obese NAFLD subjects. Many obese NAFLD subjects showed abnormal liver function test (S1, 18.2%; S2, 26.4%; S3 48.3%; P = 0.001), whereas most non-obese NAFLD subjects did not (S1, 6.1%; S2, 5.5%; S3, 10.4%; P = 0.241). Among the 220 non-obese NAFLD subjects, 62 (28.1%) presented liver fibrosis (F1, 20.5%; F2, 4.1%; F3, 2.5%) and a large waist circumference (22.6% vs. 10.1%), hypertension (38.7% vs. 25.9%), and diabetes (12.9 vs. 25.9%) versus those without fibrosis. Logistic regression analysis revealed that male sex (OR = 2.328), diabetes (OR = 3.928), and AST level (OR = 1.051) were significantly associated with fibrosis. The non-obese NAFLD subjects with diabetes had a high prevalence of liver fibrosis (52.5% vs. 28.4%). A high FIB-4 index (>1.30) was observed in many obese NAFLD subjects with fibrosis (F1, 26.2%; S2, 16.7%; S3, 55.6%; P = 0.002), but non-obese NAFLD subjects (F1, 33.3%; F2 22.2%; F3 26.6%; P = 0.267).

**Conclusion:** NAFLD was present in 29.1% of non-obese subjects and fibrosis was present in 28.1% of non-obese NAFLD subjects. Non-obese NAFLD was significantly associated with metabolic disorders. Our study findings suggest that the liver function test and FIB-4 index may be less useful in non-obese NAFLD.
95% CI for NAFLD between women with LSMI and those without LSMI (OR = 1.04; 95% CI: 0.84 – 1.30, p = 0.721).

**Conclusion:** LSMI was significantly related to NAFLD in men, not in women. This suggests that risk assessment for NAFLD may differ by gender, and such an assessment is particularly warranted for men with low muscle mass regardless of fat mass.

**THU-465**

**Serum uric acid levels and prognosis of patients with non-alcoholic fatty liver disease**

Su Lin1,1, Yang Xinyi1, Jiaofeng Huang1, Chi Yujing1. 1The first affiliated hospital, Fujian medical university, China

E-mail: sumer5129@fjmu.edu.cn

**Background and aims:** Uric acid (UA) is closely associated with non-alcoholic fatty liver disease (NAFLD). Previous studies have shown a significant association between hyperuricaemia and the development of NAFLD. However, it is unclear whether UA plays a predictive role in NAFLD prognosis. This study aimed to explore the relationship between UA levels and mortality in NAFLD patients without severe renal disease.

**Method:** Data were obtained from the Third National Health and Nutrition Examination Survey (NHANES). The survey was performed in 1988–1994 and all individuals were followed up until December 2015 for survival status. A Kaplan-Meier survival curve was plotted to illustrate mortality between cohorts. X-tile was used to determine the best UA cut-off value to discriminate between survival and death. Time-dependent Cox regression was used to estimate the hazard ratio (HR) and 95% confidence interval (CI) for mortality. Propensity score matching (PSM) was applied to match age and sex, to balance the baseline characteristics between the two study groups.

**Results:** Overall, 2493 individuals with NAFLD and estimated glomerular filtration rate (eGFR) >60 ml/min/1.73 m² were included in this study. The mean age was 44.21 ± 15.03 years and 56.56% were male patients. The median follow-up period was 26.58 years. During this period, 849 (34.06%) deaths were recorded. The mean UA level was 325.63 ± 86.60 in the death group, which was significantly higher than that of the survival group (304.86 ± 84.17, p < 0.001). According
to the UA level, participants were classified into high-UA group (UA > 320 μmol/L) and low-UA group (≤ 320 μmol/L). There were 1119 (44.89%) participants had a UA level > 320 μmol/L. The high-UA group had a higher BMI level than the low-UA group. The death rate was 39.86% in high-UA group (> 320 μmol/L), compared to 29.33% in low-UA group (≤ 320 μmol/L) (p < 0.001). Compared with low-UA group, patients in high-UA group tend to have more severe metabolic dysfunction. The survival probability between the two UA groups is illustrated as a Kaplan-Meier curve in Figure 1, indicating the association between baseline high UA levels and risk of death (p < 0.001). However, by the adjustment for the metabolic profiles, the effect of UA level on long-term outcome was no longer significant with a p value > 0.05. Time-independent Cox regression also showed that UA level was not an independent risk factor for mortality in NAFLD patients without decreased eGFR (> 60 ml/min/1.73 m²) (p > 0.05). After matching age and sex by using the propensity score matching method, UA remained not independently associated with death in NAFLD patients (p > 0.05). Similar results were found for cardiovascular-related and cancer-related deaths, showing the association between UA level and the risk of cause-specific death was dependent on metabolic confounders.

**Conclusion:** Although UA is closely related to NAFLD, UA levels are not independently associated with the long-term survival of patients with NAFLD without decreased eGFR. Metabolic disorders may play a mediating role in the relationship between UA level and NAFLD outcome.

**THU-466**

The risk of liver-related long term outcomes is altered by dynamic changes in metabolic dysfunction-associated fatty liver disease status: a nationwide cohort study

Min Kyung Park¹, Hye-Sung Moon², Sungwon Chung¹, Sungho Won³, Yun Bin Lee¹, Eun Ju Cho¹, Jeong-Hoon Lee¹, Su Jong Yu¹, Jung-Hwan Yoon¹, Yoon Jun Kim¹. ¹Seoul National University College of Medicine, Department of Internal Medicine and Liver Research Institute, Korea, Rep. of South; ²RexSoft Inc., Korea, Rep. of South; ³Seoul National University, Department of Public Health Sciences, Graduate School of Public Health, Korea, Rep. of South

E-mail: yoonjun@snu.ac.kr

**Background and aims:** Metabolic dysfunction-associated fatty liver disease (MAFLD) status, defined by hepatic steatosis with metabolic dysfunction, could be dynamic changes by treatment such as lifestyle modification. We aimed to evaluate the association between the risk of MAFLD long-term outcomes and changes in MAFLD status.

**Method:** We analyzed data from 4,228,162 participants who participated in health screening programs both in 2009 and 2013.
Dietary patterns associated with metabolic associated fatty liver disease protection

Simon Schophaus¹, Kate Townsend Creasy², Jan Clusmann¹, Alexander Koch¹, Christian Trautwein¹, Kai Markus Schneider¹, Carolin Victoria Schneider¹,¹RWTH Aachen University, Medizinische Klinik III, Aachen, Germany; ²University of Pennsylvania, Philadelphia, United States
E-mail: cheimes@ukaachen.de

Background and aims: Metabolic-associated fatty liver disease (MAFLD) is characterised by lipid droplet accumulation in the hepatocytes and affects approximately 20–30% of the general population. High caloric western style diet is a well-established risk factor for MAFLD. However, there is little data that the consumption of specific nutrients might help prevent MAFLD development in the general population.

Method: We analyzed the UK Biobank (ID 71300) dataset and selected our study population based on the availability of nutritional assessment (five questionnaires). We excluded patients with liver diseases diagnosed before the food questionnaires. We investigated the association between nutrients calculated from food questionnaires and MAFLD development during the 11-year follow-up (ICD code and 39 000 MRI images of the liver) in the first nutrient-wide association study. “Nutri-WAS.” All analyses are corrected for age, sex, BMI, Townsend index for socioeconomic status, kcal/day, alcohol/day, fat/day, carbohydrates/day, protein/day, and Townsend socioeconomic status index. Hazard ratios (with 95% confidence intervals) are presented per 1-SD increase for each nutrient.

Results: Data from >210 000 participants demonstrate despite confirming known associations (e.g., Vitamin E or Fructose) that among 50 tested nutrients, manganese showed the strongest protection from liver fat on MRI (Figure 1A). Interestingly, the recovered MAFLD group showed a significantly lower risk of liver-related outcomes compared to the persistent MAFLD group (aHR = 0.82; 95% CI = 0.76–0.89; P < .001; Figure 1B). The risk of cardiovascular complications and the risk of primary extrahepatic malignancy were also higher in the persistent MAFLD than non-MAFLD group (aHR = 1.13; 95% CI = 1.05–1.22; P < .001; Figure 1A). On the sensitivity analysis after excluding underlying liver disease, the persistent MAFLD group maintained a significantly higher risk of liver-related complication than the non-MAFLD group (aHR = 1.37; 95% CI = 1.29–1.46; P < .001).

Conclusion: Patients with persistent MAFLD status showed a higher risk of liver-related complications than non-MAFLD patients. Patients with newly developed MAFLD also had a higher risk of liver-related complications than patients who never experienced the MAFLD, while resolved MAFLD status could ameliorate the risk of liver-related complications.

THU-467

Dietary patterns associated with metabolic associated fatty liver disease protection

Simon Schophaus¹, Kate Townsend Creasy², Jan Clusmann¹, Alexander Koch¹, Christian Trautwein¹, Kai Markus Schneider¹, Carolin Victoria Schneider¹,¹RWTH Aachen University, Medizinische Klinik III, Aachen, Germany; ²University of Pennsylvania, Philadelphia, United States
E-mail: cheimes@ukaachen.de

Background and aims: Metabolic-associated fatty liver disease (MAFLD) is characterised by lipid droplet accumulation in the hepatocytes and affects approximately 20–30% of the general population. High caloric western style diet is a well-established risk factor for MAFLD. However, there is little data that the consumption of specific nutrients might help prevent MAFLD development in the general population.

Method: We analyzed the UK Biobank (ID 71300) dataset and selected our study population based on the availability of nutritional assessment (five questionnaires). We excluded patients with liver diseases diagnosed before the food questionnaires. We investigated the association between nutrients calculated from food questionnaires and MAFLD development during the 11-year follow-up (ICD code and 39 000 MRI images of the liver) in the first nutrient-wide association study. “Nutri-WAS.” All analyses are corrected for age, sex, BMI, Townsend index for socioeconomic status, kcal/day, alcohol/day, fat/day, carbohydrates/day, protein/day, and Townsend socioeconomic status index. Hazard ratios (with 95% confidence intervals) are presented per 1-SD increase for each nutrient.

Results: Data from >210 000 participants demonstrate despite confirming known associations (e.g., Vitamin E or Fructose) that among 50 tested nutrients, manganese showed the strongest protection from liver fat on MRI (Figure 1A). Interestingly, the recovered MAFLD group showed a significantly lower risk of liver-related outcomes compared to the persistent MAFLD group (aHR = 0.82; 95% CI = 0.76–0.89; P < .001; Figure 1B). The risk of cardiovascular complications and the risk of primary extrahepatic malignancy were also higher in the persistent MAFLD than non-MAFLD group (aHR = 1.13; 95% CI = 1.05–1.22; P < .001; Figure 1A). On the sensitivity analysis after excluding underlying liver disease, the persistent MAFLD group maintained a significantly higher risk of liver-related complication than the non-MAFLD group (aHR = 1.37; 95% CI = 1.29–1.46; P < .001).

Conclusion: Patients with persistent MAFLD status showed a higher risk of liver-related complications than non-MAFLD patients. Patients with newly developed MAFLD also had a higher risk of liver-related complications than patients who never experienced the MAFLD, while resolved MAFLD status could ameliorate the risk of liver-related complications.
Background and aims: Studies have shown that changes in the synthesis and composition of bile acids can potentiate hepatotoxicity through anti-inflammatory mechanisms, membrane damage or cytotoxicity, leading to severe liver fibrosis [1, 2]. Our aim was to assess the changes in bile acids (BA) profile in patients with non-alcoholic steatohepatitis (NASH) with and without obesity compared to healthy controls.

Method: Three study arms were formed: 1st arm-NASH with obesity, 2nd arm-NASH without obesity, 3rd arm-healthy controls. Although liver biopsy is the gold standard for the NASH diagnosis, the vast majority of patients refrained from biopsy. So the diagnosis of NASH was established based on the following criteria: 1) non-alcoholic aetiology (less than 20 g ethanol per day), 2) detection of steatosis by ultrasound imaging, 3) exclusion of other liver diseases. The obesity was considered if BMI was 30 or higher. The bile was obtained after intubation of the duodenum under the ultrasoundcontrol. The spectrum of BA and bile properties were assessed using photocalorimetry. To evaluate the colloidal stability of the bile the cholate-cholesterol ratio (CCR), the ratio of taurochenodeoxycholic acid (TDCA) and taurodeoxycholic acid (TCA) and the ratio of glycochenodeoxycholic acid (GGDCA) and glycodeoxycholic acid (GCA) were calculated.

Results: 67 adult patients (21–55 years, males 26 (38.8%) were included into the study. Of these, 29 patients were allocated to the 1st arm, 23 patients to the 2nd arm, and 15 healthy controls to the 3rd one. The groups were statistically comparable in age and sex. The bile of healthy patients predominantly consisted of BA conjugated with the majority of patients refrained from biopsy. So the diagnosis of NASH was established based on the following criteria: 1) non-alcoholic aetiology (less than 20 g ethanol per day), 2) detection of steatosis by ultrasound imaging, 3) exclusion of other liver diseases. The obesity was considered if BMI was 30 or higher. The bile was obtained after intubation of the duodenum under the ultrasound control. The spectrum of BA and bile properties were assessed using photocalorimetry. To evaluate the colloidal stability of the bile the cholate-cholesterol ratio (CCR), the ratio of taurochenodeoxycholic acid (TCDDCA) and taurodeoxycholic acid (TCA) and the ratio of glycochenodeoxycholic acid (GGDKCA) and glycodeoxycholic acid (GCA) were calculated.

Results: 67 adult patients (21–55 years, males 26 (38.8%) were included into the study. Of these, 29 patients were allocated to the 1st arm, 23 patients to the 2nd arm, and 15 healthy controls to the 3rd one. The groups were statistically comparable in age and sex. The bile of healthy patients predominantly consisted of BA conjugated with the majority of patients refrained from biopsy. So the diagnosis of NASH was established based on the following criteria: 1) non-alcoholic aetiology (less than 20 g ethanol per day), 2) detection of steatosis by ultrasound imaging, 3) exclusion of other liver diseases. The obesity was considered if BMI was 30 or higher. The bile was obtained after intubation of the duodenum under the ultrasound control. The spectrum of BA and bile properties were assessed using photocalorimetry. To evaluate the colloidal stability of the bile the cholate-cholesterol ratio (CCR), the ratio of taurochenodeoxycholic acid (TDCA) and taurodeoxycholic acid (TCA) and the ratio of glycochenodeoxycholic acid (GCDCA) and glycodeoxycholic acid (GCA) were calculated.

Results: 67 adult patients (21–55 years, males 26 (38.8%) were included into the study. Of these, 29 patients were allocated to the 1st arm, 23 patients to the 2nd arm, and 15 healthy controls to the 3rd one. The groups were statistically comparable in age and sex. The bile of healthy patients predominantly consisted of BA conjugated with the majority of patients refrained from biopsy. So the diagnosis of NASH was established based on the following criteria: 1) non-alcoholic aetiology (less than 20 g ethanol per day), 2) detection of steatosis by ultrasound imaging, 3) exclusion of other liver diseases. The obesity was considered if BMI was 30 or higher. The bile was obtained after intubation of the duodenum under the ultrasound control. The spectrum of BA and bile properties were assessed using photocalorimetry. To evaluate the colloidal stability of the bile the cholate-cholesterol ratio (CCR), the ratio of taurochenodeoxycholic acid (TDCA) and taurodeoxycholic acid (TCA) and the ratio of glycochenodeoxycholic acid (GCDCA) and glycodeoxycholic acid (GCA) were calculated.

Results: 67 adult patients (21–55 years, males 26 (38.8%) were included into the study. Of these, 29 patients were allocated to the 1st arm, 23 patients to the 2nd arm, and 15 healthy controls to the 3rd one. The groups were statistically comparable in age and sex. The bile of healthy patients predominantly consisted of BA conjugated with the majority of patients refrained from biopsy. So the diagnosis of NASH was established based on the following criteria: 1) non-alcoholic aetiology (less than 20 g ethanol per day), 2) detection of steatosis by ultrasound imaging, 3) exclusion of other liver diseases. The obesity was considered if BMI was 30 or higher. The bile was obtained after intubation of the duodenum under the ultrasound control. The spectrum of BA and bile properties were assessed using photocalorimetry. To evaluate the colloidal stability of the bile the cholate-cholesterol ratio (CCR), the ratio of taurochenodeoxycholic acid (TDCA) and taurodeoxycholic acid (TCA) and the ratio of glycochenodeoxycholic acid (GCDCA) and glycodeoxycholic acid (GCA) were calculated.

Results: 67 adult patients (21–55 years, males 26 (38.8%) were included into the study. Of these, 29 patients were allocated to the 1st arm, 23 patients to the 2nd arm, and 15 healthy controls to the 3rd one. The groups were statistically comparable in age and sex. The bile of healthy patients predominantly consisted of BA conjugated with the majority of patients refrained from biopsy. So the diagnosis of NASH was established based on the following criteria: 1) non-alcoholic aetiology (less than 20 g ethanol per day), 2) detection of steatosis by ultrasound imaging, 3) exclusion of other liver diseases. The obesity was considered if BMI was 30 or higher. The bile was obtained after intubation of the duodenum under the ultrasound control. The spectrum of BA and bile properties were assessed using photocalorimetry. To evaluate the colloidal stability of the bile the cholate-cholesterol ratio (CCR), the ratio of taurochenodeoxycholic acid (TDCA) and taurodeoxycholic acid (TCA) and the ratio of glycochenodeoxycholic acid (GCDCA) and glycodeoxycholic acid (GCA) were calculated.

Results: 67 adult patients (21–55 years, males 26 (38.8%) were included into the study. Of these, 29 patients were allocated to the 1st arm, 23 patients to the 2nd arm, and 15 healthy controls to the 3rd one. The groups were statistically comparable in age and sex. The bile of healthy patients predominantly consisted of BA conjugated with the majority of patients refrained from biopsy. So the diagnosis of NASH was established based on the following criteria: 1) non-alcoholic aetiology (less than 20 g ethanol per day), 2) detection of steatosis by ultrasound imaging, 3) exclusion of other liver diseases. The obesity was considered if BMI was 30 or higher. The bile was obtained after intubation of the duodenum under the ultrasound control. The spectrum of BA and bile properties were assessed using photocalorimetry. To evaluate the colloidal stability of the bile the cholate-cholesterol ratio (CCR), the ratio of taurochenodeoxycholic acid (TDCA) and taurodeoxycholic acid (TCA) and the ratio of glycochenodeoxycholic acid (GCDCA) and glycodeoxycholic acid (GCA) were calculated.
liver disease (NAFLD) and is strongly regulated by changes in energy balance and dietary factors. We aimed to investigate the association between the PNPLA3 rs738409 SNP, nutrient intake and NAFLD severity.

**Method:** PNPLA3-rs738409 SNP was genotyped in 181 patients with NAFLD who completed the EPIC Food Frequency Questionnaire. Liver steatosis was evaluated by Controlled Attenuation Parameter (CAP) (Fibroscan®530, Echosens). According to the established cut-off, a CAP value ≥300 dB/m was used to identify severe steatosis (S3). An independent group of 47 biopsy-proven NAFLD subjects was used as validation cohort.

**Results:** Overall, median age was 53 years (range 44–62) and 60.2% of patients were male. Most subjects (56.3%) had S3 and showed increased liver stiffness ($p < 0.001$), AST ($p = 0.003$) and ALT levels ($p < 0.001$) compared to those with CAP <300 dB/m. At logistic regression analyses we found that the interaction between carbohydrates intake and the carriers of the PNPLA3 G risk allele was significantly associated with S3 ($p = 0.001$). The same result was confirmed in the validation cohort, were the interaction between carbohydrates intake and the carriers of the PNPLA3 G risk allele was significantly associated with S3 ($p = 0.001$). The same result was confirmed in the validation cohort, were the interaction between carbohydrates intake and the carriers of the PNPLA3 G risk allele was significantly associated with S3 ($p = 0.001$).

**Conclusion:** The intake of greater than or equal to 48% carbohydrate in NAFLD patients carriers of the CG/GG allele of PNPLA3 rs738409 may increase the risk of significant steatosis.

This work has received support from EU/EFPIA/IM2 Joint Undertaking (LITMUS grant no. 777377) and Italian Ministry for Education, University and Research (MIUR) under the programme “Dipartimenti di Eccellenza 2018–2022” n. D15D18000410001.

**THU-471**

Diabetes mellitus (DM) is the strongest risk factor of significant inflammation or fibrosis in chronic hepatitis B (CHB) combined with non-alcoholic fatty liver disease (NAFLD)

Jie Li1, Fajuan Rui1, Brian Nguyen2, Chuanwu Zhu3, Yuanwang Qiu4, Weimiao Ding5, Qi Zheng6, Qing-Lei Zeng7, Zebao He4, Junping Shi3, Chao Wu1, Mindie Nguyen2. 1Department of Infectious Diseases, Nanjing Drum Tower Hospital, The Affiliated Hospital of Nanjing University Medical School, Nanjing, Jiangsu, China; 2Division of Gastroenterology and Hepatology, Stanford University Medical Center, Palo Alto, CA, USA, United States; 3Department of Infectious Diseases, The Affiliated Infectious Diseases Hospital of Soochow University, Suzhou, Jiangsu, China, China; 4Department of Infectious Diseases, The Fifth People’s Hospital of Wuxi, Wuxi, Jiangsu, China, China; 5Department of Hepatology, Huai’an No. 4 People’s Hospital, Huai’an, Jiangsu, China, China; 6Department of Infectious Diseases, The Fifth People’s Hospital of Wuxi, Wuxi, Jiangsu, China, China; 7Department of Infectious Diseases, The First Affiliated Hospital, Fujian Medical University, Fuzhou, China, China; 8Department of Infectious Diseases, Taizhou Enze Medical Center (Group) Enze Hospital, Taizhou, Zhejiang, China, China; 9Department of Infectious Diseases, The Affiliated Hospital of Hangzhou Normal University, Hangzhou, Zhejiang, China, China

E-mail: mindiehn@stanford.edu

**Background and aims:** Chronic hepatitis B (CHB) patients and non-alcoholic fatty liver disease (NAFLD) frequently co-exist, but the association of diabetes mellitus (DM) with hepatic inflammation and fibrosis is not well characterized. The aim of this study is to investigate the association of DM with significant hepatic inflammation and/or fibrosis in CHB patients combined with NAFLD.

**Method:** We enrolled CHB patients with concurrent NAFLD who underwent liver biopsy from eight medical centers of China between April 2004 and October 2020. Univariable and multivariable logistic regression analyses were conducted to explore the association of DM with significant inflammation (grade [G] 2–4) and fibrosis (stage [S] 2–4).

**Results:** A total of 869 CHB patients with NAFLD with available liver histology data were included in study analysis (mean age 40.6 ± 10.4 years old, 79.9% male), with 71 (8.2%) having DM. The mean body mass index was 24.9 ± 3.3 kg/m² and the mean HBV-DNA was 5.3 ± 2.0 log10 IU/ml. About half (380 patients, 46.3%) were HBeAg-positive, and 5.8% (42 patients) were on antiviral therapy. Moderate and severe FLD (grade 2–3) was present in 206 patients (24.3%). The majority (529 patients, 60.9%) had significant inflammation (G2–4), and about half (431, 49.6%) had significant fibrosis (F2–4). Compared with non-DM patients, DM patients more likely had significant inflammation (76.1% vs 59.7%, $p = 0.02$) or significant fibrosis (76.1% vs 47.3%, $p = 0.001$). On multivariable logistic analysis adjusting for DM, hepatic steatosis, age, sex, BMI, HBV DNA, and HBeAg, DM was independently associated with significant inflammation (OR: 3.38; 95% CI: 2.08–5.44; $p < 0.001$) and significant fibrosis (OR: 4.49; 95% CI: 2.08–9.72; $p < 0.001$) (Table).
Table: Factors associated with hepatic inflammation or fibrosis in hepatitis B patients

<table>
<thead>
<tr>
<th></th>
<th>Univariate analysis</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR (95% CI)</td>
<td>p-value</td>
<td>OR (95% CI)</td>
</tr>
<tr>
<td><strong>Inflammation Grade ≥ 2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes Mellitus (%)</td>
<td>2.15 (1.224–3.774)</td>
<td>0.008</td>
<td>3.38 (1.455–7.858)</td>
</tr>
<tr>
<td>Steatosis (%)</td>
<td>1.08 (0.711–1.652)</td>
<td>0.708</td>
<td>1.03 (0.975–1.090)</td>
</tr>
<tr>
<td>Grade 0–1</td>
<td>Referent 0.732</td>
<td>0.144</td>
<td>Referent 0.98 (0.928–1.037)</td>
</tr>
<tr>
<td>Age (years)</td>
<td>0.99 (0.903–1.294)</td>
<td>0.949</td>
<td>0.99 (0.932–1.033)</td>
</tr>
<tr>
<td>Sex (%)</td>
<td>0.86 (0.620–1.503)</td>
<td>0.917</td>
<td>0.85 (0.764–0.954)</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>1.10 (0.989–1.082)</td>
<td>0.144</td>
<td>1.13 (1.010–1.747)</td>
</tr>
<tr>
<td>HBV DNA (Log 10 IU/ml)</td>
<td>1.14 (1.056–1.225)</td>
<td>0.001</td>
<td>1.68 (1.265–2.229)</td>
</tr>
<tr>
<td>HBeAg positive (%)</td>
<td>1.68 (1.265–2.229)</td>
<td>&lt;0.001</td>
<td>1.81 (1.131–2.899)</td>
</tr>
</tbody>
</table>

**Fibrosis Stage ≥ 2**

<table>
<thead>
<tr>
<th></th>
<th>Univariate analysis</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes Mellitus (%)</td>
<td>3.55 (2.021–6.226)</td>
<td>&lt;0.001</td>
<td>4.49 (2.079–9.717)</td>
</tr>
<tr>
<td>Steatosis (%)</td>
<td>1.08 (0.711–1.652)</td>
<td>0.708</td>
<td>1.03 (0.975–1.090)</td>
</tr>
<tr>
<td>Grade 0–1</td>
<td>Referent 0.732</td>
<td>0.144</td>
<td>Referent 0.98 (0.928–1.037)</td>
</tr>
<tr>
<td>Age (years)</td>
<td>0.99 (0.903–1.294)</td>
<td>0.949</td>
<td>0.99 (0.932–1.033)</td>
</tr>
<tr>
<td>Sex (%)</td>
<td>0.86 (0.620–1.503)</td>
<td>0.917</td>
<td>0.85 (0.764–0.954)</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>1.10 (0.989–1.082)</td>
<td>0.144</td>
<td>1.13 (1.010–1.747)</td>
</tr>
<tr>
<td>HBV DNA (Log 10 IU/ml)</td>
<td>1.14 (1.056–1.225)</td>
<td>0.001</td>
<td>1.68 (1.265–2.229)</td>
</tr>
<tr>
<td>HBeAg positive (%)</td>
<td>1.68 (1.265–2.229)</td>
<td>&lt;0.001</td>
<td>1.81 (1.131–2.899)</td>
</tr>
</tbody>
</table>

Figure:

**Conclusion:** CHB patients with DM was more than 3 times more likely to have significant hepatic inflammation and more than 4 times more likely to have significant fibrosis compared to non-DM patients, independent of the presence of hepatitis steatosis, other metabolic (body mass index), viral and demographic factors. DM should be considered as part of the algorithm for CHB management.

**THU-472**

**PNPLA3 I148M polymorphism does not promote liver disease progression in severe alpha1-antitrypsin deficiency**

Ines Volkert1, Malin Fromme1, Huan Su2, Nurdan Gueldiken1, Mohamed Ramadan Mohamed1, Cecilia Lindhauer1, Pavel Strnad3, Christian Trautwein2, RWTH Aachen University hospital, Medical department III, Aachen, Germany; 3RWTH Aachen University hospital, Medical department III, Aachen, Germany; E-mail: ivolkert@ukaachen.de

**Background and aims:** Alpha-1 antitrypsin (AAT) deficiency (AATD) is one of the most common genetic disorders. A homozygous PiZ mutation in the AAT gene (called PiZZ genotype) is the predominant cause of severe AATD and predisposes to lung and liver damage. Non-alcoholic fatty liver disease (NAFLD) comprises a disease spectrum ranging from steatosis to cirrhosis, inflammation and hepatocellular carcinoma (HCC). The most established genetic risk factor for NAFLD is the patatin-like phospholipase domain containing protein 3 (PNPLA3) I148M that promotes disease progression. This polymorphism is characterized by a substitution of isoleucine to methionine at position 148 (I148M). The aim of the study was to evaluate the interaction between the PNPLA3 and the PiZ variants.

**Method:** Mice carrying the human PiZ variant and the PNPLA3 I148M polymorphism were generated (PiZ/PNPLA3I148M), characterized at the age of 8 and 52 weeks and compared to WT, PiZ and PNPLA3I148M controls. The mice were subjected to a Western-style Diet (WSD) for 24 weeks to assess the effects on NASH progression. The presence of PNPLA3 I148M polymorphism was evaluated in peripheral blood-derived DNA from 478 PiZZ subjects participating in the European AATD registry.

**Results:** At weeks 8 and 52, PiZ mice showed higher transaminases than WT and PNPLA3I148M mice, but no difference to PiZ/PNPLA3I148M group was seen. At 52 weeks of age, the PiZ and PiZ/PNPLA3I148M mice showed significantly stronger fibrosis than WT and PNPLA3I148M mice, but no difference between both PiZ subgroups was seen. After WSD, no changes in the liver physiology nor fibrogenesis or inflammatory parameters were noted. Neither PiZ expression nor accumulation was altered by the presence of PNPLA3I148M or through WSD feeding.

In the analyzed PiZZ subjects, PNPLA3 I148M variant was found at the expected Mendelian ratio. The carriers displayed significantly increased GLDH values and more often had elevated ALT and bilirubin levels. However, there was no difference in transient elastography-based liver fibrosis and steatosis measurements.

**Conclusion:** Our results demonstrate that the presence of PNPLA3 I148M polymorphism does not play a major role in progression of AATD-associated liver disease in mouse and humans.

**THU-473**

**Frailty in metabolic dysfunction-associated fatty liver disease is related to the presence of diabetes and the severity of liver fibrosis**

Alexis Goiffaux1, Guillaume Henin1,2, Audrey Loumagne3, Géraldine Dahlqvist4, Nicolas Lanthier1,2, Université catholique de Louvain, Laboratory of Hepato-Gastroenterology, Institut de Recherche Expérimentale et Clinique, Bruxelles, Belgium; 2Cliniques universitaires Saint-Luc (UCLouvain), Service d’Hépatologie-Gastroentérologie, Bruxelles, Belgium; 3Cliniques universitaires Saint-Luc (UCLouvain), Service d’Endocrinologie et de nutrition, Bruxelles, Belgium E-mail: nicolas.lanthier@saintluc.uclouvain.be

**Background and aims:** Frailty is very common in end-stage liver disease, regardless of disease etiology, and has a significant impact on clinical outcome and quality of life, due to impaired skeletal muscle function, quality and quantity. However, there are few data available on the relationship between liver and skeletal muscle, especially in patients with earlier disease stages. Our aims are to evaluate the prevalence of frailty in a prospective cohort of patients with metabolic-dysfunction associated fatty liver disease (MAFLD) according to its severity.

**Method:** Patients with MAFLD were recruited in a prospective single-center cohort study. Epidemiological, clinical, biological and anthropometric data were collected. All patients underwent a non-invasive assessment for frailty screening, including a dominant hand grip strength test, a balance test, and the time required to do five times sit to stand to calculate the liver frailty index (LFI). The severity of MAFLD was assessed by the fatty liver index (FLI), fibrosis 4 (FIB-4) index, and by transient elastography (elasticity and controlled attenuation parameter).

**Results:** 92 patients with MAFLD were recruited, including 44 men (47.8 %) and 44 patients with type 2 diabetes (47.8 %). Mean age was 55 years (19–78), mean BMI was 32.7 kg/m² (23.9–47.5) and mean HOMA-IR was 7.6 (0.5–30.1). Regarding the severity of MAFLD, the mean elasticity was 6.45 KPa (3.1–35) and the mean FIB-4 score was 1.33 (0.31–5.61). The mean FLI was 85.1 (28–100) and the mean controlled attenuation parameter (CAP) was 332.3 dB/m (207–400). Regarding frailty parameters, the mean dominant grip strength was 31 kg (8–62), the mean time to do five chair stands was 8.2 seconds (4.25–24.25), the mean balance test score was 9.9 seconds (2.1–10) and the mean LFI score was 2.98 (1.13–4.71). 51 patients had an LFI score <3 (robust group, 56 %), 36 had a score between 3 and 4.5 (pre-frail group, 39.6 %), and 4 had a score greater than 4.5 (frail group, 4.4 %). No correlation was observed between the degree of steatosis (assessed by the FLI or CAP values) and frailty. In contrast, a significant increase in the level of frailty is observed in patients with type 2 diabetes (p = 0.03) and with a high liver elasticity compatible with an F4 stage (mean LFI: 3.7 vs 2.9, p = 0.0078) (Figure), independent of age. Frailty is also significantly higher according to the FIB-4 index with a mean LFI of 3.72 in case of FIB-4 >2.67 vs 2.8 in case of FIB-4 <1.3 (p = 0.042) (Figure).
**POSTER PRESENTATIONS**

**THU-474**

**Significant fibrosis is a risk factor for worse health perception and impaired mental health in people living with HIV**

Jesús Funuyet-Salas¹, Maurice Michel²,³, María Angeles Pérez-San-Gregorio¹, Agustín Martín-Rodríguez¹, Manuel Romero Gomez⁴, Peter Galle², Martin Sprinzl², Jörn Schattenberg²,³,¹ Department of Personality, Assessment, and Psychological Treatment, Faculty of Psychology, University of Seville, Seville, Spain; ²Department of Medicine, University Medical Center Mainz, Mainz, Germany; ³Metabolic Liver Research Program, I. Department of Medicine, University Medical Center Mainz, Mainz, Germany; ¹Digestive diseases unit, Virgen del Rocío University Hospital. SeLiver group at Institute of Biomedicine of Seville (IBIS). University of Seville, Spain, Spain; ²I. Department of Medicine, University Medical Center Mainz, Mainz, Germany; ³Digestive diseases unit, Virgen del Rocío University Hospital. SeLiver group at Institute of Biomedicine of Seville (IBIS). University of Seville, Spain, Spain; ¹Department of Personality, Assessment, and Psychological Treatment, Faculty of Psychology, University of Seville, Seville, Spain; ²Department of Medicine, University Medical Center Mainz, Mainz, Germany; ³Metabolic Liver Research Program, I. Department of Medicine, University Medical Center Mainz, Mainz, Germany; ¹Digestive diseases unit, Virgen del Rocío University Hospital. SeLiver group at Institute of Biomedicine of Seville (IBIS). University of Seville, Spain, Spain.

E-mail: jfunuyet1@us.es

**Background and aims:** Significant fibrosis has been shown to be a critical factor for the biopsychosocial profile of patients with chronic liver disease. However, the role of significant fibrosis in models predicting health perception and mental health in people living with human immunodeficiency virus (PLWH) remains unknown. We aimed to evaluate 1) if health distress and mental health mediated the relationship between unemployment and health perception, 2) if social functioning mediated the relationship between lower education and mental health, and 3) if hepatic steatosis or fibrosis exerted a moderating effect in both relationships.

**Method:** Two hundred and seven PLWH (147 male and 60 female, mean age 51 ± 12) were evaluated using the MOS-HIV instrument, which assesses ten dimensions of quality of life. Vibration-controlled transient elastography was used to assess hepatic steatosis and significant fibrosis by measuring the controlled attenuation parameter (≥275 dB/m) and liver stiffness measurement (≥8.2 kPa), respectively. Mediation and moderated mediation models were estimated using the SPSS PROCESS macro v3.5. Bootstrapping was used to test the indirect effects estimated, considered significant when the confidence interval (CI) at 95% did not include 0.

**Results:** Health distress and mental health mediated the association between unemployment and health perception (effect = −3.00, CI = −6.07 to −0.03). Social functioning mediated the association between lower education and mental health (effect = 4.37, CI = 1.31 to 7.82). Significant fibrosis exerted a moderating effect on both relationships (health perception, beta = 0.48, p = 0.001; mental health, beta = 0.48, p = 0.001), but hepatic steatosis did not (Figure). The indirect conditional effects of unemployment and lower education on health perception and mental health, respectively, were higher in patients with significant fibrosis than in those who did not have significant fibrosis.

**Conclusion:** 44% of MAFLD patients already have a frail or pre-frail status regardless of age. This reduction of strength is associated with the presence of diabetes and the severity of MAFLD in terms of fibrosis. Further research is needed to determine the cause of this frailty and its potential impact on liver disease severity and prognosis.

**THU-475**

**Caloric input is inadequate in predicting the presence of liver steatosis and fibrosis in a population adhering to a screening program for metabolic syndrome**

Lucia Brodosi¹,², Michele Stocchi¹, Valentino Osti¹,², Valeria Guarnieri¹, Michela Genowese¹, Francesca Marchignoli¹, Dorina Mita¹, Maximiliano Ziotas², Maria Letizia Petroni¹,², Loris Pironi¹,²,¹ University of Bologna, Department of Medical and Surgical Sciences, Italy; ²IRCCS AOU BO, Clinical Nutrition and Metabolism Unit, Italy; ³Azienda USL di Bologna, Department of Public Health, Italy.

E-mail: lucia.brodosi2@unibo.it

**Background and aims:** Non-Alcoholic Fatty Liver Disease (NAFLD) is the liver manifestation of metabolic syndrome (MetS) and can progress to steatohepatitis (NASH). Scores could be calculated to predict the risk of NAFLD and liver fibrosis (LF) in a non-invasive way. The most used ones are Fibrosis-4 (FIB-4), NAFLD Fibrosis Score (NFS), Fatty Liver Index (FLI) and FibroScan® (FAST). In addition, FibroScan® allows evaluating steatosis through Controlled Attenuation Parameter (CAP) and LF. An essential link between NASH and MetS is obesity, resulting from a chronic positive caloric balance due to a caloric input (CI) greater than caloric output (CO). Precise CI assessment represents a challenge in clinical practice and usually requires a 1-to-1 inpatient visit with a dietitian; we previously developed Quanto Mangio Veramente (QMV), a questionnaire that easily allows estimating the daily CI. This work aimed to evaluate a possible link between CI, FibroScan results, and non-invasive steatosis and fibrosis scores.

**Method:** from 2020 to 2022, we screened patients for MetS according to National Cholesterol Education Program criteria. For each patient, weight, Body Mass Index (BMI), and Basal Metabolic Rate (BMR) were collected. We also administered QMV and performed Fibroscan®, FIB-4, NFS, FLI, FAST and Caloric Surplus (CS, obtained from CI-BMR) were collected. Patients were divided into two groups: those with significant fibrosis and those without. We compared the differences in CI and non-invasive scores using the Mann-Whitney U test.

**Conclusion:** Unemployment was related to health distress and poorer mental health, which in turn predicted worse self-perceived health in PLWH. Lower education was linked to lower social functioning, which predicted poorer mental health. Specifically, PLWH with significant fibrosis were more vulnerable to the negative effects of unemployment and lower education on health perception and mental health. Our results confirmed liver fibrosis as a risk factor to be considered in future multidisciplinary interventions in PLWH.
calculated for each patient. For Statistics: median ± IQR, and AUROCs are reported with a 95% confidence interval.

**Results:** 189 consecutive non-cirrhotic patients were included in the study, 80 with and 99 without MetS. CI and CS, even when normalized by weight or BMI, did not correlate to any of the criteria for MetS, nor to FAST, FIB-4, FLI and NFS, and they did not differ significantly after grouping by MetS diagnosis. We observed a weak inverse correlation between CAP and CI normalized by weight or BMI, by $-21.8\% \ (p < 0.01)$ and $-18.3\% \ (p < 0.05)$, respectively, suggesting that people with a higher steatosis degree ingested fewer calories (kcal/kg). The same degree of inverse correlation was present after grouping by MetS diagnosis in the group with the syndrome ($p < 0.01$). When considering a cut-off of 249 dB/s for liver steatosis diagnosis, CI and its normalizations did not translate into mathematically appropriate regression models and AUROCs; the same results were obtained after grouping by liver steatosis categories according to CAP.

**Conclusion:** Our work does not support using QMV to predict NAFLD or LF in healthy and MetS subjects. We hypothesize that adaptive mechanisms, due to weight history, could play a role in disrupting the caloric balance. In addition, QMV did not allow the evaluation of diet quality. Moreover, physical activity levels were not considered. Our study highlights the need for more accurate tools to assess the relationship between the quality and content of the diet and NAFLD parameters.

**THU-476**

**Disparities in the in-hospital mortality among patients with non-alcoholic fatty liver disease admitted with acute myocardial infarction: a nationwide analysis**

Umar Hayat¹, Saba Afroz², Muhammad Farhan³, Atif Nasrullah⁴, Naeem Ijaz², Faisal Kamal³, Tariq Ahmad⁵, ¹Geisinger Wyoming Valley Medical Center, Internal medicine, division of Gastroenterology, Wilkes-Barre, United States; ²Geisinger Wyoming Valley Medical Center, Internal medicine, Wilkes-Barre, United States; ³United Regional, Wichita Falls, United States; ⁴The Wright Center for Community Health, Internal medicine, Scranton, United States; ⁵Thomas Jefferson University Hospitals, Internal medicine, division of Gastroenterology, Philadelphia, United States; ⁶Geisinger Wyoming Valley Medical Center, Internal medicine, division of Cardiology, Wilkes-Barre, United States

E-mail: umarhayat216@gmail.com

**Background and aims:** Non-alcoholic fatty liver disease (NAFLD) is associated with an increased risk for cardiovascular disease (CVD). Indeed, cardiovascular disease is considered the most common cause of death among NAFLD patients. However, few studies have reported the association between CVD and NAFLD. Therefore, our study aims to assess the association between NAFLD and acute myocardial infarction (AMI) and disparities in in-hospital mortality due to AMI among NAFLD patients by age, gender, and race in the USA.

**Method:** Hospitalizations with a primary diagnosis of AMI with a concurrent diagnosis of NAFLD were identified in the National Inpatient Sample database (2016–2019) using ICD-10-CM codes. The prevalence and trends over four years were calculated among different sociodemographic groups (Table 1). We stratified the patients into two age groups (>50 years and <50 years). A univariate regression model was used to determine mortality outcomes due to AMI among NAFLD patients by age, gender, and race. A multivariate regression analysis was performed to determine NAFLD as an independent predictor of mortality among patients who had AMI after adjusting for potential confounding factors (sociodemographic and clinical variables).

**Results:** A total of 5450 patients were admitted to the hospital with AMI and were identified to have a concurrent diagnosis of NAFLD. Among them, 5.11% (279) died in the hospital. Males with NALFD admitted to the hospital due to AMI were more likely to die than females [OR 1.58, 95% CI 1.25–1.91, p < 0.001]. Also, patients >50 had higher odds of dying due to AMI if they had NAFLD compared to those <50 [OR 4.29, 95% CI 2.94–6.27, p < 0.001]. Compared with the white population, black patients [OR 0.79, 95% CI 0.54–1.15, p < 0.001], Hispanics [OR 1.21, 95% CI 0.85–1.74, p < 0.001], Asian and Pacific Islanders [OR 0.95, 95% CI 0.45–2.03, p < 0.001], and Native Americans [OR 0.58, 95% CI 0.08–4.17, p < 0.001] are less likely to die due to AMI if they have NAFLD. The NAFLD patients had higher odds of dying if admitted to the hospital with AMI [OR 1.96, 95% CI 1.74–2.21, p < 0.001] (Table 1).
Background and aims: Although an association between metabolic dysfunction-associated fatty liver disease (MAFLD) and cardiovascular disease or overall mortality has been reported, it is unclear whether MAFLD predicts cancer incidence and mortality. We aimed to investigate the differential risk of all- and specific-cancer incidence and mortality according to MAFLD subgroups categorized by additional etiologies of liver disease.

Method: Using the Korean National Health Insurance Service database, we stratified the participants into three groups: 1) single-etiolo MAF LD (S-MAFLD), or MAFLD of pure metabolic origin; 2) mixed-etiolo MAF LD (M-MAFLD), or MAFLD with additional etiological factor(s) (i.e., concomitant liver diseases and/or heavy alcohol consumption); and 3) non-MAFLD.

Results: Among the 9,718,182 participants, the prevalence of S-MAFLD and M-MAFLD was 29.2% and 6.7%, respectively. Compared with non-MAFLD, the risk for all-cancer incidence and mortality was slightly higher among patients with S-MAFLD (incidence, adjusted hazard ratio [aHR] = 1.03; 95% confidence interval [CI]: 1.02–1.04; mortality, aHR = 1.06; 95% CI: 1.04–1.08) and markedly higher among patients with M-MAFLD (incidence, aHR = 1.31; 95% CI: 1.29–1.32; mortality, aHR = 1.45; 95% CI: 1.42–1.48, respectively). The M-MAFLD with fibrosis group (BARD score ≥2) showed the highest risk of all-cancer incidence (aHR = 1.38, 95% CI = 1.36–1.39) followed by the M-MAFLD without fibrosis group (aHR = 1.09, 95% CI = 1.06–1.11). Similar trends were observed for cancer-related mortality.

Conclusion: MAFLD criteria by additional etiology identified a subgroup of people with poor cancer-related outcomes. These criteria may help identify high-risk groups for cancer.

THU-551
The rising burden of non-alcoholic fatty liver disease (NAFLD) related HCC: is time running out to contain this silent epidemic?
Saima Ajaz1, James Lok1, Paul Ross2, Riham Soliman1, Maria Guerra Veloz1, Abid Suddle1, Kosh Agarwall1, 1King's College Hospital, Institute of Liver studies, London, United Kingdom; 2Guy's and St Thomas' NHS Foundation Trust, United Kingdom
E-mail: saima.ajaz@nhs.net

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is the most common cause of chronic liver disease due to the exponential increase in obesity and metabolic syndrome. Given this upward trajectory, as well as improvements in viral hepatitis management, NAFLD is predicted to become the leading aetiology of hepatocellular carcinoma (HCC) over the coming years. However, its true oncogenic burden in developed countries remains unclear. The aim of this project was to analyse the prevalence of NAFLD in HCC patients discussed in the HCC multidisciplinary meetings (MDM) at King's College Hospital (KCH).

Method: Data was obtained from patients discussed in the HCC MDM at KCH from 2013 to 2019. A total of 400 patients with a definitive diagnosis of HCC (as per standard radiological and/or histological criteria) were reviewed. The etiologies were grouped as NAFLD, chronic viral hepatitis (Hepatitis B Virus, HBV; Hepatitis C Virus, HCV), treated viral hepatitis with co-existent NAFLD, and all other causes.

Results: We analysed data from 400 HCC patients. The underlying etiologies were as follows: NAFLD only (n = 116; 29 %), treated HCV with co-existent NAFLD (n = 60; 15 %), chronic HCV without NAFLD (n = 75; 18.5 %), chronic HBV (n = 52; 13 %) and all other etiologies (n = 97; 24.2 %). NAFLD was a contributing factor in 44% of cases (n = 176). The NAFLD patients having HCC had 78 % all-cause mortality and those with treated Chronic Hepatitis C with NAFLD had 83 % all-cause mortality over the follow-up period.

Conclusion: The data suggests that in a tertiary hepatology center in the United Kingdom, NAFLD was the most common underlying cause for HCC. The mortality was high and especially in HCV treated patients with NAFLD. This highlights the importance of early diagnosis and management of NAFLD to reduce the impending burden of NAFLD-related HCC.
**THU-552**
Comparison of non-alcoholic steatohepatitis severity between Hispanics and non-Hispanics: combined data from multiple therapeutic clinical trials including more than 5000 patients (in collaboration with NAIL-NIT consortium)
Sophie Jeannin Megnin1, Julie Dubourg1, Jörn Schattenberg2, Vlad Ratziu3, Stephen Harrison4, Mazen Noureddin5, Naim Alkhouri6, Michael Charlton7, 1Summit Clinical Research, United States; 2University medicine at the Johannes Gutenberg University in Mainz, Mainz, Germany; 3Institute for Cardiometabolism and Nutrition, France, 4University of Oxford, United Kingdom; 4Houston Methodist Hospital, Houston, United States; 4Arizona Liver Health, Chandler, United States; 5UChicago Medicine, Chicago, United States
E-mail: jdbourg@summitclinicalresearch.com

**Background and aims:** Hispanic ethnicity has been associated with a higher risk of non-alcoholic steatohepatitis (NASH) with advanced fibrosis. We aimed to describe the demographic, metabolic, and histological characteristics, between Hispanics and non-Hispanics, to further delineate the level of disease severity in this group.

**Method:** We combined screening data from 6 ongoing biopsy-proven therapeutic NASH trials (>5000 patients). Patients were categorized according to their ethnicity. At-risk NASH was defined as NASH with a non-alcoholic fatty liver disease activity score (NAS) of at least 4 and a fibrosis stage of 2 or 3. Screen failure rates were compared between the 2 groups before and after liver biopsy. We performed descriptive statistics, logistic, and linear regressions to compare the 2 groups.

### Screening

<table>
<thead>
<tr>
<th></th>
<th>Hispanic N = 2213</th>
<th>Non-Hispanic N = 2579</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>52 (12)</td>
<td>56 (11)</td>
<td>&lt;0.01</td>
<td></td>
</tr>
<tr>
<td>Glycated hemoglobin (HbA1c), %</td>
<td>6.6 (1.5)</td>
<td>6.5 (1.3)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Proportion of HbA1c ≥ 6.5%</td>
<td>42%</td>
<td>39%</td>
<td>0.04</td>
</tr>
<tr>
<td>Proportion of HbA1c &gt;9.5%</td>
<td>5%</td>
<td>3%</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>AST, IU/L</td>
<td>37 (27)</td>
<td>37 (28)</td>
<td>0.97</td>
</tr>
<tr>
<td>ALT, IU/L</td>
<td>50 (39)</td>
<td>48 (35)</td>
<td>0.03</td>
</tr>
<tr>
<td>GG, IU/L</td>
<td>61 (73)</td>
<td>65 (83)</td>
<td>0.13</td>
</tr>
<tr>
<td>LDL, mg/dl</td>
<td>102 (38)</td>
<td>102 (38)</td>
<td>0.57</td>
</tr>
<tr>
<td>Triglyceride, mg/dl</td>
<td>167 (137)</td>
<td>168 (103)</td>
<td>0.73</td>
</tr>
</tbody>
</table>

**Liver Biopsy time point**

<table>
<thead>
<tr>
<th></th>
<th>Hispanic N = 1980</th>
<th>Non-Hispanic N = 1223</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NASH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>561 (57%)</td>
<td>750 (61%)</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>Fibrosis Stage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–1</td>
<td>482 (49%)</td>
<td>505 (41%)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>2–3</td>
<td>454 (46%)</td>
<td>660 (54%)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>4</td>
<td>44 (4%)</td>
<td>59 (5%)</td>
<td></td>
</tr>
<tr>
<td>At-risk NASH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>370 (38%)</td>
<td>516 (42%)</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>Age, years</td>
<td>52 (12)</td>
<td>56 (11)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Glycated hemoglobin (HbA1c), %</td>
<td>6.4 (1.1)</td>
<td>6.4 (1.0)</td>
<td>0.41</td>
</tr>
<tr>
<td>Proportion of HbA1c ≥ 6.5%</td>
<td>376 (39%)</td>
<td>458 (39%)</td>
<td>0.86</td>
</tr>
<tr>
<td>AST, IU/L</td>
<td>40 (24)</td>
<td>42 (25)</td>
<td>0.18</td>
</tr>
<tr>
<td>ALT, IU/L</td>
<td>55 (34)</td>
<td>54 (33)</td>
<td>0.22</td>
</tr>
<tr>
<td>GG, IU/L</td>
<td>58 (58)</td>
<td>65 (72)</td>
<td>0.01</td>
</tr>
<tr>
<td>LDL, mg/dl</td>
<td>103 (38)</td>
<td>103 (38)</td>
<td>0.93</td>
</tr>
<tr>
<td>Triglyceride, mg/dl</td>
<td>159 (90)</td>
<td>164 (79)</td>
<td>0.24</td>
</tr>
<tr>
<td>Liver Stiffness Measurement-transient elastography, kPa</td>
<td>13.1 (6.9)</td>
<td>13.3 (6.2)</td>
<td>0.59</td>
</tr>
<tr>
<td>Liver fat content, %</td>
<td>18 (7)</td>
<td>18 (8)</td>
<td>0.14</td>
</tr>
</tbody>
</table>

Figure:

**Results:** 4792 patients with ethnicity data were included and 2203 had liver histology data. At screening, 2213 (46%) were Hispanic. Among Hispanic 1233 (56%) screen failed before biopsy compared to 1356 (53%) in non-Hispanic. The table shows the differences in characteristics between groups. At screening Hispanics were younger and had a higher glycated hemoglobin (HbA1c) with a higher proportion of patients with HbA1c >9.5% (considered a screen failure reason in many trials). This difference in HbA1c did not persist in patients who underwent liver biopsy. After adjustment for age, GGT and FIB-4, the non-Hispanic group had more advanced fibrosis (p = 0.02).

**Conclusion:** Hispanics had less advanced fibrosis compared to non-Hispanics. Enrichment with Hispanic patients in non-cirrhotic NASH clinical trials might not help improve the screen failure rate due to liver histology. Further studies including genotyping are important to further investigate the importance of minority groups in clinical trials of NASH.

**THU-553**
Study of an association of the serum iron markers, hepatic iron deposition and severity of non-alcoholic fatty liver disease: a single-centered prospective study
Shubham Jain1, Saurabh Bansal1, Pankaj Navghare1, Anuraag Jena1, Sanjay Chandnani1, Pravin Rathi1, 1Topiwala National Medical College, Mumbai, Gastroenterology, Mumbai, India
E-mail: dr.shubhamjazz@gmail.com

**Background and aims:** Non-alcoholic fatty liver disease (NAFLD) is commonly associated with elevated serum ferritin (SF) levels, seen in almost 30% of patients. However, whether this raised serum ferritin is a marker of hepatic inflammation or hepatic iron overload is still debatable. Recent studies have incorporated levels of serum ferritin (SF) to assess the progression of NASH and liver fibrosis. Moreover, the probable relationship between SF, Hepatocellular iron deposition, and stages of NAFLD disease is a pleasing surprise but not fully understood. Therefore we aimed to study the association of hepatic iron deposition in patients with histologically proven NAFLD and the role of serum ferritin as a predictor of the severity of NAFLD.

**Method:** We prospectively evaluated 103 outpatients with biopsy-proven NAFLD from our tertiary care centre over 2 years. Standard histological and clinical criteria were used for the diagnosis of NAFLD. Complete serum iron profile, hepatic, and metabolic parameters were collected at the time of liver biopsy. Hyperferritinaemia was defined when serum ferritin levels were more than 150 ng/ml. Significant fibrosis was defined as F2 fibrosis on histopathology/>8 kpa on transient electrography. Iron deposition in hepatocytes was assessed with staining and graded.

**Results:** Out of 103 included patients, 60 patients had steatohepatitis (NASH). Among those, 36 (60%) patients had elevated SF levels and iron staining was positive in 18 (30%) patients. However, there was no significant association found between serum hyperferritinemia and the presence of NASH (p = 0.68). Although NASH patients had no significant elevated ferritin levels but hepatic iron deposition was seen significantly higher in NASH vs non-NASH patients (18/60, 30% vs 4/43, 9%, p = 0.014); A total of 64 (62.1%) patients had hyperferritinaemia, whereas hepatic iron stain was positive in 22 (21.3%) patients. The association of hyperferritinaemia was significant in the early stages of fibrosis F0–F2 (p value= 0.04) whereas advanced stages of fibrosis F3–F4 were noted to have significantly decreased ferritin levels (p = 0.045). The stable hepatic iron deposition has no significant association with the progression of liver fibrosis as seen in Pre-cirrhotic stage (F0–F2) 11/48, 22.9% vs cirrhotic stage (F3–F4) 11/55, 20%, p value- 0.81
**THU-554**

**The importance of regular screening for HCC in non-alcoholic steatohepatitis/non-alcoholic fatty liver disease**

Taisei Keitoku¹, Nobuharu Tamaki¹, Masayuki Kurosaki¹, Naoki Uchihara¹, Keito Suzuki¹, Yuki Tanaka¹, Haruka Miyamoto¹, Michiko Yamada¹, Shun Ishido¹, Hiroaki Matsumoto¹, Tsusaba Nobusawa¹, Mayu Higuchi¹, Kenta Takaara¹, Shohei Tanaka¹, Chiaki Maeyashiki¹, Yutaka Yasui¹, Yuka Takahashi¹, Kaoru Tsuchiya¹, Hiroyuki Nakanishi¹, Daniel Huang², Namiki Izumi¹, ¹Musashino Red Cross Hospital, Gastroenterology and Hepatology, Tokyo, Japan; ²National University of Singapore, Singapore, Singapore

E-mail: kurosakim@gmail.com

**Background and aims:** Although it is necessary to detect HCC at an early stage by appropriate screening, a strategy for screening has not yet been established. Therefore, we decided to investigate the importance of regular screening in patients with NASH/NAFLD.

**Method:** We studied 317 NASH/NAFLD patients diagnosed with first-episode liver cancer at Musashino Red Cross Hospital and National University of Singapore. We investigated whether these patients had regular imaging screening (AUS/CT/MRI) at least once every 6 months prior to the diagnosis of HCC. The primary outcome was the whether or not curative treatment (curative treatment is defined as RFA or surgery in Barcelona clinic liver cancer (BCLC) Stage 0 or A patients) was performed. Survival rates in the patients with or without screening were compared as secondary outcomes.

**Results:** There were 233 patients without screening and 84 with screening. Patient background without/with screening: age (mean ± standard deviation) was 74 (± 11) vs 72 (± 11) years and BMI (mean ± SD) was 24.7 (± 4.6) vs 26.0 (± 4.4). The number of patients with cirrhosis were 106 (45.5%) vs 57 (67.9%). Among cirrhosis cases, Child-Pugh Class A/B/C: 67.6% vs 75.0%/25.5% vs 22.7%/6.9% vs 2.3% (p = 0.5). BCLC Stage 0/A was 10.4% vs 44.6%/48.7% vs 39.8% (p = 0.001). Cases with screening were significantly to receive curative treatment (34.8% vs 64.3%, p < 0.001). The 1-, 3-, and 5-year survival rates of the patients without/with screening were 72.5% vs 92.1% 55.1% vs 80.7%/48.0% vs 66.3% (p < 0.001), indicating a significantly lower survival rate in patients without screening.

**Conclusion:** Routine screening for NASH/NAFLD can detect early HCC and provide curative therapeutic intervention.
Conclusion: The overall liver-related event rate in MAFLD patients is low, but it is significantly higher among patients with advanced liver fibrosis. Cardiovascular disease is the leading cause of mortality in MAFLD patients.

THU-556

Serum vitamin D is strongly associated with liver steatosis but not with liver and spleen stiffness assessed by transient elastography in patients at risk

Gediz Dogay Us1,2, Ozgur Koc1,3, Francesco Innocenti4, Ihsan Nuri Akpinar2, Ger Koek1,3, 1Maastricht University, School of Nutrition and Translational Research in Metabolism, Maastricht, Netherlands; 2Pax Clinic, Department of Gastroenterology, Istanbul, Turkey; 3Maastricht University Medical Center, Division of gastroenterology and hepatology, Maastricht, Netherlands; 4Maastricht University, Department of Methodology and Statistics, CAPRI Care and Public Health Research Institute, Maastricht, Netherlands; 5Pax Clinic, Department of Radiology, Istanbul, Turkey
E-mail: dogaygediz@gmail.com

Background and aims: Vitamin D exerts a significant role in liver-related pathologies by interacting at multiple steps in development of liver steatosis, steatohepatitis, and liver fibrosis, as well as several related extrahepatic manifestations. Its insufficiency not only associates with obesity and metabolic syndrome but also has been shown to have a causative relationship with the severity and incidence of liver steatosis. However, the association between vitamin D insufficiency (VDI) and the stiffness of liver and spleen is not as well-defined. Therefore, we investigated the relationship between VDI and liver steatosis, liver stiffness (LS) and spleen stiffness (SS) assessed by transient elastography (TE).

Method: We recruited 395 participants for a single-centered prospective study in an outpatient clinic during a one-year period (between 01/2022 and 01/2023). All participants were older than 18 and presented at least with one component of the metabolic syndrome. Body weight, height, and waist circumference (WC) were measured, and body mass index (BMI) was calculated. Vitamin D status was measured as serum 25 (OH)D level and <30 ng/ml was considered as VDI. Liver steatosis by Controlled attenuation parameter (CAP), liver stiffness and spleen stiffness were assessed using a TE device (FibroScan®; Echosens, Paris, France). Multivariable linear regression analyses were used to investigate the association of vitamin D with CAP, LS and SS, adjusting for the following potential confounders: age, sex, WC, BMI, diabetes, hypertension, dyslipidemia, and metabolic syndrome.

Results: VDI was present in 33.4% of the participants. Vitamin D was negatively associated with CAP, with an unadjusted effect on CAP of −0.657 (95% CI: −0.921, −0.392). After adjusting for age, sex, BMI, waist circumference, diabetes, hypertension, dyslipidemia and metabolic syndrome, the association remained statistically significant but the effect of Vitamin D on CAP reduced to −0.342 (95% CI: −0.523, −0.160). There was a very weak and non-statistically significant association between Vitamin D and liver stiffness (−0.01, 95% CI: −0.02, 0.001) and spleen stiffness (−0.046, 95% CI: −0.110, 0.018), which vanishes when controlling for age, BMI, WC, sex, diabetes, hypertension, dyslipidaemia, and metabolic syndrome (−0.004, 95% CI: −0.014, 0.006 and −0.005, 95% CI: −0.071, 0.061, consecutively).

Conclusion: VDI is a predictor of the severity of liver steatosis independently from obesity and all components of metabolic syndrome, however liver and spleen stiffness does not show a significant association with it. Further studies demonstrating the impact of vitamin D in liver-related outcomes are warranted.

THU-557

Hepatic steatosis in people with HIV is associated with lower BMI and more liver fibrosis compared to metabolic dysfunction-associated fatty liver disease

Floriana Santomenni1, Rosa Lombardi1,2, Felice Cinque1,3, Jaqueline Curra1, Dana Kablawi4, Annalisa Cespitii1,2, Luca Marchesi1, Erika Fatta2, Cristina Bertelli2, Giovanna Oberti2, Wesal Elgretli3, Bertrand Lebouche4, Marc Deschênes4, Thierry Fosind Tadjou2, Giada Sebastiani1,4, Anna Ludovica Fracananz1,2, 1Department of Pathophysiology and Transplantation, University of Milan, Milan, Italy, Italy; 2Unit of Medicine and Metabolic Disease, Fondazione IRCCS Ca’ Granda Ospedale Maggiore Policlinico of Milan, Milan, Italy, Italy; 3Division of Experimental Medicine, McGill University, Montreal QC, Canada; 4Chronic Viral Illness Service, McGill University Health Centre, Montreal QC, Canada
E-mail: rosalombardi@hotmail.it

Background and aims: People with HIV (PWH) are at risk of hepatic steatosis (HS) possibly evolving to hepatic fibrosis. The pathogenesis of HS in these patients is complex, including HIV-related inflammation, frequent metabolic comorbidities and lifelong exposure to antiretroviral therapy. Recently, a new concept of metabolic dysfunction-associated fatty liver disease (MAFLD) has emerged, defined the presence of HS associated with at least one metabolic alteration. There are limited data whether HIV-associated HS differs in clinical presentation from metabolic dysfunction-associated fatty liver disease (MAFLD). We aimed to comparing severity of metabolic and hepatic dysfunction between PWH with HS and MAFLD patients.

Method: In this international case-control study, 212 consecutive HIV mono-infected patients with HS at McGill University in Montreal were compared to a sex and age matched MAFLD control group at Policlinico Hospital in Milan. Fibroscan with controlled attenuation parameter (CAP) was used to define HS (CAP >248 dB/m), severe HS (CAP > 280 dB/m), and significant liver fibrosis (liver stiffness measurement>7.0 kPa). Serum fibrosis biomarkers APRI, FIB-4 and Fibroscan-AST (FAST) score were also computed.

Results: PWH presented lower median BMI (28[25–31] vs 29[27–32] Kg/m², p = 0.002) and lower prevalence of obesity (26% vs 44%, p < 0.001) compared to MAFLD patients, along with a lower prevalence of hypertension (21% vs 38%, p < 0.001). The prevalence of dyslipidemia (41% vs 26%, p < 0.001) and statin prescription (23% vs 11%, p = 0.003), as well as of high triglycerides (26% vs 9%, p < 0.001) and low HDL cholesterol (34% vs 15%, p < 0.001), was higher among PWH compared to MAFLD patients. No difference in cardiovascular events and diabetes prevalence was observed between the two groups. As for liver disease, PWH had a lower prevalence of severe HS (54% vs 74% p < 0.001) but higher prevalence of significant liver fibrosis (15 vs 7%, p = 0.03) by Fibroscan, as well as higher serum fibrosis biomarkers APRI, FIB-4 and FAST score, compared to MAFLD patients.

Conclusion: Despite having lower BMI, PWH seem to have a more severe hepatic and atherogenic presentation of HS than MAFLD patients. Screening and follow-up for HS and especially for liver fibrosis in PWH is recommended, even if lean.

THU-558

Impact of visceral adiposity for coronary artery calcification progression in patients with metabolic dysfunction-associated fatty liver disease; multicenter cohort study

Min Kyu Kang1, KyeWhon Kim2, Jung Eun Song3, Jung Gil Park1

1College of Medicine, Yeungnam University, Internal Medicine, Korea, Rep. of South; 2Yeungnam University Hospital, Korea, Rep. of South; 3School of Medicine, Daegu Catholic University, Korea, Rep. of South
E-mail: gsnrs@naver.com

Background and aims: Metabolic dysfunction-associated fatty liver disease (MAFLD) as well as non-alcoholic fatty liver disease (NAFLD) is associated with coronary artery calcification (CAC) progression. Although body composition parameters are emerging as novel
prognostic factors for NAFLD, the clinical significance of those on CAC progression in patients with MAFLD is lacking. We investigated the impact of body composition parameters on the CAC progression in patients with MAFLD.

**Method:** A cross-sectional analysis of retrospective cohort study was conducted at two health promotion centers, including 457 MAFLD patients who performed ultrasound and abdominal and cardiac CT. Fatty liver was defined using ultrasound and presence of CAC as a CAC score >0 was defined using cardiac CT. The CAC progression was classified by Greenland methods (0, 1 to 100, 101 to 300, and >300). Using cross-sectional CT images of 3rd lumbar vertebra, sarcopenia, visceral adiposity, and myosteatosis were defined.

**Results:** Median age was 57 years (interquartile range: 52.0–63.0) and 364 (79.6%) were male. The presence of CAC was 44.6% and the CAC progression groups were identified by 253 (26.3%) in 1 to 100 group, 42 (9.2%) in 101 to 300 group, and 42 (9.2%) in >300 group, respectively. The visceral adiposity progression was correlated with the CAC progression (p < 0.001). In the multivariate analysis, visceral adiposity (odds ratio, 1.79; 95% confidence interval; 1.14–2.83, p = 0.011) was significant risk factors for presence of CAC, independent of pre-existing prognostic factors.

**Figure:**

**Conclusion:** Visceral adiposity is associated with an CAC progression in patients with MAFLD, independent of traditional risk factors.

**THU-559**

Evaluation of Google search trends for liver diseases in Europe Andreas Teufel1, Timo Itzel1, Anca Zimmermann2, Dan Dumitrascu3, Elisabetta Bugianesi4, Luca Valenti5, Laurent Castera6, Robert Flisiak10, Marcin Krawczyk11, Matthias Ebert12, Milano, Italy; 6Université de Paris, UMR1149 (CRI), Inserm, Paris, France; 7Studi di Milano, Department of Pathophysiology and Transplantation, Hatieganu”, Cluj-Napoca, Romania; 4University of Turin, Department of Medicine and Pharmacy, 42nd Department of Internal Medicine, “Iuliu Hatieganu”, Cluj-Napoca, Romania; 2University of Turin, Department of Medical Sciences, Division of Gastroenterology and Hepatology, A.O. Città della Salute and della Scienza di Torino, Turin, Italy; 3Università Degli Studi di Milano, Department of Pathophysiology and Transplantation, Milano, Italy; 5Université de Paris, UMR1149 (CR), Inserm, Paris, France; 6Hôpital Beaujon, Clichy, France; 7Aix Marseille Univ, Inserm, IRD, SESTIM, Sciences Economiques et Sociales de la Santé et Traitement de l’Information Médicale, ISSPAM, Marseille, Germany; 8Hospital Universitario Marqués de Valdecilla, Gastroenterology and Hepatology, Santander, Spain; 9University of Seville, Virgen del Rocio University Hospital, Institute of Biomedicine of Seville, Seville, Spain; 10Uniwersytecky Szpital Kliniczny w Białymstoku, Klinika Chorób Zakaźnych 1 i Hepatologii UMB, Białystok, Poland; 11Saarland University, Department of Medicine II, Saarland University Medical Center, Homburg, Germany; 12Heidelberg University, Department of Medicine II, Mannheim, Germany; 13University of Barcelona, Barcelona Institute for Global Health (ISGlobal), Hospital Clinic, Barcelona, Spain; 14Charité-Universitätsmedizin Berlin, Department of Hepatology and Gastroenterology, Campus Virchow-Klinikum and Campus Charité Mitte, Berlin, Germany

E-mail: andreas.teufel@medma.uni-heidelberg.de

**Background and aims:** Chronic liver diseases belong to the most common diseases worldwide and are associated with increased morbidity and mortality. Although every fourth adult might be affected by non-alcoholic fatty liver disease (NAFLD), awareness of this condition is low amongst the general public, health care professionals and policy makers. However, meaningful knowledge transfer is essential for raising awareness and improving prevention and treatment of liver disease. Thus, investigating the use of internet search engines might offer valuable insights on how knowledge transfer has evolved and which liver-related issues are currently searched.

**Method:** We investigated Google search trends by measuring the number of hits relating to liver diseases between 2004 and 2021 in seven languages and European countries but also worldwide. All analyses were performed in R using the R Google trends package gttrendsR.

**Results:** We found that interest in NAFLD has generally increased over time, but that interest in non-alcoholic steatohepatitis (NASH)—the most severe form of NAFLD—has decreased. Interest in viral hepatitis C has decreased, whereas the number of queries regarding viral hepatitis B have been stable but dominated by interest in vaccination for it. Recent medical developments (in viral hepatitis) did not lead to a noticeable change in overall search behavior. Users preferred searching using their native language and less complex medical terms and acronyms (e.g., fatty liver instead of NAFLD).

**Conclusion:** In the last two decades, public Google search trends have followed the general changes in hepatology. Searches are dominated by non-healthcare professionals and generally avoid complex and specific medical terms. Awareness and communication strategies around NAFLD should consider these preferences when addressing the general public.

**THU-560**

Salivary analytical device (SAD) a good tool for monitoring the metabolic status of patients with fatty liver disease Gaia Sinatì1, Silvano Junior Santini3, Giovanni Brienza1, Marco Lampieri1, Giovanna Fracassi2, Clara Balsano1, 1University of L’Aquila, Department of Life, Health and Environmental Sciences (MESVA), L’Aquila, Italy

E-mail: gaia.sinatti@graduate.univaq.it

**Background and aims:** Physical inactivity and sedentary lifestyle have contributed worldwide to the epidemic spread of obesity and non-alcohol related fatty liver disease (NAFLD), the most common cause of chronic liver disease. Besides leading to increased morbidity and mortality due to the possible evolution of the disease into non-alcohol related steatohepatitis (NASH) and/or into advanced fibrosis, NAFLD is also associated with cardiovascular disease (CVD). Monitoring NAFLD patients at risk of developing complications by using a more effective health technology would allow the implementation of preventive health strategies and follow-up programs that would bring considerable benefits to the individual and reduce the burden of this disease on the health care system. Saliva has hundreds of components that can serve as biomarkers of both physiological and pathological status. The purpose of this study was to develop a device, with multiple integrated sensors, that could use saliva to monitor patients with dysmetabolism and derive reliable
detections comparable with blood values to allow and improve telematic control of the patient. We evaluated and compared each value of lipid profile (total cholesterol, High Density Lipoprotein HDL, triglycerides) and glucose, detected in blood samples, with those identified in saliva samples by using commercial enzymatic kit assay. Besides that, hematological parameters were measured in saliva samples by a lab on chip to validate a prototype of device, with multiple integrated sensors, created in collaboration with electronic engineers and called SAD, Salivary Analytical Device. (Figure)

**Method:** In this study, a small cohort of thirty patients was enrolled. We evaluated and compared each value of lipid profile (total cholesterol, High Density Lipoprotein HDL, triglycerides) and glucose, detected in blood samples, with those identified in saliva samples by using commercial enzymatic kit assay. Besides that, hematological parameters were measured in saliva samples by a lab on chip to validate a prototype of device, with multiple integrated sensors, created in collaboration with electronic engineers and called SAD, Salivary Analytical Device. (Figure)

**Results:** we obtained a good degree of correlation between blood determinations and salivary values of total cholesterol ($r = 0.65, p = 0.04$), HDL ($r = 0.73, p = 0.04$), triglycerides ($r = 0.84, p = 0.02$) and glucose ($r = 0.98, p = 0.003$) both using commercial kits. Moreover, SAD prototype displayed an excellent reliability for salivary parameters evaluation and dosing.

**Conclusion:** Although our results need to be validated on a larger cohort of patients, our preliminary data confirm that our device SAD can be a good tool for monitoring total cholesterol, HDL, triglycerides, and glucose levels in saliva samples. Offering the possibility of monitoring multiple biochemical parameters with a non-invasive device, in a simple and fast way, capable of analyzing metabolic parameters in a few drops of saliva, is desirable, and would unequivocally implement the performance and reliability of remote telemonitoring.

**DOTS: SAD, Salivary Analytical Device render. a) general view of the device prototype, b) housing arrangement of a commercial strip, c) arrangement of sensor connection header and connector colorimetric sensor modules.**

**Conclusion:** Although our results need to be validated on a larger cohort of patients, our preliminary data confirm that our device SAD can be a good tool for monitoring total cholesterol, HDL, triglycerides, and glucose levels in saliva samples. Offering the possibility of monitoring multiple biochemical parameters with a non-invasive device, in a simple and fast way, capable of analyzing metabolic parameters in a few drops of saliva, is desirable, and would unequivocally implement the performance and reliability of remote telemonitoring.

**Background and aims:** Transient elastography (TE) may reduce the need for liver biopsies to diagnose and monitor progression of pre-cirrhotic liver fibrosis due to non-alcoholic steatohepatitis (NASH). Interim analyses of the ongoing phase 3 REGENERATE trial showed that obeticholic acid (OCA) significantly improved hepatic fibrosis vs placebo in patients with NASH as assessed by histologic analysis of liver biopsies using individual readers or a consensus panel. Secondary study objectives included non-invasive assessment of the antifibrotic effect of OCA vs placebo. Here, we describe the effect of OCA vs placebo on TE liver stiffness measurement (LSM) over 48 months in patients with pre-cirrhotic fibrosis due to NASH in the REGENERATE study.

**Method:** TE (FibroScan) was performed every 6 months at study sites where it was available. LSM was analyzed in the intent-to-treat (ITT) population, which included all randomized patients with baseline fibrosis stage 2 or 3 (histologic staging) who received at least 1 dose of placebo, OCA 10 mg, or OCA 25 mg and who had a post-baseline measurement. Fibrosis staging was determined by a consensus method for histologic analysis using NASH Clinical Research Network scoring criteria.

**Results:** In the ITT population (N = 2187), mean (standard deviation) baseline LSM across cohorts was similar (placebo, 12.2 [6.7] kilopascal [kPa]; OCA 10 mg, 12.1 [6.2] kPa; OCA 25 mg, 11.7 [6.4] kPa). Mean LSM in OCA-treated patients decreased relative to those in the placebo group as early as month 6 (about 50% had ≥20% reduction from baseline) and was sustained through month 48 in the OCA 25 mg group (Figure 1A). At month 18, LSM reductions were observed in both OCA groups whereas LSM in the placebo group worsened (OCA 10 mg vs placebo, p = 0.0066; OCA 25 mg vs placebo, p = 0.0015; Figure 1B). At month 48, there was a dose-dependent reduction of LSM, with OCA 25 mg achieving a −2.32 kPa least-squares mean change from baseline (p = 0.0172 vs placebo). In a responder analysis, LSM reductions occurred even in OCA-treated patients whose histologic fibrosis was assessed as unchanged at month 18 by central pathologists (Figure 1C).

**Conclusion:** Treatment with 48 months of OCA provided a dose-dependent and cumulative benefit in liver stiffness vs placebo in patients with pre-cirrhotic liver fibrosis due to NASH. These findings support the regulatory primary end point of histologic improvement in hepatic fibrosis in the REGENERATE study, which was demonstrated by 2 biopsy-reading methodologies.
Validation and expansion of the American gastroenterological association clinical care pathway for non-alcoholic fatty liver disease in a prospective cohort of patients with type 2 diabetes

Veeral Ajmera, Kaleb Tesfai, Scarlett Lopez, Vanessa Cervantes, Egbert Madamba, Ricki Bettencourt, Lisa Richards, Rohit Loomba

1UCSD NAFLD Research Center, United States

Email: v1ajmera@ucsd.edu

Background and aims: A multidisciplinary task force commissioned by the American Gastroenterological Association (AGA) recently developed a clinical care pathway with guidance on screening high-risk populations including those with type 2 diabetes (T2DM). We aimed to validate the pathway in a prospectively recruited cohort of patients with T2DM and evaluate the diagnostic performance of an alternate pathway with enhanced liver fibrosis (ELF) testing.

Method: This prospective study enrolled adults age ≥50 years with T2DM recruited from primary care or endocrinology clinics. Participants underwent a standardized clinical research visit with magnetic resonance imaging proton-density-fat-fraction (MRI-PDFF), magnetic resonance elastography (MRE), vibration-controlled transient elastography (VCTE) and controlled attenuation parameter (CAP) and ELF testing. The primary outcome was the diagnostic performance of the AGA clinical pathway and an alternate pathway with ELF for advanced fibrosis using MRE ≥3.63 kPa as the reference.

Results: 417 patients (36% men) with T2DM with FIB-4 and MRE data were included. The mean (± SD) age and BMI were 65 (± 8) years and 30 (± 5) kg/m², respectively. The prevalence of NAFLD (MRI-PDFF ≥5% after exclusion of other liver diseases) was 64% and 12% had advanced fibrosis (MRE ≥3.63 kPa). FIB-4 values of <1.3, 1.3–2.67 and ≥2.67 were present in 208 (50%), 183 (44%), and 26 (6%) of patients respectively. VCTE values <8 kPa, 8–12 kPa and ≥12 kPa were present in 309 (77%), 58 (14%), and 36 (9%) of patients respectively. ELF scores of <9.8, 9.8–11.3 and >11.3 were present in 236 (58%), 146 (36%) and 22 (6%) patients respectively. Applying the AGA pathway (N = 403), 202 patients were low risk by FIB-4 and 128 additional patients had VCTE <8 kPa and were classified as low risk. The false negative rate was 3.3% and 18% would qualify for specialty referral (Figure 1A). Applying the alternate pathway with ELF (N = 404), 200 patients were low risk by FIB-4 and 85 additional patients had low ELF and were low risk by VCTE <8 kPa.

Abbreviations: kPa, kilopascal; LS, least squares.

TOP-075
Validation and expansion of the American gastroenterological association clinical care pathway for non-alcoholic fatty liver disease in a prospective cohort of patients with type 2 diabetes
Veeral Ajmera, Kaleb Tesfai, Scarlett Lopez, Vanessa Cervantes, Egbert Madamba, Ricki Bettencourt, Lisa Richards, Rohit Loomba

1UCSD NAFLD Research Center, United States

Email: v1ajmera@ucsd.edu

Background and aims: A multidisciplinary task force commissioned by the American Gastroenterological Association (AGA) recently developed a clinical care pathway with guidance on screening high-risk populations including those with type 2 diabetes (T2DM). We aimed to validate the pathway in a prospectively recruited cohort of patients with T2DM and evaluate the diagnostic performance of an alternate pathway with enhanced liver fibrosis (ELF) testing.

Method: This prospective study enrolled adults age ≥50 years with T2DM recruited from primary care or endocrinology clinics. Participants underwent a standardized clinical research visit with magnetic resonance imaging proton-density-fat-fraction (MRI-PDFF), magnetic resonance elastography (MRE), vibration-controlled transient elastography (VCTE) and controlled attenuation parameter (CAP) and ELF testing. The primary outcome was the diagnostic performance of the AGA clinical pathway and an alternate pathway with ELF for advanced fibrosis using MRE ≥3.63 kPa as the reference.

Results: 417 patients (36% men) with T2DM with FIB-4 and MRE data were included. The mean (± SD) age and BMI were 65 (± 8) years and 30 (± 5) kg/m², respectively. The prevalence of NAFLD (MRI-PDFF ≥5% after exclusion of other liver diseases) was 64% and 12% had advanced fibrosis (MRE ≥3.63 kPa). FIB-4 values of <1.3, 1.3–2.67 and ≥2.67 were present in 208 (50%), 183 (44%), and 26 (6%) of patients respectively. VCTE values <8 kPa, 8–12 kPa and ≥12 kPa were present in 309 (77%), 58 (14%), and 36 (9%) of patients respectively. ELF scores of <9.8, 9.8–11.3 and >11.3 were present in 236 (58%), 146 (36%) and 22 (6%) patients respectively. Applying the AGA pathway (N = 403), 202 patients were low risk by FIB-4 and 128 additional patients had VCTE <8 kPa and were classified as low risk. The false negative rate was 3.3% and 18% would qualify for specialty referral (Figure 1A). Applying the alternate pathway with ELF (N = 404), 200 patients were low risk by FIB-4 and 85 additional patients had low ELF and were low risk by VCTE <8 kPa.

Abbreviations: kPa, kilopascal; LS, least squares.
risk. The false negative rate was 4.8% and 29% would qualify specialty referral (Figure 1B).

**Conclusion:** Validation of the AGA clinical pathway in a well-phenotyped, prospectively recruited cohort with T2DM revealed a low false negative rate, 3.3% and identified 82% of patients as low-risk. An alternative pathway with FIB-4 + ELF, which does not require VCTE, was assessed using a FibroScan-AST (CSF). However, rigorous data are lacking to support screening of CSF via FIB4 in patients with type 2 diabetes (T2D). We developed and externally validated a model to predict the presence of high-risk NASH (HRN) in patients with T2D and compared its performance against FIB4.

**Method:** 807 T2D participants with vibration-controlled transient elastography (VCTE) in the US population-based National Health and Nutrition Examination Survey (NHANES, 2011–2014) constituted the derivation cohort. 97 T2D screened for a phase 2 clinical trial (NCT05011305) comprised the validation cohort. HRN, defined as NAS ≥4 and fibrosis stage ≥2, was assessed using a FibroScan-AST (FAST) score threshold of ≥0.35 obtained from VCTE and aspartate aminotransferase (AST). Diabetes was defined by Hba1c levels ≥6.5% or fasting plasma glucose of ≥126 mg/dl or current use of glucose-lowering medications. Logistic regression models were used for variable selection and model development in the derivation cohort. The area under the ROC curve (AUC) was computed to determine the diagnostic performance of the final predictive model and FIB-4 and select different thresholds for discriminating participants with HRN.

**Results** In the derivation cohort, the prevalence of HRN was 15%. The bias-corrected AUC and Akaike Information Criterion (AIC) of a model (Diabetes-HRN index) comprising of variables independently associated with HRN (log-transformed values of ALT, GGT, and BMI along with AST/ULN-to-platelet ratio, HDL-C, and age) was 0.95 (95% CI 0.93–0.97) and 309.6, respectively. A score threshold of >15.82, selected by Youden's index, correctly identified a total of 717 (89%) out of 805 participants, with a sensitivity of 90%, specificity of 89%, NPV of 98%, and PPV of 57%. In the validation cohort, the Diabetes-HRN index yielded an AUC of 0.95 (95% CI: 0.89–0.99), and a score threshold of >15.82 correctly classified a total of 81 (84%) out of 97 participants, with NPV of 74% and PPV of 87%. The Diabetes-HRN index outperformed FIB-4 in predicting HRN in the derivation (AUC: 0.64, 95% CI: 0.61–0.67) and validation (AUC: 0.77, 95% CI: 0.67–0.84) cohorts. The Delong test p values for comparing AUCs between HRN Diabetes and FIB4 was <0.01 (Figure). In a separate analysis consisting of 1237 T2D participants in NHANES 2011–2012 and 2013–2014, our Diabetes-HRN index, after adjusting for age, gender, race/ethnicity, history of CVD and cancer, and smoking status, was significantly associated with overall mortality [HR: 1.6 (95% CI: 1.04–2.3), P = 0.03].

**Conclusion:** A newly developed and validated Diabetes-HRN index based on 6 bedside variables accurately identifies diabetic patients at high risk of fibrotic NASH. This model significantly outperforms FIB4.

**TOP-080**

A validated tool consisting of bedside variables predicts high-risk NASH (HRN) in individuals with type 2 diabetes

Eduardo Vilar Gomez, Raj Vuppalanchi, Naga Chalasani, Stephen Harrison, Samer Gawrieh, Oscar Cummings, Deven Parmar, Niharika Samala, Christian Butcher, Christie Hernandez, Egbert Madamba, Seema Singh, Lisa Richards, Veeral Ajmera, Rohit Loomba, Monica Tincopa, Ricki Bettencourt, Maral Amangurbanova, Christian Butcher, Christie Hernandez, Egbert Madamba, Seema Singh, Lisa Richards, Veeral Ajmera, Rohit Loomba, UCSD, Indiana University School of Medicine, Indianapolis, United States; 2Zydus Therapeutics Inc, United States; 3Pinnacle Clinical Research, San Antonio, United States; 4Medical Center, San Diego, United States

**Background and aims:** FIB4 is currently recommended to screen against FIB4.

**Method:** 807 T2D participants with vibration-controlled transient elastography (VCTE) in the US population-based National Health and Nutrition Examination Survey (NHANES, 2011–2014) constituted the derivation cohort. 97 T2D screened for a phase 2 clinical trial (NCT05011305) comprised the validation cohort. HRN, defined as NAS ≥4 and fibrosis stage ≥2, was assessed using a FibroScan-AST (CSF). However, rigorous data are lacking to support screening of CSF via FIB4 in patients with type 2 diabetes (T2D). We developed and externally validated a model to predict the presence of high-risk NASH (HRN) in patients with T2D and compared its performance against FIB4.

**Results** In the derivation cohort, the prevalence of HRN was 15%. The bias-corrected AUC and Akaike Information Criterion (AIC) of a model (Diabetes-HRN index) comprising of variables independently associated with HRN (log-transformed values of ALT, GGT, and BMI along with AST/ULN-to-platelet ratio, HDL-C, and age) was 0.95 (95% CI 0.93–0.97) and 309.6, respectively. A score threshold of >15.82, selected by Youden's index, correctly identified a total of 717 (89%) out of 805 participants, with a sensitivity of 90%, specificity of 89%, NPV of 98%, and PPV of 57%. In the validation cohort, the Diabetes-HRN index yielded an AUC of 0.95 (95% CI: 0.89–0.99), and a score threshold of >15.82 correctly classified a total of 81 (84%) out of 97 participants, with NPV of 74% and PPV of 87%. The Diabetes-HRN index outperformed FIB-4 in predicting HRN in the derivation (AUC: 0.64, 95% CI: 0.61–0.67) and validation (AUC: 0.77, 95% CI: 0.67–0.84) cohorts. The Delong test p values for comparing AUCs between HRN Diabetes and FIB4 was <0.01 (Figure). In a separate analysis consisting of 1237 T2D participants in NHANES 2011–2012 and 2013–2014, our Diabetes-HRN index, after adjusting for age, gender, race/ethnicity, history of CVD and cancer, and smoking status, was significantly associated with overall mortality [HR: 1.6 (95% CI: 1.04–2.3), P = 0.03].

**Conclusion:** A newly developed and validated Diabetes-HRN index based on 6 bedside variables accurately identifies diabetic patients at high risk of fibrotic NASH. This model significantly outperforms FIB4.

**TOP-083**

Utility of serum phosphatidylethanol in differentiating NAFLD from alcohol-associated liver disease among individuals with overweight and obesity: the San Diego liver study

Monica Tincopa, Ricki Bettencourt, Maral Amangurbanova, Christian Butcher, Christie Hernandez, Egbert Madamba, Seema Singh, Lisa Richards, Veeral Ajmera, Rohit Loomba, UCSD, United States

**Background and aims:** Differentiating non-alcoholic fatty liver disease (NAFLD) from alcohol-associated liver disease (ALD) can be challenging in individuals with overweight and obesity. There are limited prospective data from cohorts of individuals with overweight or obesity who have been systematically assessed for hepatic steatosis. This study aimed to evaluate the prevalence of NAFLD and ALD among individuals with overweight and obesity and to
determine the clinical utility of serum phosphatidylethanol (PEth) in differentiating NAFLD from ALD.

**Method:** This prospective study enrolled adults aged 40–75 with overweight (BMI ≥ 25–<30 kg/m²) and obesity (BMI ≥ 30). Participants completed a research visit with vibration controlled transient elastography (VCTE) with controlled attenuation parameter, MRI proton-density-fat-fraction (MRI-PDFF) and MR elastography (MRE). Alcohol use was assessed with Alcohol-Use-Disorder-Identification-Test (AUDIT)-C, Skinner Lifetime Drinking History and serum PEth. NAFLD was defined as MRI-PDFF ≥ 5% and AUDIT-C <4 for males and <3 for females with exclusion of other liver diseases and consistent with AASLD Practice Guidance. ALD was defined as MRI-PDFF ≥ 5% with self-reported measures consistent with alcohol use disorder. Advanced fibrosis was defined using established liver-stiffness cut-points on MRE.

**Results:** The cohort included 278 consecutive individuals, median age 54 years, 46% males, 41% Latinos, median BMI 31 kg/m² with 29.5% having diabetes. The prevalence of NAFLD was 68.7% and ALD 11.2%. Median hepatic fat-content by MRI-PDFF was 13.2% in NAFLD versus (vs.) 11% in ALD. Median MRE liver stiffness measures were 2.2 kPa in NAFLD vs. 2.1 kPa in ALD. The prevalence of advanced fibrosis by MRE was 11.5% in NAFLD vs. 12.9% with ALD. PEth >20–40 ng/ml, >40–60 ng/ml and >60 ng/ml was detected in 4.3%, 2.1% and 5.4% of NAFLD patients. Serum PEth correlated with MRE liver stiffness measures in NAFLD (r = 0.20, p = 0.01). A PEth cut-point of <17 ng/ml yielded an AUC of 0.82 with a negative predictive value of 96% to distinguish those with NAFLD from those with ALD (Figure 1).

**Conclusion:** Among a well characterized prospective cohort of individuals with overweight and obesity, the prevalence of NAFLD was 69% and ALD 11%. The prevalence of advanced fibrosis was 10%. Serum PEth is associated with increased liver stiffness in NAFLD, raising concern for synergistic effects of even low amounts of alcohol on disease progression in NAFLD. A PEth of <20 ng/ml may serve as a simple serum-based tool to differentiate those with NAFLD from those with ALD in patients with overlapping risk factors. These data have important implications for clinical practice and trials.
SAT-393
Early aminotransferase improvement in the phase 2b NATIVE study is predictive of response pattern of liver histology as well as hepatic and cardiometabolic health markers at the end of treatment in patients with non-cirrhotic NASH
Quentin Anstee1, Philippe Huot-Marchand2, Lucile Dzen2, Jean-Louis Junien3, Pierre Broqua2, Sven Francque1.
1Newcastle University, United Kingdom; 2Inventiva, Research and Development, Daix, France; 3Antwerp University Hospital, Edegem, Belgium; 4Mayo Clinic, Rochester, United States; 5University of Oxford, United Kingdom

Background and aims: There is a need to identify non-invasive tests (NITs) that provide an early prediction of evolving histological response/non-response to therapy. Lanifibranor has shown efficacy on liver histology and metabolic-immune markers of NASH. We evaluated the correlation of ALT and AST response at treatment week (TW) 4 with subsequent histological response and change in cardiometabolic health (CMH) in lanifibranor treated patients at TW24 in the ph2b NATIVE trial.
Method: NATIVE evaluated lanifibranor 800 and 1200 mg/d versus placebo in patients with non-cirrhotic NASH over 24 weeks. We assessed the early kinetics of liver biochemistry improvements for AST and ALT at TW4, and their abilities for predicting histological response/non-response at TW24 for ‘NASH resolution with no worsening of fibrosis’ (E1) and ‘improvement of fibrosis with no worsening of NASH’ (E2), mainly using the Negative Predictive Value (NPV) but including also Sensitivity (Sens), Specificity (Spec) and Negative Likelihood Ratio (NLR) at TW4. Analyses were performed on data available for transaminases at TW4 and histological response at TW24 (N = 142, pooled lanifibranor treated patients) individually for each NIT. Based on the results, we then analyzed the correlation of early ALT and AST improvement at TW4 and response of CMH markers at TW24.

Results: For E1, an ALT reduction ≥15% from baseline value to TW4 showed Sens 0.90 (95%CI 0.83–0.98), Spec 0.22 (0.13–0.31) for histological response. Reductions <15% were observed in 21.5% of non-responders versus 9.5% of responders, giving a NPV of 0.74 (0.56–0.92) and NLR 0.44. AST reduction ≥15% was less sensitive but more specific: Sens 0.60 (0.48–0.72), Spec 0.47 (0.36–0.58), reductions <15% gave a NPV 0.60 (0.48–0.72), NLR 0.85. For E2, biochemical changes performed less well as predictive markers. Reductions ≥15% showed Sens 0.82 (0.72–0.92), Spec 0.15 (0.08–0.23) and Sens 0.54 (0.41–0.67), Spec 0.42 (0.31–0.52) for ALT and AST respectively. ALT and AST decrease at TW4 correlated with improvement in markers of glucose and lipid metabolism, adiponectin, GGT at TW24, with a correlation more pronounced for ALT than AST.

SAT-394
Novel artificial intelligence-assisted digital pathology quantitative image analysis predicts the occurrence of liver-related clinical events in the multicentric, European, hepatic outcomes and survival fatty liver registry (HOTSURFR) study
Li Chen1, Louis Petitjean2, Javier Ampuero2, Jerome Bourrier3, Stergios Kechagias4, Salvatore Petta4, Hannes Hagström6, Jörn Schattenberg7, Frederic Charlotte8, Leila Kara9, Pierre Bedossa10, Mathieu Petitjean1, Vlad Ratziu11, 1PharmaNest, United States; 2Hospital Universitario Virgen del Rocio de Sevilla, Spain; 3CHU Angers, France; 4Linköping University, Sweden; 5Università degli Studi di Palermo, Italy; 6Karolinska University Hospital, Sweden; 7Mainz Universität, Germany; 8Assistance Publique Hôpitaux de Paris, France; 9ICAN, France; 10Liverpat, France; 11Sorbonne Université, France

Background and aims: Artificial intelligence-assisted digital pathology provides an automated, operator independent, sensitive and quantitative assessment of histological changes with the ability to identify patterns of fibrosis progression or regression. However, its value for predicting clinical events is unknown. We have previously shown that quantitative traits in collagen fiber parameters can be used to build fibrosis scores that are correlated with semi-quantitative histological NASH CRN stages. We aimed to determine if quantitative fibrosis scores from baseline liver biopsies are correlated with incident liver-related events (LRE) in a large, multicentric, European cohort with long-term follow-up.
Method: 304 patients (pts) from 6 European centers with liver biopsy performed for suspected NAFLD before 2011 and clinical follow-up, were retrospectively analyzed. LRE were defined as occurrence of cirrhosis, cirrhosis decompensation events or hepatocellular carcinoma. Formalin-fixed, paraffin-embedded biopsies where stained with collagen stains (Masson Trichrome or Picro Sirius Red) and digitized at 40X. Histology was read centrally (NASH CRN classification). Quantitative image analysis extracted 315 single-fiber quantitative traits (qFTs) to assess fibrosis composition, morphometric and architectural histological phenotypes. The qFTs that exhibited a significant (>50%) mean change between pts with or without events were identified, normalized and combined in a Liver Event Predictive Score (LEPS). A quantitative fibrosis severity score, Ph-FCS, ranging from 1 to 10, previously optimized to model the F0-F4 fibrosis progression, and derived from a selection of the same 315 qFTs was also assessed.

Results: Mean age was 53.5 yrs, 56% were males, mean BMI 30.6 kg/m², 39% had diabetes and 62% arterial hypertension. The proportion of histological fibrosis stages were: 0/1/2/3/4, 53%/17%/8%/14%/8%, respectively. Median follow-up was 11.4 yrs (IQR 4.7). 52 pts (17%) had at least one LRE. Mean (sd) LEPS was 1.88 (0.67) in pts with LRE vs 2.68 (0.78) in pts without LRE (p < 0.001). Using a cut-off value of 2.9, LEPS had a sensitivity of 71% and specificity of 68% for the prediction of LRE. When the cut-off value was changed by ±5% the sensitivity and specificity varied within a −11% to +6.5% range. Ph-FCS demonstrated a similar performance as LEPS (sensitivity = 79%, specificity = 62%) for a cut-off value of 4. There was a strong correlation between LEPS and Ph-FCS (r = 0.77, p < 0.001), confirming that fibrosis severity is a major predictor of clinical events.

Table: Comparison of FIB-4 1.3 and SWE 7.0 and 8.0 kPa among different demographic and clinical characteristics.

<table>
<thead>
<tr>
<th>Modality cut-off</th>
<th>FIB-4 ≥1.3</th>
<th>SWE ≥7.0 kPa</th>
<th>SWE ≥8.0 kPa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Age yrs</td>
<td>≥50</td>
<td>≥50</td>
<td>≥50</td>
</tr>
<tr>
<td>BMI</td>
<td>Normal</td>
<td>Elevated</td>
<td>Normal</td>
</tr>
<tr>
<td>N=</td>
<td>2,385</td>
<td>2,415</td>
<td>1,858</td>
</tr>
<tr>
<td>N=</td>
<td>5,230</td>
<td>5,250</td>
<td>4,381</td>
</tr>
<tr>
<td>FIB-4 ≥1.3</td>
<td>1,289</td>
<td>1,309</td>
<td>1,058</td>
</tr>
<tr>
<td>(28.4%)</td>
<td>(28.5%)</td>
<td>(28.1%)</td>
<td>(28.2%)</td>
</tr>
<tr>
<td>SWE ≥7.0 kPa</td>
<td>540</td>
<td>579</td>
<td>785</td>
</tr>
<tr>
<td>(11.9%)</td>
<td>(13.7%)</td>
<td>(16.9%)</td>
<td>(18.0%)</td>
</tr>
<tr>
<td>SWE ≥8.0 kPa</td>
<td>404</td>
<td>468</td>
<td>554</td>
</tr>
<tr>
<td>(9.0%)</td>
<td>(11.4%)</td>
<td>(13.8%)</td>
<td>(15.0%)</td>
</tr>
</tbody>
</table>

Conclusion: Quantitative image analysis by digital pathology performed on stained liver slides provides continuous scores that identify NAFLD patients at risk of incident clinical outcomes. Further validation on additional cases is ongoing, aiming to provide better histological surrogates for therapeutic trials.

SAT-395
Risk-stratification of patients with non-alcoholic fatty liver disease (NAFLD) in primary care: lessons from the Calgary NAFLD pathway
Abdel-Aziz Shaheen1, Elizabeth Baguley1, Wendy Schaufert2, Mark G Swain1.
Email: az.shaheen@ucalgary.ca

Background and aims: The Calgary non-alcoholic fatty liver disease (NAFLD) pathway (CNP) is the largest primary care-based NAFLD pathway in North America. We aimed to evaluate the performance of different risk-stratification modalities among CNP patients according to their baseline liver enzymes and metabolic syndrome risk factors.

Method: The CNP uses validated shearwave elastography (SWE) assessment as the primary tool of risk-stratification for patients with a history of fatty liver or ‘at-risk’ of metabolic syndrome since March 2017. In the CNP, ‘at-risk’ of advanced fibrosis patients with SWE ≥8.0 kPa or inconclusive results are referred to hepatology. Since only an ALT assessment was mandatory at baseline, some patients did not have all baseline serum fibrosis-4 variables (FIB-4). We compared the performance of both SWE ≥7.0 and 8.0 kPa, and FIB-4 ≥1.3, according to sex, age, rural residence, body mass index (≥35), normal ALT (25 U/L for women and 30 U/L for men), and presence of Type 2 diabetes mellitus (DM).

Results: A total of 12,122 patients completed SWE assessment with a confirmed NAFLD diagnosis in the CNP between March 2017 and June 2022. Baseline FIB-4 was available in 8,590 patients (70.9%). Among those patients with available FIB-4, 2,643 (33.8%) had FIB-4 ≥1.3, 402 (4.8%) had an inconclusive SWE, 1,042 (11.9%) SWE ≥7.0 kPa, and 762 (8.9%) SWE ≥8.0 kPa. The performance of different modalities among different cohorts is presented in Table 1. Patients with normal ALT levels had FIB-4 ≥1.3 (p = 0.61) and SWE ≥8.0 kPa (p = 0.09) similar to patients with elevated ALT. While SWE ≥7.0 and 8.0 kPa were significantly higher among patients with a BMI ≥35, these patients had lower advanced fibrosis confirmed by liver biopsy (n = 232 patients) compared to patients with BMI <35 (p < 0.001). Patients with DM had significantly higher rates of FIB-4 ≥1.3 and SWE ≥7.0 and 8.0 kPa, Table 1.

Table: Comparison of FIB-4 1.3 and SWE 7.0 and 8.0 kPa among different demographic and clinical characteristics.

<table>
<thead>
<tr>
<th>Modality cut-off</th>
<th>FIB-4 ≥1.3</th>
<th>SWE ≥7.0 kPa</th>
<th>SWE ≥8.0 kPa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Age yrs</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>BMI</td>
<td>Normal</td>
<td>Elevated</td>
<td>Normal</td>
</tr>
<tr>
<td>N=</td>
<td>2,385</td>
<td>2,415</td>
<td>1,858</td>
</tr>
<tr>
<td>N=</td>
<td>5,230</td>
<td>5,250</td>
<td>4,381</td>
</tr>
<tr>
<td>FIB-4 ≥1.3</td>
<td>1,289</td>
<td>1,309</td>
<td>1,058</td>
</tr>
<tr>
<td>(28.4%)</td>
<td>(28.5%)</td>
<td>(28.1%)</td>
<td>(28.2%)</td>
</tr>
<tr>
<td>SWE ≥7.0 kPa</td>
<td>540</td>
<td>579</td>
<td>785</td>
</tr>
<tr>
<td>(11.9%)</td>
<td>(13.7%)</td>
<td>(16.9%)</td>
<td>(18.0%)</td>
</tr>
<tr>
<td>SWE ≥8.0 kPa</td>
<td>404</td>
<td>468</td>
<td>554</td>
</tr>
<tr>
<td>(9.0%)</td>
<td>(11.4%)</td>
<td>(13.8%)</td>
<td>(15.0%)</td>
</tr>
</tbody>
</table>

Conclusion: In this primary care-based cohort to risk-stratify NAFLD patients for advanced fibrosis, patients with normal ALT had similar risk of elevated liver stiffness compared to those with elevated ALT. Priority of risk-stratification should be given to patients with DM.

SAT-396
Thrombospondin-2 as a new biomarker for at risk NASH and advanced fibrosis in a large multicentric European cohort
Vlad Ratziu1, Rambabu Surabattula2, Elisabetta Bugianesi3, Jörn Schattenberg2, Maharajah Ponnaiah4, Chiara Rosso5, Angelo Armandi6, Sudha Myenni7, Raluca Pais4, Leila Kara4, Detlef Schuppan2, 8Sorbonne Université, Paris, France; 7Mainz Universität, Germany; 6University of Turin, Italy; 4ICAN, France
Email: vlad.ratziu@inserm.fr

Background and aims: New biomarkers with strong biological rationale are needed for identifying patients with progressive or advanced NASH in clinical practice and for selection in therapeutic trials. Liver transcriptomic data from NAFLD patients identified thrombospondin-2 (TSP2), a matricellular glycoprotein that mediates cell-matrix interactions and collagen fibrillogenesis, as strongly induced in patients with NASH and those with advanced fibrosis. We tested the diagnostic performance of Tsp2, I7 (a matricellular and metabolic marker) and CD163 (a macrophage marker) in a large, multicentric European cohort.

Method: Retrospective study of patients with NAFLD, available liver biopsy and frozen serum collected within 3 months of the biopsy. TSP2 and I7 were measured by validated proprietary ELISAs, and CD163 was determined by commercial ELISA (RandD). Fib4 was calculated. Liver biopsies were graded and staged according to the NASH CRN histological classification. Histological outcomes were at-risk NASH (steatohepatitis with NAS ≥4 and fibrosis stage 2–4) and...
advanced fibrosis (stages 3–4). We developed combinatorial scores (with clinical variables and/or multi-biomarkers) for NAFLD and advanced fibrosis using multivariate logistic regression controlling for centers, age, BMI, and gender. Training and validation sets were defined using a machine learning algorithm which randomly split 80% and 20% of the total cohort, for 100 iterations, followed by averaging of the AUROC predictions. 

**Results:** 481 patients were included from Turin (219), Paris (173) and Mainz (99): mean age 51.4 years (s.d. 12.7), 61% males, Mean BMI 30.6 kg/m² (s.d. 5.6), 44% with type 2 diabetes, 53% with arterial hypertension, mean ALT 86 ng/ml [IQR 114], median CD163: 531 [IQR 278], FIB4 1.13 [IQR 0.87]. AUROCs for at-risk NASH were TSP2: 0.823; 17: 0.757; CD163: 0.733 and FIB4: 0.726. AUROCs for advanced fibrosis were TSP2: 0.817; 17: 0.678; CD163: 0.761 and FIB4: 0.726. Combining TSP2 with clinical and biological variables (AST, platelets, albumin, GGT) achieved an AUROC of 0.872 for at risk NASH (Se 0.77, Spe 0.85) and 0.822 for advanced fibrosis (Se 0.72, Spe 0.83) (combined with age and platelets). The addition of I7 and C163 to the TSP2-clinical biological score only marginally improved diagnostic performance: AUROCs 0.884 and 0.829 for at-risk NASH and advanced fibrosis, respectively. 

**Conclusion:** Serum levels of TSP2, a molecule with high biological rationale, have a strong discriminative performance for at-risk NASH and advanced fibrosis, especially when combined with simple clinical and biological variables. TSP2 should be prioritized as a strong biomarker candidate in patients with NAFLD.

SAT-397 Predicting severe liver outcomes in NAFLD using repeated measurements of biomarkers—a cohort study in 1,260 patients

**Background and aims:** Non-invasive biomarkers measured at a single timepoint have prognostic information for development of severe liver disease (SLD) in patients with non-alcoholic fatty liver disease (NAFLD), but these biomarkers may change over time and the predictive capacity of changes in biomarkers has yet to be determined. Herein, we aimed to assess if the change in biomarkers could predict SLD in patients with NAFLD better than the same biomarkers measured at a single timepoint.

**Method:** We used a retrospective cohort of 1,260 patients with non-cirrhotic NAFLD (among which 904 [71.7%] had biopsy-proven NAFLD) from three university hospitals in Sweden between 1974 and 2019. Medical charts were reviewed, and biomarkers were measured at baseline and at follow-up visits. Severe liver disease outcomes including cirrhosis, decompensated cirrhosis, hepatocellular carcinoma, liver failure, liver transplantation or MELD score over 15 were determined through medical charts or linkage to national registers until the end of 2020. We used multivariable Cox regression to determine baseline risk factors and biomarkers associated with SLD. We quantified the associations between the trajectory of biomarkers (including current value and slope) with risk of SLD using a joint modeling approach.

**Results:** The median age at NAFLD diagnosis was 52 years (IQR: 39–60) and 59% were male. During a median follow-up of 12.2 years, 111 (8.8%) patients developed SLD. Higher aspartate aminotransferase (AST), higher Fibrosis-4 score (FIB-4), and lower platelets at baseline were independently associated with a higher SLD risk after adjusting for metabolic factors and fibrosis stage. The average of log-transformed (log) FIB-4 increased steadily over time whereas the average of platelets count and log (AST) remained roughly constant. The multivariable joint modeling showed that higher current value of FIB-4 (HR 2.96, 95% CI 2.08–4.26), AST (HR 2.48, 95% CI 1.85–3.34) and lower platelets (HR 0.99, 95% CI 0.99–1.00) was associated with increased risk of SLD, whereas the rate of change in these biomarkers had no significant association to the risk of SLD (Table).

**Table:** The association between repeated values of the AST, platelets, FIB-4 and the event of SLD from joint modeling

<table>
<thead>
<tr>
<th>Current value of biomarker</th>
<th>HR*</th>
<th>95% confidence interval</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>log (AST), µkat/L</td>
<td>2.96</td>
<td>2.08–4.26</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Platelets, 10⁹/L</td>
<td>0.99</td>
<td>0.99–1.00</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>log (FIB4)</td>
<td>2.48</td>
<td>1.85–3.34</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Instantaneous slope of temporal pattern**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>log (AST)-slope</td>
<td>0.37</td>
<td>0.11–1.58</td>
<td>0.188</td>
</tr>
<tr>
<td>log (AST)-value, µkat/L</td>
<td>3.43</td>
<td>2.38–5.06</td>
<td>0.001</td>
</tr>
<tr>
<td>Platelets-slope</td>
<td>1.00</td>
<td>0.98–1.02</td>
<td>0.618</td>
</tr>
<tr>
<td>Platelets-value, 10⁹/L</td>
<td>0.99</td>
<td>0.99–1.00</td>
<td>0.002</td>
</tr>
<tr>
<td>log (FIB4)-slope</td>
<td>1.40</td>
<td>0.38–5.39</td>
<td>0.591</td>
</tr>
<tr>
<td>log (FIB4)-value</td>
<td>2.60</td>
<td>1.84–3.84</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

*The basic joint model, which combines a linear mixed submodel of biomarkers and a survival submodel of time to SLD.

#HR includes the baseline covariates: age, sex, type 2 diabetes, hyperlipidemia, body mass index, fibrosis stage.

**Conclusion:** In addition to the baseline measurement of the non-invasive biomarkers such as FIB-4, AST, and platelets taken at NAFLD diagnosis, monitoring their value over time is important as the current value of them is closely associated with the risk of future SLD. The rate of change may not affect the prognosis to severe liver disease.

SAT-398 Improvements in liver fibroinflammation (as assessed by corrected T1 [cT1] with HTD1801 (berberine ursodeoxycholate) treatment in patients with non-alcoholic steatohepatitis and type 2 diabetes mellitus

**Background and aims:** HTD1801 is a new molecular entity consisting of an ionic salt of berberine and ursodeoxycholic acid with a unique microstructure which has been shown to significantly reduce liver fat content (LFC) as determined by MRI-PDFF in an 18-Week, placebo-controlled Phase 2 study in patients with non-alcoholic steatohepatitis (NASH) and Type 2 Diabetes (T2DM) (NCT03656744). cT1 is an MRI-based quantitative metric for assessing liver inflammation and fibrosis. Previous studies have reported that cT1 improvements are a strong biomarker candidate in patients with NAFLD.

**Methods:** SAT-398 was a 12-week, placebo-controlled, double-blind, randomized, multicenter trial designed to determine the safety and efficacy of HTD1801 (berberine ursodeoxycholate, so-called) treatment in patients with non-alcoholic steatohepatitis (NASH) and type 2 diabetes mellitus (T2DM). The trial enrolled 481 patients (NCT03656744) and was conducted across 30 centers in the United States, with a primary objective to assess the change in liver fibroinflammation (as assessed by corrected T1 [cT1]) with HTD1801 (berberine ursodeoxycholate) treatment in patients with non-alcoholic steatohepatitis and type 2 diabetes mellitus (T2DM) (NCT03656744). cT1 is an MRI-based quantitative metric for assessing liver inflammation and fibrosis. Previous studies have reported that cT1 improvements are a strong biomarker candidate in patients with NAFLD.

**Results:** The primary endpoint of the study was the change in liver fibroinflammation (as assessed by corrected T1 [cT1]) with HTD1801 (berberine ursodeoxycholate) treatment in patients with non-alcoholic steatohepatitis and type 2 diabetes mellitus (T2DM) (NCT03656744). cT1 is an MRI-based quantitative metric for assessing liver inflammation and fibrosis. Previous studies have reported that cT1 improvements are a strong biomarker candidate in patients with NAFLD.
was to evaluate the effects of HTD1801 on cT1 in patients with NASH and T2DM.

**Method:** One hundred patients were randomized and treated with HTD1801 1000 mg BID (n = 34), HTD1801 500 mg BID (n = 33), or placebo (n = 33) for 18 weeks. MRI data was collected prospectively for evaluation of the primary end point (proton density fat fraction), and cT1 was evaluated after the completion of the study for subjects who had been randomized to HTD1801 1000 mg BID or placebo. p values (nominal) were obtained from an ANCOVA model with baseline ALT and baseline cT1 as covariates. Values are Mean (SD) unless otherwise specified.

**Results:** On average at baseline, patients were 56 (11) years, 72% female, 91% White, 38% Hispanic or Latino, with an HbA1c of 71% (1.0). At baseline, subjects had significantly elevated LFC by MRI-PDFF [19.3% (6.5)] and fibroinflammation by cT1 [542.1 [91.5] ms and 937.5 [97.7] ms for HTD1801 1000 mg BID and placebo, respectively. As shown in Figure 1, after 18 weeks of treatment there was a significant reduction in cT1 with HTD1801 compared to placebo (-60.9 [75.9] ms vs. -14.7 [68.9] ms, p < 0.05). Similarly, a significant reduction was observed in ALT, a marker of liver function, in the HTD1801 1000 mg BID group compared to placebo (-19 [27.2] U/L vs. -3 [19.2] U/L, p < 0.01). At Week 18, a larger proportion of subjects receiving HTD1801 compared to placebo (39% vs 16%, respectively) experienced at least an 80 ms reduction in cT1, which has been correlated with a 2-point reduction in the NAS.

**Conclusion:** These data provide further evidence that HTD1801 may improve measures of disease activity in patients with NASH and T2DM and warrant further investigation. A Phase 2b study is currently ongoing to evaluate the histologic effects of HTD1801 in T2DM and warrant further investigation. A Phase 2b study is currently ongoing to evaluate the histologic effects of HTD1801 in patients with NASH and confirm the findings of this evaluation (NCT05623189).

**SAT-399**

**Prevalence of NAFLD and advanced fibrosis in Stockholm, Sweden**

Emilie Toresson Grip1, Helena Skröder1, Ying Shang2, Öskar Störm1, Hannes Hagström1, 1. Quantify Research AB, Stockholm, Sweden; 2. Karolinska Institutet, Department of Medicine, Huddinge, Stockholm, Sweden; 3. Karolinska University Hospital, Clinical Epidemiology Division, Department of Medicine Solna, Stockholm, Sweden.

Email: emilie.toresson-grip@quantifyresearch.com

**Background and aims:** Estimates of prevalence of NAFLD in Sweden are lacking, despite globally unique register data. Use of invasive or costly diagnostics such as histology or imaging are scarce in primary care, leading to underdiagnosis of NAFLD, and subsequently under-reporting of NAFLD in registers. Therefore, non-invasive measures of NAFLD, such as the commonly used Hepatic Steatosis Index (HSI), can be used to estimate the prevalence of probable NAFLD in broad populations. Here, we used data from the HERALD (Health outcomes and risk assessment in chronic liver disease) cohort to estimate prevalence of NAFLD in primary or secondary care settings in Stockholm, using data from national health registries and regional electronic health records.

**Method:** All patients with any liver-related tests taken in Stockholm during 2015–2020 were included (n = 715,161). The HSI was calculated using the latest available information on AST, ALT and BMI during 2015–2020, in either primary or secondary care. A cut-off of ≥ 36 was used to define patients with probable NAFLD. Patients with alcohol-related diseases or other liver diseases than NAFLD since 2001 were excluded. The FIB-4 score was calculated using a cut-off of ≥ 1.3 (age <65) and ≥ 2.0 (age ≥ 65) to define intermediate or high-risk (≥ 2.67) of advanced fibrosis among all patients with NAFLD.

**Results:** In total 341,305 patients with assessable HSI were included, of which 45% (n = 151,939) had probable NAFLD. Among the patients with probable NAFLD, 25% had T2DM, median age was 57 years, and 56% were females. In addition, 23% of patients with probable NAFLD had an intermediate (15%) or high risk (8%) of advanced fibrosis, but only 1.7% had a NAFLD/NASH diagnosis code (ICD-10 K76.0/K75.8) recorded in primary or secondary care, despite allowing for a 19-year look back period for such diagnoses. Of patients with a recorded NAFLD diagnosis, 88% had high HSI, and 32% had intermediate or high risk of advanced fibrosis. Among the patients without a recorded NAFLD diagnosis, the corresponding fractions were 44% for high HSI and 31% for intermediate or high risk for advanced fibrosis.

**Conclusion:** This study provides an up-to-date estimate of NAFLD prevalence in a unique, unscreened heterogeneous population of individuals in Stockholm. The results support previous indications that there are many undiagnosed patients with NAFLD. Advanced fibrosis may be equally common in patients with and without a recorded diagnosis of NAFLD, highlighting needs for further improvement of identification of at-risk patients.

**SAT-400**

**Accuracy of 100 Hz transient elastography-based spleen stiffness for the identification of advanced fibrosis in biopsy-proven non-alcoholic fatty liver disease**

Angelo Armandi1,2, Antonio Liguori3,4, Talal Merizian2, Merle Marie Werner2, Maurice Michel2, Christian Labenz2, Carmen Lara Romero6, María Del Barrio Azaceta5,6, Belen Pino5, Beate Straub7, Manuel Romero Gomez2,4, Luca Miele1,4, Jörn Schattenberg5, 1. Division of Gastroenterology and Hepatology, Department of Medical Sciences, University of Turin, Turin, Italy; 2. Metabolic Liver Disease Research Program, I. Department of Medicine, Fondazione Policlinico Gemelli IRCCS, Rome, Italy; 3. Department of Medicina e Chirurgia Traslazionale, Università Cattolica del Sacro Cuore, Rome, Italy; 4. Digestive Units Unit, Hospital Universitario Virgen del Rocio, Seville, Spain; 5. Centro de Investigación Biomédica en Red de Enfermedades Hepáticas y Digestivas (CIBEREHD), Madrid, Spain.

**Background and aims:** The non-invasive identification of advanced fibrosis in Non-Alcoholic Fatty Liver Disease (NAFLD) represents an unmet need. In NAFLD, the liver-spleen axis may be affected by the chronic, low-grade splanchnic inflammation, leading to spleen tissue congestion even in the absence of portal hypertension. We aimed to explore the accuracy of spleen stiffness measurement (SSM) as a non-invasive tool to detect advanced fibrosis in individuals with biopsy-proven NAFLD.

**Method:** Retrospective cohort study of 167 patients with biopsy-proven NAFLD analyzed from 3 centers (Mainz, Rome, Seville). Liver stiffness measurement (LSM) and SSM were collected within 6 months from the index liver biopsy, using the Fibroscan 630 Expert. For SSM, the 100 Hz spleen-specific probe was employed. Patients
with a history or presence of decomposition were excluded. Advanced fibrosis was defined by histological stages F3 and F4.

**Results:** Median age was 58 [50–64] years and 50.3% were male. Obesity and type 2 diabetes (T2D) were present in 63.5% and 59% of cases. A total of 83 (49.7%) cases had advanced fibrosis on liver histology. Median LSM was 10.2 [7.0–17.7] kPa and median Fibrosis-4 (FIB-4) score was 1.6 [1.08–2.79]. Median SSM was 30.5 [20.0–45.1] kPa, showing a stepwise increase across fibrosis stages, with higher values in advanced fibrosis, when compared to F0–F2 stages (median 38.4 [32.0–59.3] kPa versus 21.8 [16.4–30.6] kPa, p < 0.000001). Overall, SSM correlated with longitudinal spleen size (r = 0.63, p < 0.001) and inversely with platelet count (r = 0.44, p < 0.001), and was associated with advanced fibrosis after adjusting for age, sex, Body Mass Index, T2D and transaminases (OR 1.13 [95% CI 1.04–1.21], p < 0.001). In the whole cohort, SSM had AUC of 0.85 for advanced fibrosis (Se 93.6%, Sp 61.9%, PPV 59.2%, NPV 91.2%), which was similar to that of LSM (AUC 0.87, DeLong p for SSM 0.475), and FIB-4 (AUC 0.80, DeLong p for SSM 0.228). In the Mainz cohort (derivation cohort), a model combining LSM and SSM reached the best accuracy for advanced fibrosis (AUC 0.94, when compared to the other models (Table 1). In the combined Rome and Seville cases (validation cohort), the same model reached an AUC of 0.87. In the derivation cohort, the cut-off of 24.6 kPa was identified by the lowest negative likelihood ratio for ruling out advanced fibrosis (Se 92.8%, Sp 58.9%, PPV 79.4%, NPV 90.9%). In the validation cohort, the consecutive use of SSM could identify F3–F4 patients that would have been ruled out by other non-invasive tests (n = 12 FIB-4 <1.3; n = 5 LSM <8 kPa).

**Conclusion:** SSM displays a progressive increase across fibrosis stages and is associated with advanced fibrosis. In this cohort with high prevalence of advanced fibrosis, the accuracy of SSM is comparable to LSM and FIB-4. The combined use of LSM and SSM in the NAFLD diagnostic algorithm may improve liver disease staging and risk stratification.

Boehringer-Ingelheim sponsored the study.

**SAT-401**

**Performance of non-invasive tests as exclusion criteria for cirrhosis in trials targeting at-risk non-alcoholic steatohepatitis:** combined data from multiple trials including more than 5,000 patients (in collaboration with NAIL-NIT consortium)

Naim Alkhouri1, Julie Dubourg2, Stephen Harrison3, Mazen Noureddin4, Michael Charlton5, Vlad Ratziu6, Sophie Jeannin Megnien2, Jörn Schattenberg7, 1Arizona Liver Health, Chandler, United States; 2Summit Clinical Research, San Antonio, United States; 3University of Oxford, United Kingdom; 4Houston Methodist Hospital, Houston, United States; 5Chicago Medicine, Chicago, United States; 6Institute for Cardiometabolism and Nutrition, France; 7University medicine at the Johannes Gutenberg University in Mainz, Mainz, Germany

Email: jdupourg@summitclinicalresearch.com

**Background and aims:** Non-alcoholic steatohepatitis (NASH)cirrhosis is a distinct group of patients which is usually excluded from NASH with F2–F3 clinical trials for reasons related to safety and efficacy assessments. We aimed to assess non-invasive tests (NITs) including Fibrosis–4 score (FIB-4), vibration-controlled transient elastography (VCTE) and FibroScan-based score Agile 4 to distinguish this group of patients.

**Method:** We combined screening data from 6 ongoing non-cirrhotic NASH clinical trials (>5,000 patients). Liver histology data were assessed centrally, and cirrhosis was defined as a fibrosis stage of 4 with or without NASH. Diabetes status required by the Agile 4 formula was defined using glycated hemoglobin (HbA1c). Area under the receiver operating characteristic (AUROC) analysis was used to determine the diagnostic accuracy of each test to rule-in cirrhosis. Considering the low prevalence of cirrhosis in NASH with fibrosis stage (F) 2 or 3 trials, we presented the positive likelihood ratio (LR+) as it is independent of the prevalence of cirrhosis, rather than the positive predictive value. We calculated the pre- and post-test probability of cirrhosis to express the clinical utility of each score.

**Results:** In 1,104 patients included in this analysis, 12 (1%) had a FIB-4 ≥ 3.48, 13 having no cirrhosis. The LR+ of the published FIB-4 rule-in cut-off (≥3.48) was 9.25. This reflects a post-test probability of cirrhosis of 30% compared to a pretest probability of 4%. Among the 1,104 patients included in this analysis, 39 (3.5%) had Agile 4 ≥ 0.57 with 28 of those having no cirrhosis. The LR+ of the published Agile 4 rule-in cut-off (≥0.57) was 9.25. This reflects a post-test probability of cirrhosis of 30% compared to a pretest probability of 4%. Among the 1,104 patients included in this analysis, 12 (1%) had a FIB-4 ≥ 3.48, with only 1 of those having cirrhosis and 13 having no cirrhosis. The LR+ of the published VCTE rule-in cut-off (≥20) was 4.36. This reflects a post-test probability of cirrhosis of 16% compared to a pretest.
probability of 4%. Among the 1,104 patients included in this analysis, 117 (11%) had a VCTE \( \geq 20 \), with 98 of those having no cirrhosis but mainly F2 and F3.

Figure:

**Conclusion:** In comparison to FIB-4 and VCTE, Agile 4 is the best test to be used as exclusion criteria for cirrhosis in NAFLD F2-F3 clinical trials.

**SAT-402**

**FIB-4 predicts the risk of hepatocellular carcinoma in patients with type 2 diabetes: a longitudinal multicentre study**

Vincent Mallet\(^1,2\), Mathis Collier\(^3\), Nathanael Beeker\(^3\), Lucia Parlati\(^1,2,4\), Stanislas Poil\(^1,2,3\), Emmanuel Tsochatzis\(^5\), \(^1\)AP-HP Centre, Groupe Hospitalier Cochin Port Royal, DMU Cancérologie et spécialités médico-chirurgicales, Service d’Hépatologie, Paris, France; \(^2\)Université Paris Cité, F-75006, Paris, France; \(^3\)AP-HP Centre, Groupe Hospitalier Cochin Port Royal, DMU PRIME, Unité de Recherche Clinique, Paris, France; \(^4\)Institut Cochin, Université Paris Cité, CNRS, INSERM, F-75014 Paris, France; \(^5\)UCL Institute for Liver and Digestive Health, Royal Free Hospital and UCL, London, United Kingdom

**Background and aims:** Patients with type-2 diabetes (T2D) are at risk for NAFLD and hepatocellular cancer (HCC). FIB-4 is recommended to delineate liver fibrosis in patients with NAFLD. We evaluated the performances of FIB-4 and the FIB-4 variation to predict HCC risk in patients with T2D.

**Method:** The data source was the Assistance Publique—Hôpitaux de Paris (AP-HP) Clinical Data Warehouse, that contains all clinical and biological data for acute inpatient/day case hospital admissions; post-acute care; and outpatient visits to 36 Greater Paris university hospitals. We selected, among all patients discharged from the AP-HP between August 1, 2017 and March 9, 2022, those with T2D mellitus (ICD-10: E11; n = 144,378). We excluded patients with an extra-hepatic cause of thrombopenia; those without synchronous serum hepatic cause of thrombopenia; those without synchronous serum transaminase and/or platelet measurement; and those without any FIB-4 measurement >3 months before censoring. We assessed the ability of a random FIB-4 and of FIB-4 variations to predict hepatocellular cancer (HCC) risk using the c-Index metric. The primary outcome was development of HCC and secondary outcome was liver disease progression to decompensated cirrhosis or HCC. Models were trained with two-third of the dataset and validated in the other third.

**Results:** 69,225 patients were included, mean age 66.7 years, 57.1% males. The average (standard deviation) number of FIB-4 measurements per patient was 9.3 (14.4), with a total of 643,755 FIB-4 measurements. 408 (0.6%) patients were diagnosed with HCC over 378,734 person-years, corresponding to a median follow-up of 2 years per patients. FIB-4 was associated with HCC risk in Cox univariate [HR 1.668 (1.602–1.738)] and multivariate [aHR 1.52 (1.453–1.59)] analyses in the training set, and yielded concordant predictions in the validation set [c-index 0.804 (0.761–0.847) and 0.83 (0.789–0.871), respectively]. Adding absolute or relative FIB-4 variations, or FIB-4 slope over \( \geq 3 \) previous FIB-4 measures, to a single, random FIB-4 measure, did not increase the prognostic value. Results were similar in nonparametric machine learning random forest survival models. The areas under the ROC curve (95% CI) of a single, random, FIB-4 measurement to predict 12- and 24-months HCC risk were 0.823 (0.797–0.849) and 0.829 (0.806–0.851). The FIB4 cut-offs for 90% sensitivities were 1.21 and 1.245, respectively. The cut-offs for 90% specificities were 3.075 and 3.834, respectively. Similar results were obtained for the risk of liver disease progression.

Figure: Performance of a single, random, measure of FIB-4 to predict 2-year HCC risk, by strata.

FIB-4 Threshold | Sensitivity | Specificity
--- | --- | ---
1.045 | 95.2% | 32.6%
1.245 | 90.3% | 44.2%
3.118 | 54.3% | 90%
4.291 | 40.2% | 95%
AUC | 0.81 [0.782–0.837] | ---

Strata = men

1.094 | 95.7% | 44%
1.21 | 91% | 50.9%
2.742 | 63.9% | 90%
3.761 | 51% | 95%
AUC | 0.862 [0.82–0.894] | ---

Strata = women

1.596 | 95.6% | 46.1%
2.11 | 90.2% | 61%
5.798 | 40% | 90%
Inf | 0% | 100%
AUC | 0.822 [0.782–0.862] | ---

Strata = alcohol use disorders

1.045 | 95.1% | 36.9%
1.183 | 90.2% | 45.4%
2.832 | 51% | 90%
3.834 | 37.9% | 95%
AUC | 0.798 [0.77–0.826] | ---

Strata = liver risk factors

**Conclusion:** FIB-4 predicts the risk of HCC in patients with T2D. These data support its use as a liver health check measure in these patients' group.

**SAT-403**

**FIB-4 as a screening tool for significant liver fibrosis in a cohort of overweight subjects involved in a weight loss program conducted in a primary care setting**

Charlotte Costentin\(^1\), Odile Fabre\(^2\), Remy Legrand\(^2\), Sébastien Bailly\(^1\).

\(^1\)Centre Hospitalier Universitaire de Grenoble, La Tronche, France; \(^2\)Franchise Groupe Éthique et Santé-Siege social, Aubagne, France

**Background and aims:** International societies have issued guidelines supporting systematic screening for liver fibrosis in the primary care setting whenever a risk factor for chronic liver disease is identified. FIB-4 has been selected as the first line tool of choice to stratify patients according to the risk of advanced fibrosis and need for additional liver assessment (FIB-4 >1.3). The objective of this study was to assess prevalence and characteristics of patients at risk for advanced fibrosis in a cohort of obese and overweight subjects involved in a weight loss program conducted in a primary care setting.

**Method:** It is a multicenter prospective cohort study including obese and overweight subjects participating in a weight loss program after referral by their physician and conducted in 110 centers distributed across France. Patient characteristics, anthropometrics and biological data support its use as a liver health check measure in these patients' group.
data were collected in each center by using a single electronic medical record.

**Results:** From 63 744 adult participants in the RNPC® program, 27 643 had baseline FIB4 data and were included in the subsequent analysis: predominantly women (78.3%), median age of 54 years [IQR 44; 63], median initial body mass index (BMI) was of 32.6 [IQR 29.2; 36.4] kg/m² (70% with BMI ≥30), median initial waist circumference (WC) 107 cm [IQR 97; 117]). Fatty Liver Index (FLI) was available in 12 454 participants, in which steatosis defined by Fatty Liver Index FLI>60 was present in 8 452 subjects (66%). FIB4 at baseline was <1.3 in 22 353 participants (80.9%), and >2.67 in 264 (1%). When moving from the lower risk category (FIB4<1.3) to the intermediate (1.3–2.67) and the higher risk (FIB4>2.67), the population was enriched in male gender (from 19.1 to 32% and 47.3% respectively), waist circumference increased (from 106 to 110 and 116 cm) as well as rates of metabolic comorbidities such as of sleep apnea (from 14.9 to 26.6% and 37.7%), diabetes (from 36.8 to 39.7 and 40.2%), arterial hypertension from 40 to 58.2% and 66.7%) (p <0.01). When available, rates of FLI>60 increased from 65.5 to 69.9% and 77.5%. Diagnosed non-alcoholic fatty liver disease was more prevalent in the higher risk category compared to the lowest (22.3% vs 5.3%; p <0.01). After 5 [3–7] months into the program, all anthropometric parameters improved: median WC decreased from 108.6 to 95.6 cm, fat mass decreased from 40.9% to 37%, muscle mass increased from 29.7 to 30.7% (p <0.01). A follow-up FIB-4 value was available in 5 735 participants. Among participants from the low-risk category at baseline, 28 (43%) changed classes, 3 (4.6%) moving to the higher-risk category. Among participants from the high-risk category at baseline, 23% changed classes, 3 (4.6%) moving to the lower-risk category (Figure 1). In the population with FIB-4 ≥1.3 eligible for additional liver assessment, results of specialized second line fibrosis testing were not recorded.

**Conclusion:** In a cohort of overweight and obese patients from the primary care setting, prevalence of patients at risk for advanced fibrosis according to initial FIB-4 >1.3 was 19.1%. Higher-risk participants (FIB-4 >2.67, 1%) displayed higher rates of metabolic comorbidities. General practitioners and nutrition professionals are important assets to implement the two-steps algorithm to screen for advanced fibrosis in patients at risk. Efforts should be made to improve the care pathway to the second line non-invasive fibrosis tests.

**SAT-404**

**Soluble TREM2 and PRO-C3 as efficacy of intervention markers in NASH**

Charlotte Wernberg1,2, Vineesh Indira Chandran2, Mette Lauridsen2, Maria Kjølgaard Skrythe2, Camilla Dalby Hansen1, Johanne Kragh Hansen1, Lea Ladegaard Grønkjær2, Birgitte Jacobsen2, Tina Di Caterino3, Sönke Detlefsen4, Maja Thiele1, Alejandro Mayora Guilliani1, Diana Leeming5, Morten Karsdal4, Ida Villesen1, Jonas Graversen1, Aleksander Krag1,3Fibrosis, Fatty liver and Steatohepatitis Research Center Odense (FLASH), Denmark; 2Institute for Regional Health Research, University of Southern Denmark, Denmark; 3Clinical Institute, University of Southern Denmark, Department of Molecular Medicine, University of Southern Denmark, Odense, Denmark; 4Nordic Bioscience Biomarkers and Research A/S, Denmark

Email: charlotte.wilhelmina.wernberg@rsyd.dk

**Background and aims:** Patients with obesity and type 2 diabetes have a high risk of developing non-alcoholic steatohepatitis. Diet and weight loss are currently the mainstay of treatment in most patients with non-alcoholic fatty liver disease (NAFLD) and some drugs are approved for the use in NAFLD, but multiple drugs are at advanced stages of clinical testing. There is consequently an unmet medical need for non-invasive tests that can help clinicians assess treatment response. Our aim was to explore the ability of NITs to reflect a change of at least one stage in histologic NAFLD Activity Score (NAS).

**Method:** A longitudinal study of 173 patients with type 2 diabetes or severe obesity, suspected of NAFLD, and ≥6 months follow-up including dual liver biopsies and blood samples. We measured soluble TREM2, collagen formation markers (III, IV, VI, VIII, XVIII) using ELISA assays PRO-C3, PRO-C4, PRO-C6, PRO-C8, and PRO-C18L (Nordic Bioscience), FAST-score using Fibroscan (Echosens), and calculated HOMA-IR. We calculated Fibrosis-4 (FIB-4) and NAFLD Fibrosis Score (NFS). Patients were stratified into three outcome groups according to NAS change between baseline and end of study: worsened ≥1 NAS stage, no change in NAS, and improved ≥1 NAS stage.

**Results:** The mean age was 52 years (± 12), 38% were males, 70% had low fibrosis (F0-F1), and 15% had NASH (n = 39) at baseline. Outcome groups were balanced regarding age, BMI, triglycerides, and fibrosis grades; but participants that improved had the highest HOMA-IR of 7.7 (p = 0.002) and a higher prevalence of NASH (p < 0.001). Several NITs were significantly reduced in patients who improved NAS at follow-up, and there was an overall dose-response between outcome groups (worsened (n = 22), no change (n = 50), improved (n = 101)).
sTREM2 \( p < 0.001 \), PRO-C3 \( p < 0.01 \), HOMA-IR \( p < 0.001 \), and FAST-score \( p < 0.001 \). On the other hand, levels of PRO-C3BL were downregulated in patients that worsened in NAS \( p < 0.01 \). Seventy percent of patients that improved had a change in inflammation and/or ballooning. In multivariable analysis, sTREM2 combined with PRO-C3 predicted NAS improvement well \( \text{(AUROC 0.75) with an OR for every unit decrease respectively of 1.05 (95\% CI 1.02–1.09) and 1.13 (95\% CI 1.05–1.21)} \) \( p < 0.01 \). HOMA-IR also performed well \( \text{(AUROC 0.76), but even better in combination with sTREM2 (AUROC 0.79). FIB-4 and NFS did not (AUROC <0.60, OR <1.05 p > 0.5). The Fibroscan yielded non-valid measurements in 16\%, at either one or both visits, making it less ideal for monitoring.}

**Figure:** Figure legend. Logistic regression analysis to assess the probability of NAS improvement \( \geq 1 \) stage \( =1 \), as opposed to no improvement \( \text{(no-change and worsened} = 0) \). We include each NITs’ units change from baseline in models as a difference. A. Dot plot shows area under the receiver operation characteristic curve \( \text{(AUROC)} \) diagnostic accuracy and Akaike information Criterion \( \text{(AIC)} \) estimator of prediction error and, thereby, the relative quality of statistical models for a given set of data for all models \( \text{(green vertical lines mark the best models).} \)

**Conclusion:** sTREM2 and PRO-C3 in combination reflect NAS improvement and should be further explored as surrogate markers for efficacy of interventions. Divergently, FIB-4 and NFS showed low accuracy for monitoring histological response in this cohort.

**SAT-405**

**Dynamic changes in liver stiffness assessed by transient elastography as a prognostic factor in NAFLD patients with prediabetes and type 2 diabetes**

Elías Maledí 1, Claudia Regina Cardoso 1, Gil Salles 1,
Ana Carolina Cardoso 1, Lorrane Santos 1, Henrique Sérgio Coelho 1,
Cristiane Villela-Nogueira 1, Nathalie Leite 1, Federal University of Rio de Janeiro, Brazil

Email: nathaliecleite@gmail.com

**Background and aims:** Baseline liver stiffness measure \( \text{(LSM)} \) associates with a higher risk of liver events \( \text{(Les)} \) and mortality in NAFLD patients. We aimed to assess the prognostic value of dynamic changes of \( \text{LSM} \) for predicting survival and the occurrence of liver \( \text{(Les)} \) and cardiovascular events \( \text{(CVEs)} \) in prediabetes \( \text{(PreDM)} \) type 2 diabetes \( \text{(T2DM)} \) NAFLD patients.

**Method:** NAFLD adults with PreDM or T2DM with two consecutive reliable LMS by TE were included. Clinical, biochemical and elastography data \( \text{(Fibroscan Touch 502, Fr)} \) were collected at baseline. Follow-up LSM was recorded accordingly. Dynamic changes in \( \text{LSM} \) \( \geq \text{25\% from baseline} \) and impairment \( \text{(LSM increase of} \geq \text{25\% from baseline). During follow-up, Les (ascites, encephalopathy, variceal bleeding, HCC) and CVEs (myocardial infarction, new-onset heart failure, any myocardial revascularization, stroke, any aortic or lower limb revascularization, any amputation above the ankle) were recorded. The follow-up period was from the baseline LSM to the last clinical visit or the outcome. Multivariate cox analysis evaluated the associations between \( \Delta \text{LSM} \) \( \text{(as continuous and categorized variables)} \) and the occurrence of \( \text{Les, CVEs events or mortality.} \)

**Results:** 301 patients were included \( \text{(68\% female, age 59 \pm 10 y): 19\% had PreDM and 81\% T2DM.} \)

At the first TE examination, 12\% had LSM \( >15kPa \) \( \text{[median 6.9 kPa (5.1–10.1)]}\). Overall, 26\% experienced \( \Delta \text{LSM improvement [median 32.7 (22.3–42.2)]} \), and 25\% had \( \Delta \text{LSM impairment [median 29.6 (14.6–56.2)]} \) on a 38 (27–55) months interval. During an observation period of 76 (65–86) months \( \text{(1878 person-years)}, there were 31 deaths, 24 CVEs and 20 Les. Cumulative incidences by Kaplan Meier showed a higher incidence of CVEs in those with \( \Delta \text{LSM impairment.} \)

**Conclusion:** Dynamic changes in \( \text{LSM} \), more specifically an increase of \( \geq 25\% \) from baseline \( \text{LSM} \), can predict adverse CVEs in NAFLD individuals with either prediabetes or type 2 diabetes. In contrast, only baseline \( \text{LSM} \) is associated with a higher risk of Les or death. \( \text{LSM} \) impairment does not seem to be an additional risk of liver events or overall mortality in this population.

**SAT-406**

**Fibrosis-4 score and liver stiffness measurement by vibration-controlled transient elastography predict risk of liver-related events in non-alcoholic fatty liver disease**

Esteban Urias 1, Tianyu Qui 2, Michael Song 3, Tanvi Goyal 3, Jing Hong Loo 4, Yu Jun Wong 4, Vincent Chen 4, Michigan Medicine, Department of Internal Medicine, Ann Arbor, United States; 2Changi General Hospital, Department of Gastroenterology and Hepatology, Singapore; 3Michigan Medicine, Department of Gastroenterology and Hepatology, United States; 4Yong Loo Lin School of Medicine, National University of Singapore, Singapore

Email: uuesteban@med.umich.edu

**Background and aims:** Both the Fibrosis-4 \( \text{(FIB-4)} \) score and liver stiffness measurement \( \text{(LSM)} \) by vibration-controlled transient elastography \( \text{(VCTE)} \) are non-invasive tests used to classify risk of adverse events in patients with non-alcoholic fatty liver disease \( \text{(NAFLD)} \). Current practice guidelines recommend a sequential approach to risk stratification in NAFLD with FIB-4 followed by VCTE. However, whether LSM more accurately predicts risk of liver-related events \( \text{(LREs)} \) than FIB-4 or outweighs FIB-4 is not known. We sought to determine combined effects of FIB-4 and LSM to predict LREs in NAFLD.

**Method:** This was a retrospective study of consecutive patients with NAFLD undergoing VCTE and serum testing within 12 months of VCTE at the University of Michigan Health System (USA) and Changi General Hospital (Singapore) from 2015 to 2022. NAFLD was defined by hepatic steatosis without alternative chronic liver diseases or excess alcohol intake. The index date was the date of VCTE. The primary outcome was LREs defined as decompensation or hepatocellular carcinoma. The primary predictors were FIB-4 score, stratified...
by low (<1.3), intermediate (1.3–2.67), and high (>2.67); and LSM, stratified by low (<8 kPa), intermediate (8–12 kPa), high (>12 kPa).

Results: We included 1,572 patients meeting inclusion criteria. Median age was 53 years, 54% were male, 57% were White, and 32% were Asian. FIB-4 scores were low, intermediate, and high in 59%, 32%, and 9% of patients, and LSM was low, intermediate, and high in 62%, 19%, and 18%, respectively. Median follow-up was 38 months with 4,969 person-years of follow-up in total. There were no LREs in patients with FIB-4 <1.3 regardless of LSM and no LREs in patients with FIB-4 <2.67 and LSM <8 kPa in 3,321 person-years of follow-up (Figure). Within each FIB-4 category, higher LSM was associated with higher incidence rate of LREs, and similarly within each LSM category, higher FIB-4 was associated with increased risk of LREs. For example, for FIB-4 1.3–2.67, the incidence rate was 5.2 and 13.2 per 1,000 person-years for LSM 8–12 kPa and >12 kPa, respectively. For FIB-4 >2.67, the incidence rate was 18.7 and 62.4 events per 1,000 person-years for LSM <12 and >12 kPa, respectively.

Conclusion: FIB-4 and LSM in combination more accurately predict risk of LREs in NAFLD than either alone. However, no LREs occurred in patients with FIB-4 <1.3 regardless of LSM, supporting existing guidelines to not obtain VCTE in this patient population.

SAT-407
A stepwise screening approach using non-invasive tests to identify phenotypic non-alcoholic steatohepatitis (NASH) patients with fibrosis for clinical trials
Naim Alkhouri1, Rohit Loomba2, Mazen Noureddin3, Eric Lawitz 4, Kris Kowdley5, Hiba Graham6, Erin Quirk7, Diana Chung8, Arizona Liver Health, Tucson, United States; 2University of California San Diego, NAFLD Research Center, La Jolla, United States; 3Houston Research Vol. 78(S1) | S101
Method: Screening and baseline characteristics from the phase 2a LIFT and phase 1b AVIATION studies were combined. In screening step 1, both trials required age ≥18, BMI ≥25 kg/m², ALT above the median central laboratory normal range, vibration controlled transient elastography (VCTE) of 7.5 (LIFT) and 6.5 (AVIATION) to 21 kPa, and controlled attenuation parameter (CAP) of 280 (AVIATION) and 300 (LIFT) dB/m within 3 months of screening. Neither trial required liver biopsy. Potential subjects remaining eligible after the step 1 screening underwent MRI to assess liver fat content eligibility ≥10% by proton density fat fraction (PDFF) for LIFT or corrected T1 (cT1) >800 msec for AVIATION. Common SF reasons were tabulated, and multiparametric MRI SF rates were calculated.

Results: 567 (446 in LIFT; 121 in AVIATION) patients were screened and 153 (101 in LIFT; 52 in AVIATION) were randomized; overall SF rate was 73%. Recruitment durations were 6 and 3 months for LIFT and AVIATION, respectively. Of the 567 patients, 181 (32%) met step 1 eligibility criteria, with a SF rate of 68%. The most common reason for SF was not meeting the ALT enrollment eligibility threshold value. Of the 181 patients, 155 (86%) met either MRI-PDFF in LIFT or cT1 criteria in AVIATION, resulting in a step 2 MRI SF rate of 14% (26/183; 2 patients not treated for other reasons post step 2). Per baseline characteristics, each study enrolled a population with VCTE ranging from 4.4 to 19.6 kPa, CAP 261 to 400 dB/m, PDFF 6.0 to 48.2% and cT1 721.0 to 1461.0 msec.

Conclusion: A stepwise screening approach first using clinical assessments, laboratory tests and VCTE with CAP allowed for screening of patients that were more likely to meet the MRI eligibility criteria. As a result, this reduced the number of MRI assessments that were required which reduced costs and the need for patients to be scheduled for a separate imaging visit. These NIT-guided studies recruited efficiently and enrolled subjects likely to have presumed NASH. These biomarkers may be used in combination with medical history to identify phenotypic at-risk NASH patients in a non-invasive fashion to enable clinical trials of experimental NASH therapies.

SAT-408
Machine learning with routine laboratory tests and clinical features performs similar to current NAFLD clinical pathways
Devon Y. Chang1, Emily Truong2, Ju Dong Yang3, Naim Alkhouri 4, Stephen Harrison5, Mazen Noureddin6, Arnold O. Beckman High School, United States; 2Cedars Sinai Medical Center, United States; 3Cedars-Sinai, United States; 4Arizona Liver Health, United States; 5Pinnacle Clinical Research, United States; 6Houston Liver Institute, United States
Background and aims: AGA’s NAFLD Clinical Care Pathway (Kanwal, et al. Gastro 2021) screens patients with risk factors for NAFLD with Fibrosis-4 index (FIB-4) to determine risk (low, indeterminate, or high) for clinically significant liver fibrosis. Indeterminate patients subsequently undergo FibroScan® to further stratify risk for clinically significant liver fibrosis. In this study, we assessed the performance of established machine learning (ML) models (Chang et al, Hepatology 2022) versus sequential testing with FIB-4 followed by FibroScan® (STFF) in predicting the risk of clinically significant liver fibrosis.

Method: We implemented ML models including logistic regression (LR), random forests (RF), and artificial neural network (ANN) to predict risk of significant fibrosis (defined by histological stage of fibrosis ≥F3) using 17 routine demographic, clinical, and laboratory features in 1223 NAFLD patients at multiple US centers. These patients had ≥1 risk factors for NAFLD, including ≥2 metabolic risk factors, type 2 diabetes mellitus, steatosis on any imaging modality,

Figure: (abstract: SAT-406).
and elevated aminotransferases, and underwent liver biopsy, FibroScan®, and labs within a 6-month period. 29.52% of these 1223 patients had significant fibrosis, according to liver biopsy results. Patients with low, indeterminate, and high risk for significant liver fibrosis were predicted using the ML models and STFF according to the NAFLD Clinical Care Pathway. We used 80% of the cohort to train and 20% to test the ML models. Finally, we used the correctly classified (CC) measurement, defined as (true negative for rule-out cutoff + true positive for rule-in cutoff)/total, to compare the performances of the ML models to STFF. We also used the percentage of indeterminate-risk patients to compare the abilities of the ML models to separate the positive and negative classes to that of STFF.

**Results:** The performances of the ML models and STFF are shown in Table 1. LR had a CC of 63.96% (confidence interval, or CI: 61.12–66.8%) and a percentage of indeterminate-risk patients of 8.2% (CI: 7.14–9.26%). RF had a CC of 67.47% (CI: 64.67–70.27%) and a percentage of indeterminate-risk patients of 14.16% (CI: 12.47–15.86%). ANN had a CC of 63.06% (CI: 60.35–65.78%) and a percentage of indeterminate-risk patients of 10.41% (CI: 8%–12.82%). STFF had a CC of 70.53% (CI: 66.51–74.55%) and a percentage of indeterminate-risk patients of 11.51% (CI: 10.13–12.89%). Overall, there was no statistically significant difference when comparing the CCs of LR and RF to that of STFF. While there was no statistically significant difference in percentage of indeterminate-risk patients when comparing RF or ANN to STFF, LR had a statistically significantly lower percentage of indeterminate-risk patients compared to STFF.

**Conclusion:** There was no statistically significant difference in the performances of LR, RF, and STFF in the prediction of risk of clinically significant liver fibrosis. LR better separated the positive and negative classes compared to STFF. ML may replace STFF in the NAFLD Clinical Care Pathway to predict the risk of clinically significant liver fibrosis.

**SAT-409**

Validation of elastography criteria and cACLD risk model for diagnosis of compensated advanced chronic liver disease (cACLD) in NAFLD patients

Antonio Liguori1,2, Mirko Zoncape2,3, Roshni Patel2, Davide Roccarina2, Nicholas Viceconti1, Lucrezia Petrucci1, Laura Logna Prat2, Francesca D’Ambrosio1, Giuseppe Marrone1, Marco Biolo1, Anna Mantovani2,3, Jennifer-Louise Clancy2, Atul Goyale2, Antonio Gasbarrini1, Antonio Grieco1, Luca Miele1, Emmanuel Tochatzisz1, 1Department of Translational Medicine and Surgery, Fondazione PoliClinico Universitario Agostino Gemelli IRCCS, Università Cattolica del Sacro Cuore, Rome, Italy; 2University College London (UCL) Institute for Liver and Digestive Health, Royal Free Hospital and UCL, London, UK; 3Liver Unit, Division of General Medicine C, Department of Internal Medicine, University and Azienda Ospedaliera Universitaria Integrata di Verona, Verona, Italy Email: lig.antonio91@gmail.com

**Background and aims:** Fibroscan is a well-established NIT for the diagnosis of advanced fibrosis (F≥3) in patients with NAFLD, recently defined as compensated advanced chronic liver disease (cACLD). EASL Guidelines proposed 8 and 12 kPa, respectively, as rule-out and rule-in cut-offs for cACLD. Patients with Fibroscan measurement between 8 and 12 fall in a grey zone where further investigations are recommended. We recently proposed the cACLD Risk Score to further stratify this population. The main aim of this study was to test the diagnostic performance of the main NITs in two European cohorts of patients with histological diagnosis of NAFLD. Secondly, we assessed the performance of the cACLD risk score to further stratify patients in the Fibroscan’s grey zone.

**Method:** This is a retrospective observational study. We enrolled consecutive patients with histological diagnosis of NAFLD/NASH from...
January 2014 to December 2021 at two tertiary liver units in UK (Royal Free Hospital, London-RFH) and Italy (Fondazione Polyclinico Universitario A. Gemelli IRCCS, Rome-FPG). We excluded patients who did not perform at least one of these NITs at time of biopsy (± 6 months): FIB4, NAFLD Fibrosis score (NFS), Fibroscan, APRI, AGILE3+, cACLD Risk Score. We performed a ROC analysis to explore the diagnostic performance of NITs for cACLD (F > 2). Secondly, in patients with intermediate Fibroscan results (between 8 and 12 kPa), we tested the diagnostic performance of cACLD Risk Score, considering the originally proposed cutoff of 0.5.

**Results:** We included 536 patients; 201 were female, median age was 53 years, and 44% had diabetes. Fibroscan and AGILE3+ score had the best diagnostic performances for cACLD with an AUROC of 0.81 and 0.83 respectively. EASL criteria showed a high sensitivity and high specificity for 8 kPa and 12 kPa Fibroscan’s cutoffs, respectively (Sens 84.3%; Spec 86.6%), a wrong classification rate of 14.2%. 129 patients (24.1%) fell in the grey zone (between 8 and 12 kPa). Diagnostic performance of cACLD Risk Score in Fibroscan’s grey zone was suboptimal (AUROC: 0.682). The use of Fibroscan+cACLD Risk Score vs Fibroscan alone showed a better overall accuracy (77.8% vs 61.7%) and a slight worsening of overall wrong classification rate (22.7% vs 14.2%) mainly due to a higher number of false negatives than false positives. Among patients with intermediate Fibroscan (8–12 kPa), cACLD risk score correctly classify 64.4% of patients with a PPV of 72.0% and NPV of 62.5%.

**Conclusion:** Our results suggest that cACLD Risk Score should be used in patients with indeterminate Fibroscan results to further stratify their risk of cACLD. The use of cACLD Risk Score improve the performance in identifying patients with cACLD (high PPV) although its false negative rate could lead to missed diagnosis (suboptimal NPV). Patients with intermediate fibroscan and low cACLD risk score should be still considered for further investigation (liver biopsy).

SAT-410
Predictors of liver stiffness changes in consecutive cohorts of patients with non-alcoholic fatty liver disease and longitudinal follow-up
Mirko Zoncape1,2, Antonio Liguori1,3, Serena Pelusi4, Cristiana Bianco4, Rosnhi Patel1, Davide Roccarsa1, Laura Logna Prat1, Anna Mantovani1,2, Jennifer-Louise Clancy1, Atul Goyale1, Luca Valenti4, Emmanuel Tsochatzis1,2 Royal Free Hospital, University College London (UCL) Institute for Liver and Digestive Health, London, United Kingdom; 2Azienda Ospedaliera Universitaria Integrata Verona, Liver Unit, Division of General Medicine C, Department of Internal Medicine, Verona, Italy; 3Università Cattolica del Sacro Cuore, Department of Translational Medicine and Surgery, Fondazione Policlinico Universitario Agostino Gemelli IRCCS, Roma, Italy; 4Polliclinik of Milan, Department of Pathophysiology and Transplantation and Translational Medicine, Department of Transfusion Medicine and Hematology, Milano, Italy
Email: mirko.zonky@yahoo.it

**Background and aims:** The serial use of non-invasive fibrosis tests can refine prognosis in patients with non-alcoholic fatty liver disease (NAFLD) and evaluate the progression or improvement of liver fibrosis. We evaluated predictors of improvement or worsening of liver stiffness measurements (LSM) in well characterized cohorts of patients with NAFLD from London (UK) and Milan (Italy).

**Method:** We included two consecutive cohorts of 405 patients with at least two outpatient visits between 2014 and 2022. The minimum time interval between baseline and follow-up LSM was >6 months. LSM worsening was defined as an increase of >20% kPa if the baseline LSM was ≥5 kPa, or a follow-up LSM >6 kPa if the baseline LSM was <5 kPa. An LSM improvement was defined as an LSM decrease of >20% kPa (if the baseline LSM was >6 kPa). A significant change in weight was defined as a >5% reduction or increase at follow-up, while a

<table>
<thead>
<tr>
<th>Variable</th>
<th>Multivariate for LSM worsening</th>
<th>Multivariate for LSM improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR (95% CI)</td>
<td>p-value</td>
</tr>
<tr>
<td>Age</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Weight change, %</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>BMI</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>DM</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Follow up time</td>
<td>1.01 (0.98 – 1.02)</td>
<td>0.48</td>
</tr>
<tr>
<td>AST/ALT ratio at baseline</td>
<td>1.01 (0.98 – 2.24)</td>
<td>0.28</td>
</tr>
<tr>
<td>Total cholesterol change, %</td>
<td>0.98 (0.95 – 0.99)</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>AST change, %</td>
<td>0.98 (0.96 – 0.99)</td>
<td>0.04</td>
</tr>
<tr>
<td>ALT change, %</td>
<td>1.02 (1.01 – 1.03)</td>
<td>0.02</td>
</tr>
<tr>
<td>HbA1c change, %</td>
<td>1.03 (1.01 – 1.06)</td>
<td>0.03</td>
</tr>
<tr>
<td>Difference between expected and actual FIB-4 at follow up</td>
<td>1.39 (0.28 – 6.94)</td>
<td>0.68</td>
</tr>
</tbody>
</table>

Figure: Multivariate analysis for Fibroscan LSM increase and for LSM decrease. Numbers in bold represent statistical significance. Legend: ALT, alanine aminotransferase; AST, aspartate aminotransferase; BMI, body mass index; DM, type II diabetes mellitus; FIB-4, fibrosis-4 index; HbA1c, glycated hemoglobin.
significant change in glycated hemoglobin (HbA1c) was defined as a >10% reduction or increase. The variation between the true and expected FIB-4 index (based on the patient’s age at the follow-up visit, but using the blood tests performed at the first visit) was calculated. A significant improvement or worsening in FIB-4 was defined as a >20% variation between the actual and “expected” FIB-4.

Results: Of the 405 patients, 282 (70%) were males; mean age was 54 ± 11 years. The median time from the first visits was 20.3 (13.9–28.7) months. 128 and 54 patients had an LSM >8 kPa and LSM>12 KPa at follow-up, respectively. 77 patients (19.3%) had an LSM improvement, while 67 (16.8%) had an LSM worsening; 256 patients (63.9%) maintained a stable value. In patients with an LSM improvement, 22 had an improvement, 12 had worsening, while 37 had stable FIB-4. In patients with an LSM worsening, 10 had an improvement, 20 had worsening, while 33 had a stable FIB-4. In multiple logistic regression analysis, LSM worsening was independently associated with an increase in ALT and in HbA1c levels (OR 1.02 and 1.03 respectively), but also with a reduction in total cholesterol and AST levels (OR 0.98 for both). LSM improvement was independently associated with weight and ALT reduction (OR 0.93 and 0.98 respectively), but also with an increased AST level (OR 1.02).

Conclusion: More than 35% of patients with NAFLD have significant changes in their LSM measurements over a period of 20 months, with worsening or improvement at similar rates. Improvement in weight is independently associated with significant improvement in LSM measurements. On the converse, worsening in metabolic comorbidities, particularly glycemic control, could be associated with significant worsening in LSM, further supporting a multidisciplinary model of care.

Disclosure: All authors declare no conflict of interest. This work received no public or private funds.

SAT-411
Association of non-high-density lipoprotein cholesterol trajectories with the development of non-alcoholic fatty liver disease
Jun-Hyuk Lee¹, Jjyeon Kim², Jung Oh Kim², Yu-jin Kwon³, Eileen Yoon³, Dae Won Jun³, Sang Bong Ahn³.
¹Nowon Eulji Medical Center, Eulji University School of Medicine, Internal Medicine, Seoul, Korea, Rep. of South; ²Institute of genetic epidemiology, Basgenbio Co., Ltd., Korea, Rep. of South; ³Yongin Severance Hospital, Yonsei university college of medicine, Family medicine, Yongin-si, Korea, Rep. of South.
Email: noshin@hanyang.ac.kr

Background and aims: Dyslipidemia including non-high-density lipoprotein (non-HDL) cholesterol can induce hepatic insulin resistance, which contributes to the incidence of non-alcoholic fatty liver disease (NAFLD). To date, the effect of longitudinal trends in non-HDL cholesterol on NAFLD development is unknown. This study aimed to verify relationship between non-HDL cholesterol trajectories and incident NAFLD and identify genetic differences contributing to the development of NAFLD between non-HDL cholesterol trajectory groups.

Method: From a total of 10,030 participants aged 40–69 years who participated in the Korean Genome and Epidemiology Study, we analyzed data from 2203 adults without NAFLD at baseline who consecutively participated in the first, second, and third follow-up surveys. During the 6-year exposure periods (from baseline to third follow-up periods), participants were classified into increasing non-HDL cholesterol trajectory group (n = 934) and stable group (n = 1269); NAFLD was defined as NAFLD-liver fat score > -0.640. Multiple Cox proportional hazard regression analysis was performed to estimate the hazard ratio (HR) and 95% confidence interval (CI) for incident NAFLD of increasing group compared with stable group. For genome-wide association study (GWAS), we applied the interaction polygenic risk scores (PRS) to clarify effects of single-nucleotide polymorphisms (SNPs) on NAFLD phenotypes. For case-control comparison, we set control group by randomly selecting 2203 samples from total participants in the KoGES and calculate interaction PRSs using same difference of effect sizes.

Results: During the median 7.8-year of event accrual period, 666 (30.2%) newly developed NAFLD cases were collected. Incidence rate per 2 years of NAFLD was ranged from 5.03 to 11.14. Kaplan-Meier curves showed significant higher cumulative incidence rate of NAFLD in increasing group than in stable group (log-rank test p < 0.001). Compared with stable group, the adjusted HR (95% CI) for incident NAFLD of increasing non-HDL cholesterol group was 1.54 (1.32–1.80, p < 0.001). Linear mixed model revealed that increasing group had consistently and significantly higher NAFLD-liver fat score than stable group during the follow-up periods except the baseline. On GWAS, no significant SNPs were identified. PRS was highest in increasing group, followed by stable group and control group.

Conclusion: A trend in increasing non-HDL cholesterol was positively related to incident NAFLD. Results from GWAS suggested that lifestyle (diet) or external environmental factors have a greater effect size of factors involved in NAFLD progression risk than genetic factors. Intensive lifestyle modification could be an effective prevention strategy for NAFLD for people with elevated non-HDL cholesterol.

SAT-412
A gut-mycobiome-derived signature predicts advanced fibrosis in people with diabetes
Daniel Huang¹,², Tae Gyu Oh³, Megan Hill³, Ricki Bettencourt², Egbert Madamba², Harris Siddiqi³, Maral Amanzurbanova², Michael Downs³, Ronald Evans³, Jack Gilbert³, Robit Loomba¹,²
¹National University of Singapore, Yong Loo Lin School of Medicine, Department of Medicine, Singapore; ²University of California, San Diego, NAFLD Research Center, Division of Gastroenterology and Hepatology, United States; ³Salk Institute for Biological Studies, Gene Expression

Figure:
Background and aims: One in seven older adults with type 2 diabetes mellitus (T2DM) have advanced liver fibrosis (stage 3–4) due to non-alcoholic fatty liver disease (NAFLD); T2DM is associated with dysbiosis of the gut mycobiome, and emerging data suggest that the gut mycobiome may influence the progression of NAFLD to advanced fibrosis and cirrhosis. However, it is unknown if a stool mycobiome signature can be utilized as a non-invasive test for advanced fibrosis in individuals with T2DM.

Method: This prospective study enrolled participants with T2DM aged ≥50 years from primary care or endocrine clinics. Participants underwent MRI-proton density fat fraction, magnetic resonance elastography (MRE), vibration-controlled transient elastography (VCTE) and controlled-attenuation parameter. The presence of advanced fibrosis was defined by the presence of concordant findings between MRE and VCTE (MRE ≥ 3.63 kPa and VCTE ≥12 kPa). We performed fungal internal transcribed spacer (ITS) 2 sequencing using stool samples from 186 participants (64% female). A random forest machine learning algorithm and differential abundance analysis were utilized to identify signatures to identify advanced fibrosis and cirrhosis. However, it is unknown if a stool mycobiome signature can be identified using the high cut-off, 854 (18.6%), 1596 and advanced fibrosis (Figure, *p < 0.05 compared to SAFE). Based on cut-off values of SAFE score (0 and 100 points), 854 (18.6%), 1596 (34.6%) and 2153 (46.8%) were in the low-, intermediate- and high-risk groups, respectively. Six (0.7%), 15 (0.9%) and 59 (2.7%) developed liver-related events at 10 years, using the high cut-off, SAFE score could predict 90.7% of patients with liver-related complications in NAFLD patients in Hong Kong. Diagnostic and prognostic performance characteristics of the SAFE, FIB-4, NAFLD Fibrosis Score (NFS) and AST-platelet ratio index (APRI) were compared. Liver stiffness data by transient elastography were also available in the biopsy cohort.

Results: The mean (SD) age and body mass index (BMI) were 65.3 (8.19) years and 31.8 (6.31) kg/m², respectively. The presence of the mycobiome was substantially different in participants with NAFLD and advanced fibrosis, compared to those without advanced fibrosis. Notably, there was an increase in Candida albicans (p value = 8.6E-34), Kazachstania humilis (p value = 2.6E-03), and Penicillium concentricum (p value = 2.4E-16), and a decrease in Saccharomyces cerevisiae (p value = 3.7E-07), Aspergillus versicolor (p value = 2.1E-04), and Fusarium fujikuroi (p value = 2.8E-05). A unique stool mycobiome signature in combination with BMI was able to accurately distinguish the presence of advanced fibrosis (AUC 0.89, CI: 0.87–0.91) (Figure 1) and displayed consistent findings in an ethnically and geographically distinct cohort.

Conclusion: These findings demonstrate that a core set of gut mycobiome species may be useful as a non-invasive diagnostic test for advanced fibrosis in patients with T2DM.

SAT-413
Diagnostic and prognostic performance of the SAFE score in non-alcoholic fatty liver disease
Guanlin Li1,2, Huapeng Lin1,2, Pimsiri Siripongpun3,4, Yan Liang1,2, Xinrong Zhang1,2, Vincent Wai-Sun Wong1,2, Grace Lai-Hung Wong1,2, W. Ray Kim3, Terry Cheuk-Fung Yip2,5,7.
1The Chinese University of Hong Kong, Department of Medicine and Therapeutics, Hong Kong; 2The Chinese University of Hong Kong, Institute of Digestive Disease, Hong Kong; 3Stanford University, Department of Medicine, United States; 4Prince of Songkla University, Division of Internal Medicine, Thailand; 5The Chinese University of Hong Kong, Department of Medicine and Therapeutics, Hong Kong
Email: tcfyp@cuhk.edu.hk

Background and aims: The steatosis-associated fibrosis estimator (SAFE) was developed for detection of significant (≥stage 2) fibrosis (SF) in patients with non-alcoholic fatty liver disease (NAFLD) for non-hepatologists (Hepatology 2023;77 (1):256–267). We validate the performance of the SAFE score in comparison to other non-invasive tests to diagnose SF, and to assess their performance in predicting liver-related complications in NAFLD patients in Hong Kong.

Method: This is a retrospective cohort study involving two datasets. The first cohort, prospectively recruited between 2006 and 2021, consisted of adult patients who underwent liver biopsy at Prince of Wales Hospital. The second cohort composed of territory-wide adults with NAFLD (ICD-9-CM code 571.8) first diagnosed from January 2000 to July 2021, retrieved from the Clinical Data Analysis and Reporting System (CDARS) under the management of the Hospital Authority, Hong Kong. Diagnostic and prognostic performance characteristics of the SAFE, FIB-4, NAFLD Fibrosis Score (NFS) and AST-platelet ratio index (APRI) were compared. Liver stiffness data by transient elastography were also available in the biopsy cohort.

Results: Four hundred and seventy patients of the biopsy cohort and 4603 patients of the territory-wide cohort were included. In the primary analysis detecting SF, liver stiffness had the highest AUROC (0.844), followed by SAFE score (0.773), FIB-4 (0.746), NFS (0.737) and APRI (0.697). Results were similar for the detection of fibrosing NASH and advanced fibrosis (Figure, *p < 0.05 compared to SAFE). Based on cut-off values of SAFE score (0 and 100 points), 854 (18.6%), 1596 (34.6%) and 2153 (46.8%) were in the low-, intermediate- and high-risk groups, respectively. Six (0.7%), 15 (0.9%) and 59 (2.7%) developed liver-related events in these three groups from territory-wide cohort. Among diabetic patients who had liver-related events at 10 years, using the high cut-off, SAFE score could predict 90.7% of patients accurately, compared to 80.6% for FIB-4 and 66.8% for APRI. In subgroup analyses of NAFLD patients with and without type 2 diabetes, SAFE score had consistently good performance in detecting SF and liver-related events.
Conclusion: The SAFE score has good overall accuracy in diagnosing SF and predicting liver-related events in NAFLD patients. It has similar performance in patients with and without diabetes and is therefore well-suited for initial assessment of a broad spectrum of NAFLD patients to assess liver fibrosis and future risk of liver-related complications.

SAT-414
Standardized non-invasive screening for non-alcoholic fatty liver disease in people with type 2 diabetes identifies a substantial number of individuals with advanced liver disease
Naomi Lange1,2, Jonas Schropp1, Martin Hilpert3, Andreas Melmer3, Markus Laimer1, Christoph Stettler2, Annalisa Berzigotti1, Jean-François Dufour1. 1Department of Visceral Surgery and Medicine, Inselspital, Bern University Hospital, University of Bern, Bern, Switzerland; 2Graduate School for Health Sciences, University of Bern, Switzerland; 3Department of Diabetes, Endocrinology, Nutritional Medicine and Metabolism, Inselspital, Bern University Hospital and University of Bern, Bern, Switzerland; 4Centre des Maladies Digestives Lausanne, Lausanne, Switzerland
Email: naomi.lange@insel.ch

Background and aims: International guidelines recommend screening for advanced non-alcoholic fatty liver disease (NAFLD) in high-risk populations using validated, non-invasive tests. We implemented an algorithm to systematically screen and refer people with type 2 diabetes (T2DM), based on the simultaneous use of fibrosis-4 (FIB4) score and vibration controlled transient elastography (VCTE). Our objective was to assess feasibility, and evaluate the prevalence of clinically suspected and histologically assessed liver disease in referred patients.

Method: We included adult people with T2DM from a tertiary care diabetes outpatient clinic. Hepatology referral was recommended to patients who 1.) presented with a high FIB4 and/or VCTE, or 2.) intermediate values of both FIB4 and VCTE using previously validated cut-offs (FIB4: low <1.30, intermediate 1.30–2.67, high >2.67; VCTE [kPa]: low <7.9, intermediate 7.9–9.6, high >9.6). Clinical suspicion of advanced liver disease was defined as indication for the performance of liver biopsy, clinical diagnosis of cirrhosis, and detection of hepatocellular carcinoma (HCC), and significant liver disease was defined as liver disease warranting follow-up. Histological fibrosis was staged according to NASH-Clinical Research Network (CRN) criteria.

Results: Of 840 eligible individuals, 276 (32.9%) were included. Valid screening test results were obtained in 95.7% of participants (1.8% and 2.5% invalid results of FIB4 and VCTE, respectively). Among 261 participants evaluated for hepatology referral, mean age was 60.7 years, 28% were female and prevalence of steatosis assessed by controlled attenuation parameter (CAP) was 76.6%. 16.9% of participants (n = 44) were recommended for hepatology referral due to elevated screening tests and 43 did undergo hepatology work-up (Fig. 1). Referred patients were older (64.4 vs. 59.9 years, p = 0.021), and had higher body mass index (33.6 vs. 31.5 kg/m², p = 0.047), CAP (330 vs. 288 dB/m, p = 0.001) and HbA1c (7.6 vs. 7.1%, p = 0.014). Overall, 90.7% (n = 39) of referred patients were clinically diagnosed with advanced (n = 24) or significant (n = 15) liver disease. 75% of cases without identifiable or only mild liver disease in work-up were referred due to high FIB4 in combination with low VCTE. The most common liver-related diagnosis was NAFLD in 60.5% (n = 26) of cases, followed by metabolic liver disease (MAFLD) with dual etiology due to alcohol-related and viral liver disease in 20.9% (n = 9) of cases.

Conclusion: Implementation of an algorithm to screen people with T2DM for liver disease using a combination of FIB4 and VCTE was feasible and identified a large number of clinically relevant liver disease cases in a tertiary care setting. Our data suggest a high prevalence of MAFLD with dual etiology in this population, highlighting the necessity of offering screening to high-risk T2DM populations beyond the suspicion of NAFLD.

SAT-415
Patients with risk factors for liver diseases associated with hepatic steatosis constitute the target population for liver fibrosis assessment in primary care
Rosario Hernández1, Jordi Hoyo1, Marta Carol2,3,4,5, Ruth Nada2,3,4, Adrià Juanaola2,3,4, Anna Soria2,3,4, Ana Belen Rubio García2,3,4, Marta Cervera2,3,4, Martina Perez2,3,4, Matilde Fuentes6, Guillem Perá7, Sara Martinez2,3,4, Carla Chacon7, María Sánchez8, Aura Capdevila9, Marife Alvarez9, Jordi Gratacos2,3,4, Pere Torán9, Isabel Grauera2,3,4, Elisa Pose2,3,4, Alba Martínez-Escude2, Pere Ginés2,3,4,5, Llorenç Caballeria7, Núria Fabrellas2,3,5.

1Institut de recerca de l’Hospital de la Santa Creu i Sant Pau (IHiS), Barcelona, Spain; 2Department of Surgery, Hospital de la Santa Creu i Sant Pau (HCS), Barcelona, Spain; 3Department of Gastroenterology, Hospital de la Santa Creu i Sant Pau (HCS), Barcelona, Spain; 4Adderley Institute of Liver and Digestive Health, University of Witwatersrand, Johannesburg, South Africa; 5Industrial Research Institute for Health Technology Development (INTEC), Barcelona, Spain; 6Department of Radiology, Hospital de la Santa Creu i Sant Pau (HCS), Barcelona, Spain; 7Department of Pathology, Hospital de la Santa Creu i Sant Pau (HCS), Barcelona, Spain; 8Department of Immunology, Hospital de la Santa Creu i Sant Pau (HCS), Barcelona, Spain; 9Department of Biomedical Research, Hospital de la Santa Creu i Sant Pau (HCS), Barcelona, Spain.

Background and aims: Hepatic steatosis is a common liver disorder, which is associated with severe liver steatosis, elevated transaminases, and significant fibrosis. We aimed to measure the prevalence and fibrosis stage of patients with increased liver enzymes and steatosis on ultrasound.

Method: In this study, we analyzed 554 patients who were referred to our hospital for an evaluation of liver fibrosis. We measured liver enzymes, steatosis on ultrasound, and fibrosis stage using transient elastography.

Results: The prevalence of increased liver enzymes was 30.9%, and the prevalence of liver steatosis was 35.8%. The mean score of liver fibrosis was 0.54, indicating mild liver fibrosis.

Conclusion: Patients with increased liver enzymes and liver steatosis on ultrasound constitute the target population for liver fibrosis assessment in primary care. Further studies are needed to determine the clinical significance of these findings.

Figure: (abstract: SAT-414): Findings of a clinical referral algorithm in people with T2DM based on the simultaneous use of FIB4 (low <1.30, intermediate 1.30–2.67, high >2.67) and VCTE (low <7.9, intermediate 7.9–9.6, high >9.6 [kPa]).
Background and aims: Primary care is the ideal setting for early identification of subjects with liver fibrosis before cirrhosis or liver cancer occurs. Early diagnosis is critical to undertake personalized effective therapeutic interventions to stop disease progression and prevent liver-related mortality. However, the target population for liver fibrosis assessment in primary care is not well defined. The objective of this study was to investigate the characteristics of target population for liver fibrosis assessment, particularly the relationship between risk factors of liver fibrosis and presence of steatosis.

Method: Prospective cohort of 5760 subjects without known liver disease randomly recruited from primary care. Fibrosis was estimated by liver stiffness (LS) with transient elastography. A LS ≥9.2 kPa was considered suggestive of liver fibrosis, as reported by previous studies in population-based cohorts. Hepatic steatosis was estimated with fatty liver index (FLI). A FLI ≥60 was considered suggestive of moderate/severe hepatic steatosis. Risk factors of fibrosis were metabolic syndrome and its components, obesity, type2DM, or risk alcohol consumption.

Results: Out of the 5760 subjects included, 3,614 (63%) had at least one risk factor of liver fibrosis. Among subjects with risk factors, the prevalence of LS≥9.2 kPa was higher compared to that of subjects without risk factors (4.7% vs 0.3%, p < 0.001). We then assessed the prevalence of LS≥9.2 kPa in patients with risk factors categorized by liver stiffness (LS) with transient elastography. A LS ≥9.2 kPa was considered suggestive of liver fibrosis, as reported by previous studies in population-based cohorts. Hepatic steatosis was estimated with fatty liver index (FLI). A FLI ≥60 was considered suggestive of moderate/severe hepatic steatosis. Risk factors of fibrosis were metabolic syndrome and its components, obesity, type2DM, or risk alcohol consumption.

Conclusion: In primary care, the target population for evaluation of liver fibrosis should consist of subjects with risk factors for liver fibrosis and associated hepatic steatosis. Subjects without risk factors or with risk factors but without steatosis, the prevalence of increased LS is very low and does not seem to justify the assessment of liver fibrosis. In subjects with risk factors, FLI is more accurate than FIB-4 to predict individuals with high likelihood of liver fibrosis.

SAT-416
Performance of non-invasive fibrosis tests for long-term liver and heart outcomes in Europeans with metabolic risk factors from the UK Biobank
Federica Tavaglione1,2, Antonio De Vincentis2,3, Oveis Jamialahmadi4, Raffaele Antonelli Incalzi5,6, Antonio Picardi2,6, Stefano Romeo7,8,9, Umberto Vesepasian Gentilucci2,6,1 Fondazione Policlinico Universitario Campus Bio-Medico, Critical Medicine and Hepatology Unit, Rome, Italy; 2Università Campus Bio-Medico di Roma, Department of Medicine and Surgery, Rome, Italy; 3Fondazione Policlinico Universitario Campus Bio-Medico, Internal Medicine Unit, Rome, Italy; 4University of Gothenburg, Department of Molecular and Clinical Medicine, Sahlgrenska Academy, Gothenburg, Sweden; 5Fondazione Policlinico Universitario Campus Bio-Medico, Clinical Medicine and Hepatology Unit, Rome, Italy; 7University of Gothenburg, Department of Molecular and Clinical Medicine, Sahlgrenska Academy, Gothenburg, Sweden; 6Sahlgrenska University Hospital, Cardiology Department, Gothenburg, Sweden; 8University Magna Graecia, Clinical Nutrition Unit, Department of Medical and Surgical Sciences, Catanzaro, Italy
Email: fede.tavaglione@gmail.com

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is the leading cause of chronic liver disease in Western countries. NAFLD is associated with both liver-related and extrahepatic complications, including cardiovascular disease (CVD). Non-invasive tests (NITs) for advanced fibrosis are increasingly used to identify individuals with NAFLD who are at risk for liver-related complications. Their performance for extrahepatic complications has recently been tested in tertiary care settings and found to be limited. Herein, we investigated the performance of NITs for predicting long-term liver and heart outcomes in individuals with dysmetabolism from the large prospective UK Biobank.

Method: To assess the performance of NITs for liver and heart outcomes, we selected 305,745 Europeans with overweight/obesity and/or type 2 diabetes, without any liver disease at baseline, and 194,236 Europeans with overweight/obesity and/or type 2 diabetes, without chronic viral hepatitis and CVD at baseline, respectively. Then, we estimated the performance of NITs for predicting incident severe liver disease (SLD: cirrhosis, decompensated liver disease, hepatocellular carcinoma, liver transplantation) or incident CVD (angina, myocardial infarction, stroke, transient ischemic attack) by Cox proportional hazards models. Follow-up length was calculated from the date of baseline assessment visit up to the first date of target outcome diagnosis, the date of death, or the date of end of follow-up at the assessment center (July 1st, 2022), whichever occurred first. The following NITs were tested: fibrosis-4 index (FIB-4), NAFLD fibrosis score (NFS), fibrotic NASH index (FNI), AST to platelet ratio index (APRI), BARD.

Results: After a median follow-up of 9 years, FNI was the best score for predicting liver outcomes (area under the curve [AUC] 0.77, p <0.05 vs all the other NITs). After a median follow-up of 13 years, NFS was the best score for predicting heart outcomes (AUC 0.60, p <0.05 vs all the other NITs). All NITs showed a worse and limited performance for heart outcomes compared with that for liver outcomes.

<table>
<thead>
<tr>
<th>Score</th>
<th>SLD (N = 305,745)</th>
<th>CVD (N = 194,236)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AUC P value</td>
<td>AUC P value</td>
</tr>
<tr>
<td>FIB4</td>
<td>0.75 (0.73–0.77)</td>
<td>0.03 0.59 (0.59–0.60) &lt;0.001</td>
</tr>
<tr>
<td>NFS</td>
<td>0.72 (0.70–0.74)</td>
<td>&lt;0.001 0.60 (0.60–0.61) reference</td>
</tr>
<tr>
<td>FNI</td>
<td>0.77 (0.75–0.79)</td>
<td>reference 0.59 (0.58–0.60) 0.003</td>
</tr>
<tr>
<td>APRI</td>
<td>0.75 (0.73–0.77)</td>
<td>0.01 0.53 (0.53–0.54) &lt;0.001</td>
</tr>
<tr>
<td>BARD</td>
<td>0.62 (0.61–0.64)</td>
<td>&lt;0.001 0.55 (0.54–0.55) &lt;0.001</td>
</tr>
</tbody>
</table>

Conclusion: NITs showed a satisfactory performance for predicting liver outcomes, but a rather limited performance for predicting heart outcomes in individuals with dysmetabolism from the general population.
Impact of age as a confounding factor on non-invasive blood-based tests for the evaluation of non-alcoholic fatty liver disease: comparing NIS2+™ to established tests
Quentin Anstee1,2, Jeremy Magnanensi3, Yacine Hajji3, Alexandre Caron3, Zouher Majd3, Dean Hum3, Bart Staelens4, Margery A. Connelly5, Rohit Loomba6, Stephen Harrison7,8, Vlad Ratziu9, Arun Sanyal10.1Translational and Clinical Research Institute, Faculty of Medical Sciences, Newcastle University, Newcastle upon Tyne, United Kingdom; 2Newcastle NIHR Biomedical Research Centre, Newcastle upon Tyne Hospitals NHS Foundation Trust, Freeman Hospital, Newcastle upon Tyne, United Kingdom; 3GENFIT S.A., Loos, France; 4Univ. Lille, INSERM, CHU Lille, Institut Pasteur de Lille, U1011-EGID, Lille, France; 5Labcorp, Morrisville, United States; 6NAFLD Research Center, Division of Gastroenterology, Department of Medicine, University of California at San Diego, La Jolla, United States; 7Summit Clinical Research, Division of Gastroenterology, Department of Medicine, University of California at San Diego, La Jolla, United States; 8Univ. Lille, INSERM, CHU Lille, Institut Pasteur de Lille, U1011-EGID, Lille, France; 9Labcorp, Morrisville, United States; 10Division of Gastroenterology, Hepatology and Nutrition, Virginia Commonwealth University School of Medicine, Richmond, United States
Email: jeremy.magnanensi@genfit.com

Background and aims: Non-alcoholic steatohepatitis (NASH) is the more progressive form of non-alcoholic fatty liver disease (NAFLD), the leading cause of chronic liver disease. Timely diagnosis of specific conditions associated with higher risk of liver-related/all-cause mortality, such as “at-risk NASH” (NASH with a NAFLD activity score [NAS] ≥4 and a fibrosis stage [F] ≥2) or advanced fibrosis (F ≥3), is critical and different non-invasive tests (NITs) have been developed for these purposes. NAFLD affects patients of all ages, therefore, NITs should perform consistently across age groups to simplify large-scale use in clinical practice. This work investigated the effect of age on several well-established NITs including NIS2+™ and compared it to a histological reference standard.

Method: An analysis cohort (N = 2108; ≤45 years [n = 496], 46–55 years [n = 569], 56–64 years [n = 625], and ≥65 years [n = 418]) containing all patients with liver biopsies and data for NIS2+™, aspartate aminotransferase-to-platelet ratio index (APRI), NAFLD fibrosis score (NFS), Fibrosis-4 (FIB-4), and Enhanced Liver Fibrosis (ELF) was selected among those screened for the phase 3 RESOLVE-IT clinical trial (NCT02704403). To avoid potential confounding effects and allow for a robust analysis of the age impact on NITs, a well-balanced cohort (N = 800, n = 200 per age group) was obtained by applying a propensity score matching algorithm to the analysis cohort. Baseline values of biomarkers and NITs were compared across age groups using one-way ANOVA, and age impact on NITs’ distribution was compared to the effect of histology (F, NAS) using 3-way type-2 ANOVA and associated effect sizes. Using derived Youden cutoffs, the impact of age on NITs’ clinical performance (sensitivity, specificity) for the diagnosis of targeted condition was analysed.

Results: NIS2+™ and APRI were not impacted by age (p = 0.70 and p = 0.91, resp.), while the means of NFS, FIB-4, and ELF increased significantly with age (p < 0.0001), driven notably by decreasing ALT (NFS, FIB-4) and increasing hyaluronic acid (ELF) concentrations (p <0.0001). Age had a higher effect size for FIB-4, NFS, and ELF than liver fibrosis, the hypothesized main driver of these NITs. The age impact on FIB-4, NFS and ELF led to a decrease in specificity (FIB-4: 0.91–0.34; NFS: 0.81–0.23; ELF: 0.86–0.42) and an increase in sensitivity (FIB-4: 0.26–0.89; NFS: 0.49–0.92; ELF: 0.49–0.93) for the detection of F ≥3 across the different age groups. While not being impacted by age, NIS2+™ was the only NIT for which both F stage and

Figure: (abstract: SAT-417).
NAS score had medium to large effect sizes (partial omega squared = 0.16 and 0.12, resp.), confirming its adequacy for the detection of at-risk NASH as a composite end point.

**Conclusion:** FIB-4, NFS and ELF were impacted by age, therefore consideration should be given to adopting age-adapted cutoffs. NIS2 +™ was not impacted by age, demonstrating robust assay performance for ruling in/out at-risk NASH with fixed medical decision points.

**SAT-418**

Cost effectiveness analysis of screening for advanced hepatic fibrosis in patients with various ‘at-risk population’ in guidelines

Hye-Lin Kim1, Huiyul Park2, Hyo Young Lee3, Eileen Yoon3, Mimi Kim2, Sang Bong Ahn2, Chul-min Lee2, Bo-Kyeong Kang5, Joo Hyun Sohn3, Jihyun An4, Joo Hyun Oh6, Dae Won Jun6, Eun Chul Jang7. 1Sahmyook University, College of Pharmacy, Korea, Rep. of South; 2Samsung Medical Center, Eulji University College of Medicine, Department of Internal Medicine, Korea, Rep. of South; 3Uiyeongbuk Eulji Medical Center, Eulji University College of Medicine, Department of Internal Medicine, Korea, Rep. of South; 4Hanyang University, College of Medicine, Department of Internal Medicine, Korea, Rep. of South; 5Hanyang University, College of Medicine, Department of Radiology, Korea, Rep. of South; 6Nownon Eulji Medical Center, Eulji University School of Medicine, Department of Internal Medicine, Korea, Rep. of South; 7Soonchunhyang University College of medicine, Department of Occupational and Environmental Medicine, Korea, Rep. of South

Email: noshin@hanyang.ac.kr

**Background and aims:** Current guidelines for non-alcoholic fatty liver disease (NAFLD) recommend that the screening test for hepatic fibrosis should be performed to at-risk group for hepatic fibrosis. This study aimed to evaluate the cost-effectiveness of screening strategy using sequential combination of FIB-4 followed by transient elastography for advanced hepatic fibrosis in various at-risk populations.

**Method:** We built a combined model of decision tree model and Markov model to compare expected costs and quality-adjusted life-years (QALYs) between ‘screening’ and ‘no screening’ groups from healthcare system perspective. At-risk group was mainly defined as the group of individuals with any of the following risk factors: fatty liver, two or more metabolic abnormalities (three or more in the European Association for the Study of the Liver (EASL)), diabetes mellitus, and abnormal liver function test based on American Gastroenterological Association (AGA) guideline. Patients with pre-diabetes or obesity in American Association for the Study of Liver Diseases (AASLD) and overweight in EASL were additionally added in at-risk group, respectively. Fibrosis distribution of at-risk group was based on real world data from 8,545 health check-up examiners who underwent magnetic resonance elastography. Patients who diagnosed as advanced fibrosis in screening group were applied with intensive life-style intervention (ILI). The model included not only liver disease–related health states, but also cardiovascular disease (CVD) and extrahepatic cancer states that could be affected by NAFLD. Incremental cost-effectiveness ratio (ICER) was calculated for 20-year horizon and evaluated by applying the definition of ‘at-risk’ population to various guidelines.

**Results:** The cost-effectiveness analysis showed that screening group had $253 incremental costs and additional 0.0191 QALY per patient compared to no screening group in at-risk population. Through the base-case analysis ICER was $13,234/QALY. The result indicated that screening was cost-effective based on the implicit ICER threshold of $25,000/QALY in Korea. Sequential algorithm based on FIB-4 and transient elastography was more cost-effective considering the effects of ILI on cardiovascular and other malignancy in the ‘at-risk group’. In addition to the at-risk group defined by AGA guideline, the screening algorithm with ILI was also cost-effective in the at-risk group definition suggested by other guidelines ($14,211/QALY in EASL, $13,986/QALY in AASLD). Even when replacing medical costs in other countries, they were cost-effective because they were below the ICER threshold ($44,860/QALY in the US and $61,47 in Japan).

**Conclusion:** Screening for advanced hepatic fibrosis using FIB-4 in patients with at-risk population would be cost-effective when applying definitions in most of all guidelines about at-risk populations.

**SAT-419**

Which screening of advanced liver fibrosis in NAFLD?

Paul Cales1, Clémence M Canivet2, Lannes Adrien2, Frédéric Oberti2, Isabelle Fouchard3, Charlotte Costentin4, Victor de Lédinghen4, Jerome Boursier2, 1Angers University Hospital, Angers, France; 2Grenoble University Hospital, France; 3Grenoble University Hospital, France; 4Bordeaux University Hospital, France; 5Rennes University Hospital, France; 6Bordeaux University Hospital, France

Email: paul.cales@univ-angers.fr

**Background and aims:** The EASL and AGA guidelines recommend screening advanced fibrosis in patients at risk of NAFLD using sequential tests. Our aim was to compare and improve these algorithms.

**Method:** 1051 NAFLD patients were divided in derivation (n = 637) and validation (n = 414) sets. The outcome was advanced fibrosis (Kleiner F3+4). The main descriptors were sensitivity, accuracy, indeterminate rate, liver stiffness measurement (LSM by Fibroscan) recource and direct costs. The recommended algorithms were evaluated according to cut-offs either original or adapted to derivation set. In the EASL algorithm, we included either the agreement between LSM and Fibrotest (FT) or FibroMeter (FM), or the FM+LSM (EFM) combination. A new 3-steps Fibs algorithm used first FIB9 (using 9 usual liver blood markers), then FIB11 (adding 2 specialized blood markers) and finally FIB-12 (adding LSM). These new FIB tests were obtained by multi-targeting (PMID: 29619423) improved by machine learning in the derivation set.
RESULTS: They are given in the validation set. AUROC were, FIB4: 0.757, FT: 0.766, FM: 0.850, LSM: 0.885, FIB12: 0.912 (p < 0.001). 1/1The recommended algorithms with original cut-offs had the same fair sensitivity (70.3%) but the AGA algorithm had a significantly higher indeterminate rate and cost. The indeterminate rate of EASL algorithm was, FT: 13.5%, FM: 7.5% (p < 0.001). 2/Optimized EASL or AGA algorithms by adapted cut-offs improved sensitivity and accuracy vs original algorithms at the expense of increased indeterminate rate and cost. 3/ The modified EFM-EASL algorithm significantly reduced the indeterminate rate (5.3%, p < 0.001) and cost vs optimized algorithms. The new Fibs algorithm improved all outcomes (Figure), e.g. sensitivity: 82.1% vs AGA: 77.2% or EASL: 74.5% (p = 0.052), indeterminate rate: 3.1% vs AGA: 16.4% or EASL: 9.7% (p < 0.001), LSM recourse: 15.5% vs AGA: 66.9% or EASL: 49.0% (p < 0.001) and mean cost: 57€ vs AGA: 188€, EASL: 134€ (p < 0.001).

Method: 772 patients (mean age 47.3 ± 8.9 (range 40–65 ys), 67.1% male) with non-cirrhotic NAFLD diagnosed by abdominal ultrasound were enrolled at three hepatology centers (Verona, Milan and London). Hepatic fibrosis was diagnosed by Fibroscan (echoSense) by a liver stiffness measurement (LSM) ≥ 7.2 kPa. Glomerular filtration rate (GFR) was estimated using 2021CKD-EPI formula and AGA was defined by FGR ≥ 110 ml/min, whereas normal filtration (nGFR) by GFR 60–110 ml/min. Anthropometric and biochemical data, as well as medical history and current therapy were recorded at enrollment.

RESULTS: In the whole cohort, 152 (20%) belonged to the GH group. Compared to the nGFR, the GH group presented younger age (38.4 ± 8.3 vs 49.5 ± 7.7 years, p < 0.001), higher prevalence of severe steatosis (39.9% vs 27.1%, p = 0.03) and higher LSM values (8.04 ± 6.15 kPa vs to 7.47 ± 6.12 kPa, p = 0.023). In multivariate analysis adjusted for age, sex, type 2 diabetes, hypertension and obesity, age (OR 0.83, CI 95% 0.77–0.89) and LSM (OR 6.6, CI 95% 2.2–19.9) were independent risk factors for GH. LSM remained independently associated with GH even when considered diagnostic for fibrosis (LSM ≥ 7.2 kPa) (OR 1.83, CI 95% 1.10–3.03). These association were maintained even adjusting for diuretic and ACE/ARBs therapy.

Conclusion: GH is associated with hepatic fibrosis by LSM independently of other metabolic alterations. Therefore, GH could be considered an early marker of liver fibrosis in non-cirrhotic NAFLD patients and calculation of a simple index as GFR could suggest the need for a Fibroscan assessment in NAFLD patient even in primary care.

SAT-421 NIS2+™ as a screening tool for optimizing patient selection in non-alcoholic steatohepatitis therapeutic trials

Vlad Ratziu1, Stephen Harrison2,3, Yacine Hajji4, Jeremy Magnanensi4, Stéphanie Petit5, Zouher Majd6, Jeremy Magnanensi4, Dean Hum7, Bart Staels8, Quentin Anstee7,8, Arun Sanjay9, 1 Sorbonne Université, Institute for Cardiometabolism and Nutrition, Hôpital Pité-Salpêtrière, Paris, France; 2 Summit Clinical Research, San Antonio, TX, United States; 3 Radcliffe Department of Medicine, University of Oxford, Oxford, United Kingdom; 4 GENFIT, Loos, France; 5 GENFIT, Loos, France; 6 Université de Lille, INSERM, CHU Lille, Institut Pasteur de Lille, Lille, France; 7 Translational and Clinical Research Institute, Faculty of Medical Sciences, Newcastle University, Newcastle upon Tyne, United Kingdom; 8 Newcastle NIHR Biomedical Research Centre, Newcastle upon Tyne Hospitals NHS Foundation Trust, Freeman Hospital, Newcastle upon Tyne, United Kingdom; 9 Division of Gastroenterology, Hepatology and Nutrition, Virginia Commonwealth University School of Medicine, Richmond, VA, United States.

Background and aims: In clinical trials of non-cirrhotic patients with at-risk NASH (NAS ≥ 4; F ≥ 2), the screen failure rate of liver biopsy (LB) is unacceptably high. Standard non-invasive fibrosis tests aimed at detecting advanced fibrosis are not optimal to identify at-risk NASH. NIS2+™ is an improved version of the blood-based NIS4® biomarker, designed to identify at-risk NASH. We assessed the potential of NIS2+™ for optimized biopsy referral in therapeutic trials targeting at-risk NASH.

Method: Among >5000 patients who were screened in the RESOLVE-IT Phase 3 trial (NCT02704403), 1929 patients were selected with non-historical LB, available NIS2+ and FIB4 results and less than 3 months between LB and serum samples. This cohort was representative of the overall screening population and was used to perform a simulation to compare the actual screening performance observed in the RESOLVE-IT trial (based on clinical judgment of the investigators and standard local practices) with two simulated pathways using NIS2+™ alone, and FIB4-NIS2+™ sequentially. The number of patients needed to screen, the LB failure rate, and the screening cost (based on average costs of RESOLVE-IT in US sites) were assessed for a range of cutoff values of 0–8 for NIS2+™ and 0–2.0 for FIB4.
Performances were estimated for the inclusion of 1000 patients as confirmed by liver biopsy.

**Results:** The RESOLVE-IT screening process (RSP) cost $15 million per 1000 included patients, with a LB failure rate of 60.3% and 3220 patients needed to screen. Using, NIS2+™ for screening with a cost-optimized cutoff of 0.53, reduced the LB failure rate to 39%, saving $84 unnecessary biopsies ($-58%) with a $2.3 million cost reduction ($-16%) for only 812 ($+25%) additional patients to be screened, corresponding to a NNT (number needed to be tested) of 4. For this cost-optimized cutoff, the sensitivity of NIS2+™ would have been 80% specificity 66%, NPV 83% and PPV 61%. Compared to NIS2+™ alone, neither FIB4 alone nor FIB4-NIS2+™ would have reduced cost of inclusion or LB failure rates without considerably increasing the number of screenings. Unlike FIB4, NIS2+™ did not alter the demographic profile of patients included, in particular for important stratification parameters such as diabetes, histological activity or advanced fibrosis.

**Conclusion:** In therapeutic trials of non-cirrhotic at-risk NASH, the NIS2+™ blood-based biomarker would substantially optimize the referral pathway for liver biopsy by reducing unnecessary liver biopsies and overall costs thus greatly improving a major aspect of feasibility of NASH clinical trials.

**SAT-423**

**Abdominal adiposity and insulin resistance are the main predictors of CAP values in metabolically dysfunctional: the liver-bible cohort**

Cristiana Bianco1, Serena Pelusi1, Sara Margarita1, Francesco Malvestiti2, Giulia Periti1, Jessica Rondena1, Melissa Tomasi1, Rossana Carpani1, Matteo Vidal1, Ferruccio Ceriotti1, Daniele Prati1, Luca Valenti1-3, Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico di Milano, Precision Medicine-Department of Transfusion Medicine, Italy; 2Università degli Studi di Milano, Department of Pathophysiology and Transplantation, Italy; 3Fondazione IRCCS Ca’ Granda Ospedale Maggiore Policlinico di Milano, Clinical Pathology Unit, Italy

Email: biancocristiana.md@gmail.com

**Background and aims:** Evaluation of controlled attenuation parameter (CAP) during vibration controlled transient elastography (VTCE) permits the non-invasive estimation of hepatic fat content and the presence of fatty liver disease (FLD), a key driver of liver disease. Aim of the study was to examine the independent determinants and clinical predictors of CAP values in a cohort of apparently healthy individuals at high risk of FLD due to metabolic dysfunction.

**Method:** We considered 1230 consecutive blood donors (Liver-Bible cohort up to June 2022) with ≥3 features of metabolic dysfunction (overweight/obesity, hyperglycemia, hypertension, low HDL/high triglycerides), who underwent cardiometabolic evaluation from June 2019 to June 2022. CAP was measured by VTCE with Fibroscan. CAP determinants and predictors were identified by backward stepwise analysis and introduced in generalized linear models.

**Results:** Among participants, 210 (17.1%) were females, mean age was 53.8 ± 6.4 yrs, BMI 28.6 ± 3.2 Kg/m², 600 (48.8%) had steatosis (CAP ≥275 dB/m) and 27 (2.2%) had liver stiffness measurement (LSM) ≥ 8 kPa. CAP values correlated with higher LSM (p < 0.020). At multivariable analysis, independent determinants of CAP values were fasting insulin and abdominal circumference (AC; p < 0.01 for both), together with body mass index (BMI; p < 0.01), age, diabetes, triglycerides, ferritin, and lower HDL and thyroid stimulating hormone (TSH; p < 0.05 for all). AC was also an independent determinant of CAP ≥275 dB/m (p < 0.05), with insulin and diabetes, BMI, and lower HDL and TSH (p < 0.05 for all). In a subgroup of 592 participants for whom the information was available, we observed an independent association between higher FT3 levels, correlating with higher TSH, and CAP values (estimate 11.78 ± 3.92, p = 0.0027), independently of TSH levels and of levothyroxine treatment. A clinical score based on age, BMI, AC, HDL, HbA1c and ALT predicted CAP ≥275 dB/m with moderate accuracy (AUROC = 0.73), which was better than that of ALT alone and fatty liver index (AUROC = 0.61/0.70 respectively).

**Figure:** Independent determinants of CAP values in the LIVER-BIBLE-2022 cohort.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Estimate</th>
<th>SE</th>
<th>p value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td>0.59</td>
<td>0.17</td>
<td>0.0005</td>
</tr>
<tr>
<td>Sex, F</td>
<td>0.81</td>
<td>1.60</td>
<td>0.6118</td>
</tr>
<tr>
<td>BMI, Kg/m²</td>
<td>2.23</td>
<td>0.55</td>
<td>4.80 x 10⁻⁵</td>
</tr>
<tr>
<td>AC, cm</td>
<td>1.06</td>
<td>0.20</td>
<td>1.11 x 10⁻⁷</td>
</tr>
<tr>
<td>Glucose, mg/dL</td>
<td>0.14</td>
<td>0.07</td>
<td>0.06</td>
</tr>
<tr>
<td>Insulin, miU/L</td>
<td>0.68</td>
<td>0.12</td>
<td>1.31 x 10⁻⁸</td>
</tr>
<tr>
<td>T2D, yes</td>
<td>10.31</td>
<td>4.46</td>
<td>0.0209</td>
</tr>
<tr>
<td>HDL-C, mg/dL</td>
<td>-0.28</td>
<td>0.11</td>
<td>0.0153</td>
</tr>
<tr>
<td>TG, mg/dL</td>
<td>0.03</td>
<td>0.01</td>
<td>0.0375</td>
</tr>
<tr>
<td>Ferritin, log ng/ml</td>
<td>3.60</td>
<td>1.27</td>
<td>0.0245</td>
</tr>
<tr>
<td>TSH, miU/L</td>
<td>-1.57</td>
<td>0.74</td>
<td>0.0324</td>
</tr>
<tr>
<td>FT3, ng/L</td>
<td>2.38</td>
<td>1.64</td>
<td>0.1456</td>
</tr>
<tr>
<td>FT4, ng/L</td>
<td>11.87</td>
<td>3.93</td>
<td>0.0025</td>
</tr>
</tbody>
</table>

At GLM, adjusted for ethnicity, Levothyroxine replacement therapy and reported variables (identified at backward stepwise analysis, not shown).

AC: abdominal circumference; BMI: body mass index; F: female; fT3: free triiodothyronine; HDL-C: high-density lipoprotein cholesterol; SE: standard error; T2D: type 2 diabetes; TG: triglycerides; TSH: thyroid stimulating hormone.

**Conclusion:** The severity of insulin resistance and abdominal adiposity were the main independent determinants of CAP in individuals with metabolic dysfunction and may improve the risk stratification of FLD at an early stage of development. CAP values were modulated by hypophysis-thyroid-axis activity.

**SAT-423**

**A cost-effective non-invasive serum test for diagnosing NASH-cirrhosis (NC-3) in high-risk metabolic syndrome and/or type 2 diabetes patients**

Shira Shaham-Niv1, Eldad Kepten1, Boris Sarvin1, Avishai Gavish1, Claudia Filozof2, Tomer Shlomi1,3, MetaSight Diagnostics, Rehovot, Israel; 2Labcorp Drug Development, Israel; 3Technion, Department of Computer Science and Biology, Haifa, Israel

Email: shira.s@metasightdx.com

**Background and aims:** Liver cirrhosis is majorly underdiagnosed and with an estimated prevalence of 6% among T2D patients; hence, ~70% of cirrhosis cases are only incidentally found. However, currently high-risk T2D and metabolic syndrome patients are typically not screened for NASH-cirrhosis as part of common general practice. Here, we develop a robust non-invasive test (NI) for NASH-cirrhosis based on cost-effective metabolomics and lipidomics, amenable for screening asymptomatic high-risk patients.

**Method:** Serum samples from ~500,000 subjects (>50 years old) were collected as part of standard clinical routine by a central Israeli HMO between July 2021 and January 2023, within the ongoing Israeli multi-Omics Serum Screening (IMOSS-500 K) study. De-identified electronic health records (EHR) were used to identify ~60,000 samples from patients diagnosed with NAFLD, among which 183 were diagnosed with cirrhosis within ±6 months from serum collection. Cirrhosis cases were identified based on ICD-9 and were individually validated by a health specialist (based on biopsy, imaging and/or clinical assessment data). Patients with matching age, gender, and metabolic syndrome features (n = 183) were selected as controls. All samples were analyzed with high-throughput liquid-
SAT-424
Comparison between EASL and AGA algorithms for hepatology referral in 1572 outpatients with type 2 diabetes and suspected NAFLD seen in a diabetes clinic
Laurent Castéra1, Tiphaine Vidal-Trecan2, Tania Khoury3, Dominique Vallè3, Jean-François Gautier4, Beaugren hospital, Université Paris Cité, Pathology, Clichy, France; Lariboisière hospital, Université Paris Cité, Diabetology, Paris, France; Beaujon hospital, Hepatology, Clichy, France; Lariboisière hospital, Université Paris Cité, Diabetology, France; Beaugren hospital, Université Paris Cité, pathology, Clichy, France
Email: laurent.castera@bjn.aphp.fr

Background and aims: Recently, two algorithms screening patients at risk for NAFLD and advanced fibrosis to decide if a referral to a hepatologist is needed have been proposed by EASL (J Hepatol 2021) and AGA (Kanwal Gastroenterology 2021). Screening of patients with type 2 diabetes (T2D), who are the most at risk of advanced fibrosis, is an unmet need. We aimed to compare the performance of these two algorithms in term of hepatology referral in a large cohort of T2D outpatients seen in a diabetes clinic.

Method: 1572 T2D outpatients seen in our diabetes clinic between October 2019 and February 2022, were systematically screened for NAFLD (steatosis and/or elevated ALT) and underwent FIB-4 and liver stiffness measurement (LSM) by vibration-controlled transient elastography (VCTE). Excessive alcohol consumption and viral hepatitis B and C were excluded. According to EASL algorithm, patients with FIB-4 ≥1.3 should undergo VCTE and those with LSM ≥8 kPa should be referred to a hepatologist. According to AGA algorithm, patients with FIB-4 >2.67 or with FIB-4 between 1.3 and 2.67 and LSM ≥8 kPa should be referred to a hepatologist.

Results: The characteristics of the 1572 patients were as follows: male 60%; median age 61 years; BMI 29 kg/m²; waist circumference 103 cm; HbA1c 7.6%; AST 28 IU/L; ALT 28 IU/L. A liver biopsy (LB) was performed in 163 patients (advanced fibrosis 30%). Comparison of the two algorithms is shown in the Figure. According to EASL, 186 (12%) should be referred to a hepatologist (LSM ≥8 kPa). The 1386 remaining patients were considered at low risk. According to AGA, 227 patients (15%) should be referred (132 at high risk (FIB-4 >2.67 or LSM >12 kPa) and 95 at intermediate risk). The 1345 remaining patients were considered at low risk. Among the 163 patients with LB, the rate of false positive was higher than that of false negative and similar between algorithms (38%, and 15%, respectively).

Conclusion: EASL and AGA algorithms performed similarly allowing to identify 12 to 15% of intermediate-high risk T2D patients, who should be referred to a hepatologist. These numbers are higher than reported in the general population, highlighting the urgent need for screening these patients.

SAT-425
Non-Alcoholic Steatohepatitis impacts on visceral adipose tissue proteomic signature
Cristian Martínez Navidad1, Cristina Placed2, Helena Castañé3, Andrea Jiménez Franco4, Joan de Reus, Unitat de Recerca Biomeòdica, Reus, Spain; Universitat Rovira i Virgili, Unitat de Recerca Biomeòdica, Reus, Spain; Hospital Universitari San Joan de Reus, Unitat de Recerca Biomeòdica, Reus, Spain
Email: cristian.marnav@gmail.com

Background and aims: Obesity is a major global health concern due to its growing prevalence and associated diseases, leading to reduce the quality and life expectancy of those affected. Non-alcoholic steatohepatitis (NASH) is a serious condition potentially leading to cirrhosis and liver failure, requiring urgent diagnosis and treatment. However, the current high rates of NASH-cirrhosis under-diagnosis highlights the urgent need for non-invasive methods for its identification. We aimed to compare the performance of these two algorithms in term of hepatology referral in a large cohort of T2D outpatients seen in a diabetes clinic.
steatohepatitis (NASH), a form of non-alcoholic fatty liver disease (NAFLD), is commonly linked to obesity and manifests as liver damage and inflammation, caused by the fat accumulation. The diagnosis of NASH is challenging due to its silent and non-specific symptoms, often going undetected until late stages of the disease. Proteomics allows us to examine the mechanisms involved in these biological successes. The objective is to investigate the differences in protein profiles of plasma, liver and adipose tissue between NASH and non-NASH patients using proteomic analysis, with the goal for identifying a biological marker for earlier NASH diagnosis.

**Method:** To carry out the analyses, plasma samples were collected from patients undergoing bariatric surgery (n = 40), including patients with NASH (n = 20) and patients without NASH (n = 20). Additionally, biopsies of a portion of these (n = 18) were obtained to perform a proteomic analysis of visceral adipose tissue, subcutaneous adipose tissue and liver to determine possible biomarkers that would differentiate patients with NASH (n = 9) from patients without it (n = 9).

**Results:** Multivariate analysis revealed differences in plasma proteomic profiles between NASH and non-NASH groups. A PCA showed highlight P09871 to be significantly reduced and P25311 and V9GYE7 significantly increased in NASH patients. PLSDA (A) and heat map (B) analyses provide a separation with almost no overlap between both groups of patients. These results suggest that the difference on the plasma proteomic profile has diagnostic capacity (C). As for the liver (D), multivariate analysis revealed a significantly increasing on P1640 and K7EIV0 and a decreasing of A0A087X1G1 between both groups. These suggest that the liver proteomic profiles also have diagnostic potential. In addition to the impact on plasma and liver, a signature has also been observed in visceral adipose tissue (E), characterized by increasing of P12814 and decreasing P53007. In subcutaneous adipose tissue (F), no NASH proteomic signature is observed.

**Conclusion:** Patients with NASH present significant differences in the proteome of plasma, liver and visceral adipose tissue compared to patients without the pathology. In the liver, there is an increase in proteins associated with cell growth and inflammation, and a decrease in mitochondrial respiration. In visceral adipose tissue, proteins linked to mitochondrial metabolism decrease and those related to the cytoskeleton increase. However, no proteomic signature is observed in subcutaneous adipose tissue.

**SAT-426**
Al-enabled virtual hematoxylin and eosin and Masson’s trichrome staining for non-alcoholic fatty liver disease activity scoring from single unstained slide

Carson McNeil1, Pok Fai Wong1, Niranjan Sridhar1, Yang Wang1, Charles Santori1, Cheng Hsun Wu1, Andrew Homyk1, Michael Gutierrez2, Ali Behrooz1, Dina Tiniakos3, Alastair Burt4,5, Rish Pai2, Kamilla Tekiela1, Po-Hsuan Cameron Chen2, Sudha Rao1, Debra Hanks1, Shamira Sridharan2, Eduardo Bruno Martins6, Star Seyedkazemi7, Laurent Fischer6, Charlie Kim1, Peter Cimermancic1. 1Verily Life Sciences, United States; 2Newcastle University, United Kingdom; 3The University of Adelaide, Adelaide, Australia; 4Mayo Clinic, Scottsdale, United States; 5Google, Mountain View, United States; 6Allergan, United States

**Background and aims:** Pathologists’ interpretation of disease activity using hematoxylin-and-eosin (HanE) and Masson’s trichrome (MT) stained slides from liver biopsies is the current gold standard for monitoring response in non-alcoholic steatohepatitis.
POSTER PRESENTATIONS

(NASH) clinical trials. However, staining and scoring variability, and limited tissue availability have created challenges in NASH clinical trials that impact efficiency, cost, and end point assessment. Our aim was to develop a virtual staining approach that relies on digitization and computational prediction of HandE and MT from a single unstained tissue section. This approach reduces the need for chemical staining and the amount of tissue used.

**Method:** We present a novel digital pathology platform that digitizes information in unstained tissue sections and then uses machine learning to perform virtual staining. The tissue is digitized using autofluorescence (AF) imaging of unstained tissue at hundreds of excitation-emission wavelength pairs using a hyperspectral microscope developed at Verily. The virtual staining step utilizes recent advances in computer vision and deep learning. Importantly, the platform is non-destructive, with the tissue samples remaining unstained and available for other analyses. To develop the virtual staining module, paired AF and stained images of the same tissue sections were collected by imaging 200 unstained liver biopsies from the completed Phase 2b CENTAUR trial, followed by HandE or MT staining and scanning. The virtual stains were evaluated on an independent test set of 45 cases using a reader study with 3 adjudicator hepatopathologists (co-authors of this abstract), as follows: (a) all cases were presented to each pathologist in a randomized order and blinded to the stain modality (real or virtual); (b) consensus scores based on NASH Clinical Research Network (NASH CRN) system were generated via in-person adjudication; (c) the accuracy of virtual stains was measured by computing linearly-weighted Kappa values between adjudicated NASH CRN scores on real versus virtual stains. Additionally, 9 hepatopathologists (not authors) scored the same set of chemically stained cases to measure inter-observer variation on real stains. We define success of virtual staining by real versus virtual kappa values being non-inferior to those from inter-observer variation on real stains.

**Results:** In the blinded and randomized adjudication reader study, concordance (linearly-weighted kappa) of NASH CRN scores derived from virtual stains versus real stains were 0.86 (95% CI [0.74, 0.96]), 0.33 (95% CI [0.06, 0.57]), 0.76 (95% CI [0.61, 0.88]), and 0.55 (95% CI [0.35, 0.70]) for steatosis, lobular inflammation, ballooning, and Ishak fibrosis stage, respectively. The Kappa values for inter-observer variability were 0.57 (95% CI [0.49, 0.65]), 0.28 (95% CI [0.17, 0.40]), 0.31 (95% CI [0.22, 0.40]), and 0.50 (95% CI [0.39, 0.61]), respectively.

**Conclusion:** The virtual staining platform generates HandE and MT images equivalent to chemical stains as demonstrated by the equivalence of hepatopathologist NASH-CRN scoring of liver biopsies. This demonstrates the high potential for improving efficiency and maintaining consistency of histopathologic end point assessment. Furthermore, the tissue-sparing stain-free system conserves tissue for downstream analyses.

**SAT-427**

**Practical diagnosis of cirrhosis by liver specialists in non-alcoholic fatty liver disease using currently available non-invasive fibrosis tests**

Jeremy Boursier1, Marine Roux1, Charlotte Costentin2, Julien Chaigneau1, Céline Fournier-Poizat3, Aldo Trylesinski4, Clémence M Canivet1, Sophie Michalak5, Brigitte Le Bail6, Valérie Paradis7, Pierre Bedossa8, Nathalie Sturm9, Victor de Lédinghen10, Philip N Newsome5, Angers University, France; 2Grenoble University Hospital, France; 3Echosens, France; 4Advanz Pharma, United Kingdom; 5Angers University Hospital, France; 6Bordeaux University Hospital, France; 7APHP Beaujon, France; 8Birmingham University Hospital, France; 9Birmingham University, United Kingdom

**Background and aims:** Unlike for advanced liver fibrosis, the practical rules for the early non-invasive diagnosis of cirrhosis in NAFLD remain not well defined. We aimed to develop and validate an accurate diagnosis of cirrhosis in NAFLD using the best non-invasive tests currently available to liver specialists.

**Method:** Patients with NAFLD and liver biopsy from four independent cohorts were allocated to derivation and validation sets according to a phase 3 TRIPOD design. All patients had six non-invasive fibrosis tests utilizing different modalities (elastography, blood tests) and dedicated to different diagnostic targets (advanced liver fibrosis, cirrhosis): FB4, FibroMeterV3G, CirrhoMeterV3G, Fibroscan, Agile3+, and Agile4. Cirrhosis was defined as fibrosis stage F4 according to the NASH CRN staging.

**Results:** 1,568 patients were included (872 in the derivation set, 696 in the validation set). Median age was 57.6 years, 59.1% of the patients were male, median biopsy length was 25 mm, and the prevalence of cirrhosis was 12.1%. AUROC for cirrhosis were: 0.816 ± 0.016 (FIB4), 0.820 ± 0.016 (FibroMeterV3G), 0.812 ± 0.017 (CirrhoMeter V3G), 0.870 ± 0.013 (VCTE), 0.893 ± 0.011 (Agile3+), and 0.893 ± 0.012 (Agile 4). However, despite this good to very good global accuracy, fibrosis tests showed an imbalance with a much better accuracy to rule out cirrhosis than to rule-in the diagnosis. A stepwise algorithm, using first the Agile3+/Agile4 elastography-based tests and then the FibroMeterV3G/CirrhoMeterV3G specialized blood tests, was developed in the derivation set. This algorithm applied fibrosis tests in the same order as recommended by the 2021 EASL guidelines and provided stratification in four groups, the last of which being enriched in cirrhosis (71% prevalence in the validation set). We also derived a risk prediction chart to allow estimation of the individual

---

Figure: (abstract: SAT-427).
probability of cirrhosis (Figure). In the validation set, calibration of the predicted risk was excellent: the integrated calibration index was 0.025, and mean difference with perfect prediction was only −2.9% (extremes: −5%; −2%). Quantitative morphometric analysis confirmed that both approaches (sequential algorithm, risk prediction chart) stratified patients into subgroups with significantly different amounts of liver fibrosis.

**Conclusion:** The new tools we developed improve the personalized non-invasive diagnosis of cirrhosis in NAFLD patients.

**SAT-428**

**Associations of genetic risk panel with enhanced liver fibrosis scores among patients with non-alcoholic fatty liver disease**

Zobair Younossi1,2,3, James M Estep1, Sean Felix3, Elena Younossi1, Nagashree Gundu Rao1, Leyla Deavila1, Huong Pham1, Rebecca Cable1, Jillian Price3, Andrei Racila4, Maria Stepanova1,4.

1Inova Health System, Department of Medicine, United States; 2Inova Health System, Department of Medicine, Center for Liver Diseases, United States; 3Beatty Liver and Obesity Research Program, Inova Health System, United States; 4Center for Outcomes Research in Liver Disease, United States

**Email:** zobair.younossi@inova.org

**Background and aims:** Genetic risk factors have been linked to advanced histologic stage of fibrosis among patients with NAFLD. It is unknown if these genetic risk factors are also associated with non-invasive biomarkers such as enhanced Liver Fibrosis (ELF) and FIB-4. Our aim was to assess the associations of select SNPs with the risk of having elevated ELF and FIB-4 in NAFLD.

**Method:** After informed consent, clinical data, serum and whole blood were collected from patients with NAFLD. In addition to standard laboratory test (liver enzymes, platelet count, to calculate FIB-4), ELF score was measured (ADVIA Centaur). Genomic DNA was extracted from the whole blood (QiAamp DNA Blood Mini Kit). Genotyping was performed for determination of minor allele frequency for genomic loci rs641738 (MBOAT7), rs58542926 (TM6SF2), rs738409 (PNPLA3), rs62305723 (HSD1713B) using CFX96 (BioRad). Individual alleles were evaluated for the association with elevated (≥9.8) and high (≥11.3) ELF, elevated FIB-4 (≥2.67) in NAFLD.

**Results:** There were 953 NAFLD patients included: 57 ± 14 years, 57% male, BMI 34.0 ± 9.1, 33% type 2 diabetes. Of those, 83% had low ELF (<9.8), 14.5% had elevated ELF (9.8–11.2) and 2.5% had high ELF (≥11.3). Furthermore, 6.9% had elevated FIB-4 score (≥2.67). Of the studied four SNPs, only PNPLA3-rs738409 (51% CC, 42% CG, 7% GG) was significantly (p < 0.05) associated with elevated and high ELF scores: elevated ELF 12% in CC vs. 19% in CG/GG, high ELF 0.7% in CC vs. 4.1% in CG/GG (both p < 0.01). In multivariate analysis adjusted for age, sex, BMI and type 2 diabetes, having PNPLA3-rs738409 (51% CC, 42% CG, 7% GG) was independently associated with increased risk of elevated and high ELF: odds ratio (OR) = 1.87 (1.25–2.78) for elevated ELF; OR = 5.82 (1.67–20.30) for high ELF (both p < 0.01). Similarly, only PNPLA3-rs738409 CC/GG was associated with elevated FIB-4: 5.1% in CC vs. 8.0% in CG vs. 13.7% in GG (p = 0.05). In multivariate analysis, having PNPLA3-rs738409 CC/GG genotype was independently associated with a higher risk of elevated FIB-4: odds ratio (OR) = 2.10 (1.13–3.90) (p = 0.019).

**Conclusion:** The well-known SNP in the PNPLA3 gene linked to advanced histologic fibrosis is also associated with elevated/high ELF and FIB-4 scores in NAFLD. These data validate the association of non-invasive biomarkers with the genetic risks in NAFLD.

**SAT-429**

**Morphometric analysis of sonic hedgehog in non-alcoholic fatty liver steatohepatitis patients by MorphoQuant: a potential biomarker of disease severity**

Cindy Serdjebi1, Bastien Lepoivre1, Florine Chandes1, Linda Willis2, Jule Yvon1. 1Biocellvia, Marseille, France; 2Histolgix Ltd, United Kingdom

**Email:** cindy.serdjebi@biocellvia.com

**Background and aims:** Sonic hedgehog (Shh) is an important pathway activated in non-alcoholic fatty liver diseases and its expression is known to increase along with the severity of non-alcoholic steatohepatitis (NASH). In addition, computer-assisted morphometry previously demonstrated that Shh expression was associated with ballooning degeneration score as well as fibrosis grading. Yet, the use of this immune-histo-chemistry (IHC) has long been ignored in the current general practice and/or in clinical trials. In this study, we have developed and a fully automated morphometry software to detect and quantify Shh expression and investigated the interest of measuring the area of active injury in patients’ liver biopsies.

**Method:** Liver biopsies were scored by a blinded expert pathologist according to the NASH CRN for steatosis, inflammation, ballooning and fibrosis. Shh labeling was developed using SG vector as chromogen. MorphoQuant, a fully automated and deterministic artificial intelligence, based on morphometry and expert system-completely independent from pathologist’s annotations, was developed to specifically detect Shh and areas of active liver injury from whole slide images. As an edge effect was seen on a significant number of labeled slides, a 150-μm safety margin was automatically removed from all biopsy fragments before analysis. The quantitative data of Shh expression and areas of active injuries were thus compared to the pathologist’s reading and correlations were calculated using the Spearman correlation test for fibrosis, steatosis, lobular and portal inflammation, Mallory-Denk bodies, interface hepatitis, NAS and NASH status. Active injury area also correlated with the same items, though the strength of the correlation was systematically higher for all the compared items.

**Results:** A total of 271 slides were processed for quantitative image analysis by MorphoQuant. Results are presented in Table 1. Shh was expressed in all patients, 5.49‰ in average, ranging from 0.046 to 44.88‰ while active injury area ranged from 0 to 82.06‰ with a mean at 5.239‰. Both Shh and active injury area were higher in NASH than in non-NASH patients (6.428 vs 3.270; 6.632 vs 1.943, respectively; p values <0.0001 for both). Shh was significantly associated with fibrosis, ballooning, lobular inflammation, interface hepatitis, Mallory-Denk bodies, NAS and NASH status. Active injury area also correlated with the same items, though the strength of the correlation was systematically higher for all the compared items.

**Conclusion:** The current study demonstrates the utility of Shh IHC to discriminate NAFLD from NASH patients. Active injury always correlated more with the histopathological reading than Shh, identifying this new readout as a potential biomarker for disease activity.

**SAT-430**

**Burden of non-alcoholic fatty liver disease and usefulness of non-invasive tests to identify advanced liver disease in patients with type 2 diabetes mellitus: interim analysis of an Italian prospective multicentre study**

Gian Paolo Caviglia1, Angelo Armandi1,2, Roberta D'Ambrosio3,4, Pietro Lamperi3,4, Cristina Bianco5, Luca Valenti6, Carlo Ciccioli6, Grazia Pennisi6, Salvatore Petta6, Lucia Bradosi7,8, Maria Letizia Petroni1,9, Francesca Marchignolf1,8, Loris Pironi7,8, Alessandra Sagripanti1, Maria Eva Argenziano1, Gianluca Svegliati-Baroni1, Elisabetta Bugianesi1. 1University of Turin,
Background and aims: Non-alcoholic fatty liver disease (NAFLD) is closely associated with type 2 diabetes mellitus (T2DM). However, systematic data on the epidemiology and severity of NAFLD in T2DM are scarce and mostly relying on data from gastroenterological systematic data on the epidemiology and severity of NAFLD in T2DM. A substantial number of VCTE (Table 1).

Conclusion: In patients with T2DM and NAFLD, the prevalence of advanced liver fibrosis by VCTE is approximately 22%, while cACLD is found in 14% of subjects. In Diabetes Units, pre-screening by NOS or FIB-4 is the most convenient referral approach to hepatologists for the identification of T2DM patients at risk of advanced liver fibrosis by VCTE. This research was supported by Gilead Sciences, Inc (study ID: IN-IT-989–5790).

LIVERFasting GP+, first-line screening tool in at-risk MAFLD patients outperforms the standard-of-care (SOC) FIB-4
Ronald Quiambao1, Paul Hermabessiere2, Adele Delamarre3, Imitiaz Alam4,5, Juan Manuel Minoz Perez6, John Lee7, Mona Munteanu1, Victor de Ledinghen8, Fibronostics, Medical Affairs, United States; CHU Bordeaux, Hepatology Department, United States; CHU Bordeaux, France; Austin Hepatitis Center, United States; University Medical School, United States; Fibronostics, IT, United States; Fibronostics, IT, Singapore; CHU Bordeaux, Hepatology, France Email: mona_munteanu@hotmail.com

Background and aims: LIVERFASt GP+ (GP+) is an AI-based blood test conceived for the screening of MAFLD at risk subjects. GP+ combines common blood biomarkers (lipid panel, liver enzymes, glucose and bilirubin) with patient's anthropometrics. Recently, GP+ has been validated to predict the short-term severe outcomes in those patients infected with SARS-CoV-2 virus and liver fibrosis. (Hepatology-Suppl2022). The primary aims of this retrospective analysis was: 1) to construct and validate a new MAFLD screening test, GP+, noninferior to the SOC reference, FIB-4, for bridging fibrosis (F3F4 stages), and 2) with less drawbacks related to age-adapted cutoffs.

Method: N = 580 MAFLD patients prospectively included with liver biopsy and concomitant GP+ and FIB-4 were randomly assigned in (20.0%), followed by FIB-4 (11.9%) and APRI (5.5%). The lowest probability of missing advanced liver fibrosis was observed for NFS (5.8% of patients with NFS <1.455 and LS ≥8.0 kPa) in spite of the highest VCTE referral rate (71.1% vs 32.6% for FIB-4 and 9.7% for APRI, respectively). On the contrary, screening by FIB-4 could spare a substantial number of VCTE (Table 1).

Figure:

Table 1.(abstract: SAT-429): Spearman correlations between Shh-related readouts and pathologist’s score

<table>
<thead>
<tr>
<th>Feature from the NASH CRN</th>
<th>Spearman correlation rate r (CI95 interval)</th>
<th>p</th>
<th>Spearman correlation rate r (CI95 interval)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibrosis</td>
<td>0.4111 (0.2901 - 0.5192)</td>
<td>&lt;0.0001</td>
<td>0.5292 (0.4226 - 0.6214)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Steatosis</td>
<td>0.1193 (-0.0205 - 0.2541)</td>
<td>0.0839</td>
<td>0.1222 (-0.01706 - 0.2569)</td>
<td>0.0764</td>
</tr>
<tr>
<td>Ballooning</td>
<td>0.427 (0.3047 - 0.5332)</td>
<td>&lt;0.0001</td>
<td>0.5329 (0.4254 - 0.6256)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Lobular inflammation</td>
<td>0.2997 (0.1676 - 0.4211)</td>
<td>&lt;0.0001</td>
<td>0.4130 (0.2906 - 0.5220)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Portal inflammation</td>
<td>0.06690 (-0.07278 - 0.2040)</td>
<td>0.335</td>
<td>0.08778 (-0.05186 - 0.2241)</td>
<td>0.2041</td>
</tr>
<tr>
<td>Interface hepatitis</td>
<td>0.1526 (0.01384 - 0.2855)</td>
<td>0.0267</td>
<td>0.1782 (0.04018 - 0.3095)</td>
<td>0.0095</td>
</tr>
<tr>
<td>Mallory-Denk bodies</td>
<td>0.2826 (0.1495 - 0.4057)</td>
<td>&lt;0.0001</td>
<td>0.3430 (0.2142 - 0.4600)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>NAFLD Activity Score</td>
<td>0.3964 (0.2724 - 0.5075)</td>
<td>&lt;0.0001</td>
<td>0.4953 (0.3826 - 0.5934)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>NASH status</td>
<td>0.3160 (0.1851 - 0.4359)</td>
<td>&lt;0.0001</td>
<td>0.3996 (0.02759 - 0.5102)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

NITS VCTE referral rate Hepatologist referral rate (LS ≥8.0 kPa) False negative (LS ≥8.0 kPa)
|               |               |               |
|---------------|---------------|---------------|---------------|
| APRI ≥0.5     | 9.7%          | 5.5%          | 16.9%         |
| FIB-4 ≥1.3    | 32.6%         | 11.9%         | 10.6%         |
| NFS ≥1.455    | 71.1%         | 20.0%         | 5.8%          |
two subsets. GP+ was trained to identify the presumed MAFLD clinical stages: N0 no-fibrosis/steatosis, N1 steatosis only, N2 fibrosis non-bridging, N3 fibrosis bridging with reference the liver biopsy and using AUROCs (95%CI).

**Results:** Characteristics: 56% males, median age 59.5yo, BMI 31.5, ALT 55IU/l. The AUROCs for F3F4, for GP+ and FIB-4 in the subsets 1 and 2 were, respectively: 0.806 (0.737–0.841) vs. 0.807 (0.630–0.756, p = NS) and 0.759 (0.701–0.808) vs. 0.757 (0.698–0.805, p = NS) in the subset 2. FIB4 underperformed in males aged ≥65yo for identifying F3F4 stages in both subsets 1 and 2: 0.586 (0.451–0.695, p = NS vs. hazard and p = 0.02 vs GP+).

**Conclusion:** In a MAFLD cohort LIVERFASt GP+, compared to FIB-4, demonstrated several advantages to identify MAFLD from steatosis to bridging fibrosis without grey zone and no drawbacks related to age and male gender.

**SAT-432**

**Velacur ACE outperforms CAP for liver fat quantification using MRI PDFF as the gold standard**

Rohit Loomba1, Alnoor Ramji2, Tarek Hassanein3, Emily Peng4, Caitlin Schneider5, Michael Curry6. 1University of California San Diego, La Jolla, United States; 2The University of British Columbia, Vancouver, Canada; 3Southern California Research Center, United States; 4Vancouver Coastal Health (VCH), Vancouver, Canada; 5Sonic Incytes Medical Corp., Vancouver, Canada; 6Beth Israel Deaconess Medical Center, Boston, United States

**Background and aims:** With the global rise of non-alcoholic fatty liver disease (NAFLD) and the potential new therapeutics, it is imperative to accurately measure the amount of fat in the liver. Although Magnetic Resonance Imaging Proton Density Fat Fraction (MRI PDFF) has become the gold standard in non-invasive liver fat assessment, two point of care methods are presented here in comparison to MRI PDFF: Velacur’s Attenuation Coefficient Estimation (ACE) and FibroScan’s Controlled Attenuation Parameter (CAP).

**Method:** Velacur ACE was compared to CAP in patients with clinically proven NAFLD or non-alcoholic steatohepatitis (NASH). The study was completed at five sites in the US and Canada. All patients received a contemporaneous magnetic resonance imaging proton density fat fraction (MRI PDFF) scan. Using the MRI PDFF cut offs of 5%, 15%, and 20%, the AUROC and 95% confidence intervals were computed for both ACE and CAP, allowing for the optimal cutoff for this set of patients. DeLong’s test was used to compare the AUC’s. The overall correlation coefficient and correlation for BMI categories for both ACE and CAP to MRI PDFF was calculated.

**Results:** A total of 164 patients were enrolled into this study. Of these, 132 had complete data sets. The average MRI PDFF for all patients was 13.8 ± 8.7%, with the average for ACE and CAP being 310. ± 54 dB/m and 304. ± 60 dB/m respectively. There were 21, 56, 26 and 29 patients in the ≤5%, 5–15%, 15–20% and >20% groups respectively. Using the MRI PDFF cut offs of ≤5%, ≤15%, and ≤20%, ACE was able to separate the patients with AUROC [95% confidence interval] of 0.816 [0.715, 0.917], 0.878 [0.823, 0.940] and 0.902 [0.846, 0.945] respectively. CAP has AUCs of 0.859 [0.766, 0.919], 0.820 [0.731, 0.891] and 0.797 [0.700, 0.864]. DeLong’s test showed that the AUC of ACE and CAP were statistically different for separation patients with >20% fat. The correlation coefficient (r) between ACE and PDFF was 0.69, while r for CAP and PDFF was 0.59. When separating the patients into <27 kg/m², 27–33 kg/m², and ≥33 kg/m², the correlation coefficients were 0.71, 0.68, and 0.68 for ACE, and 0.60, 0.58, and 0.59 for CAP respectively.
When examining the graph, colored by BMI category, there were 5 patients with CAP of 390 dB/m or more but MRI PDFF ≤20% indicating a possible overestimation by CAP. Of these, 60% were in the highest BMI category.

**Conclusion:** At each fat percentage, Velacur ACE shows a numerically higher AUC than FibroScan CAP and was statistically different for patients with the highest measures of liver fat. The correlation coefficients between ACE and MRI PDFF were greater than that of CAP, in all patients and in each BMI category. Velacur ACE was shown to be a superior point-of-care method for measuring liver fat in patients with NAFLD and NASH.

**SAT-433**

Assessing the role of organokines as biomarkers for diagnosing non-alcohol related liver disease

Andrea Jiménez Franco1, Cristian Martínez Navidad2, Cristina Placed1, Helena Castañé2, Jordi Camps3, Jorge Joven3. 1Universitat Rovira i Virgili, Unitat de Recerca Biomèdica, Reus, Spain; 2Fundació IISPV, Unitat de Recerca Biomèdica, Reus, Spain; 3Hospital Universitari Sant Joan de Reus, Unitat de Recerca Biomèdica, Reus, Spain

Email: andreajfranco99@gmail.com

**Background and aims:** Non-alcoholic Fatty Liver Disease (NAFLD) and obesity are widespread global health issues. NAFLD starts as simple fat buildup in the liver and can progress to non-alcoholic fatty liver disease (NASH).
Gastroenterology, Amsterdam, Netherlands; 2OLVG Hospital, General Pediatrics, Netherlands

Fibrokids cohort

alcoholic fatty liver disease using transient elastography, Dutch Evaluating the prevalence of liver fibrosis in children with non-alcoholic fatty liver disease (NAFLD). Our cohort consisted of 322 children, 64% male. Median age 13 years [11.00, 15.75], BMI z-score 3.5 (0.63). The prevalence of probable significant fibrosis differed significantly from 1.5% in the normal ALT group and 16.3%, 18.6% and 41.2% in three elevated ALT groups (p < 0.001). (Figure 1). Lasso regression for variable selection with subsequent logistic regression showed that fibrosis was correlated with male gender (OR = 2.98) higher age (OR = 1.39), ALT>80 IU/L (OR = 15.66), higher BMI z-score (OR = 3.20) and presence of acanthosis nigricans (OR = 5.67).

Results: We identified significant differences in the organokines profile between healthy volunteers and NAFL patients regarding the analyzed organokines' profile. However, only Adiponectin and FGF21 were found to be significantly related to hepatic histological features. Significant differences were found between healthy volunteers and NAFL patients regarding the analyzed organokines profile. However, only Adiponectin and FGF21 were found to be associated with NAFLD progression. Organokines' concentration was not significantly related to hepatic histological features.

Conclusion: Significant differences were found between healthy volunteers and NAFL patients regarding the analyzed organokines' profile. However, only Adiponectin and FGF21 were found to be associated with NAFLD progression. Organokines' concentration was not significantly related to hepatic histological features.

SAT-434 Evaluating the prevalence of liver fibrosis in children with non-alcoholic fatty liver disease using transient elastography, Dutch Fibriokids cohort

Jalina Rooseboom1, Laura Draijer1, Malika Chegmary2, Marc Benninga1, Bart Koot1.
1Amsterdam University Medical Centre, Pediatric Gastroenterology, Amsterdam, Netherlands; 2OLVG Hospital, General Pediatrics, Netherlands
Email: j.b.rooseboom@amsterdamumc.nl

Background and aims: Major international guidelines currently recommend screening for non-alcoholic fatty liver disease (NAFLD) in children with obesity, but the method for screening is not forthright due to insufficient evidence. This study evaluates the screening for advanced NAFLD guided by alanine aminotransferase (ALT) based screening algorithm and identifies additional risk factors for probable significant fibrosis.

Method: A prospective cohort study in children (8–18 years) with obesity or overweight with at least one metabolic risk factor visiting our University Clinic after referral from local obesity outpatient clinics. Referral was based on the three ALT thresholds defined in the NASPCHAN 2017 Clinical Practice Guideline. Additionally, a fourth group of children with obesity and normal ALT was analysed. Transient elastography (Fibroscan) was used to detect probable significant fibrosis with a cut-off of 7.4 kPa.

Results: Our cohort consisted of 322 children, 64% male. Median age 13 years [11.00, 15.75], BMI z-score 3.5 (0.63). The prevalence of probable significant fibrosis differed significantly from 1.5% in the normal ALT group and 16.3%, 18.6% and 41.2% in three elevated ALT groups (p < 0.001). (Figure 1). Lasso regression for variable selection with subsequent logistic regression showed that fibrosis was correlated with male gender (OR = 2.98) higher age (OR = 1.39), ALT>80 IU/L (OR = 15.66), higher BMI z-score (OR = 3.20) and presence of acanthosis nigricans (OR = 5.67).

Figure:

Conclusion: ALT is a strong predictor of probable significant fibrosis in screening population of children with obesity and overweight, supporting its use as a primary screening test. Fibrosis evaluation for children with obesity with ALT>80 IU/L seems warranted. In children with lower elevated ALT levels this needs further evaluation balancing risk, benefits and costs. Gender, age, BMI and presence of acanthosis nigricans could be taken into account in this consideration.

SAT-436 The impact of projected increases in obesity prevalence on incident liver disease in the UK: insights from bayesian-network modelling

Tom Waddell1,2, Ana Namburete3, Paul Duckworth1, Daniel Cuthbertson4, Celeste McCracken3, John Michael Brady2. 1The University of Oxford, Department of Engineering Science, Oxford, United Kingdom; 2Perspectum Ltd, United Kingdom; 3The University of Oxford, Department of Computer Science, Oxford, United Kingdom; 4University of Liverpool, United Kingdom; 5The University of Oxford, United Kingdom
Email: tom.waddell@perspectum.com

Background and aims: Obesity is a complex multi-system disease and a growing public health challenge. Recent projections estimate that 71% of adults living in England will be overweight or obese by 2040, with the percentage of people living with obesity (37%) surpassing that of those of a ‘healthy weight’. Obesity is associated with non-alcoholic fatty liver disease and non-alcoholic steatohepatitis (NASH) and a complex set of variables that interact in myriad ways. We use Bayesian-network (BN) analysis applied to a large UK-based cohort, specifically magnetic resonance imaging (MRI) derived measures of liver steatosis and fibroinflammation, both to explore likely projected increases in obesity prevalence and to illustrate the power of BN methods to address such complexity.

Method: Proton density fat fraction [PDFF]) and corrected T1 (cT1) were obtained from 27,002 UK Biobank cases (application 9914). These were combined with additional participant data to construct a BN. Each directed edge is supported by medical literature, making it a “semantic” BN. BNs explicitly model conditional dependencies as a directed acyclic graph, where network variables denote biomarkers and the directed edges connecting such variables the direction of causality. The probabilities of being normal weight, overweight, obese, and severely obese in this dataset were then fixed to 2040 projections (29%, 27%, 37% and 7%, respectively), and conditional probability queries explored the resultant changes in the probability of liver steatosis and NASH (defined by PDFF >10% and cT1 >800 ms).

Results: The rate of obesity in the study population was substantially lower than the UK population estimate (16% vs 29%). Fixing the variable ‘Obesity’ to 2040 projections resulted in an 8% (2160 participants), 5% (1350) and 3% (800) increase in the probability of severe steatosis (PDFF >10%), moderate steatosis (PDFF 5.6–10%) and NASH, respectively. We observed a 2% (470 participants) and 6% (1620 participants) increase in the probability of elevated blood glucose (HbA1c >42 mmol/mol) and hypertension, respectively.
Furthermore, when fixing the value of ‘Obesity’ to projected obesity estimates in areas of low socioeconomic status (46%), we observed an additional 1440 and 550 participants with severe steatosis and NASH, respectively, above our previous estimates for the entire UK population. Such increases equate to an additional £7.5 million in direct NASH-related costs within our population of 27,002 participants, only <1% of the entire UK population.

Figure: Bayesian-network structure (here the probabilities of ‘Obesity’ have been fixed to 2040 projections). Waist circum = waist circumference; LDL = low density lipoprotein; HDL = high density lipoprotein; H.chol = high cholesterol; HTN = hypertension; MI = myocardial infarction; MS = metabolic syndrome.

Conclusion: BN analysis models the complexity of liver disease and, in this case, illustrates a ‘best case scenario’ of the impact of projected increases in obesity on liver disease. This disproportionately impacts areas of low socio-economic status, and the cost associated with increasing rates of NASH.

SAT-437

The prevalence and predictors of non-alcoholic fatty liver disease by vibration controlled transient elastography among lean adults in the United States

Ifrah Fatima1, Mohamed Ahmed1, Wael Mohamed1, Alisa Likhitsup2.
1University of Missouri - Kansas City School of Medicine, United States; 2Saint Luke’s Hospital System, United States
Email: ifrahfatima@umkc.edu

Background and aims: Non-Alcoholic Fatty Liver Disease (NAFLD) affects about 25–30% of individuals worldwide. About 16.7% of all NAFLD individuals are lean. This study aims to identify the prevalence and predictors of NAFLD among lean United States (US) adults.

Method: Lean adults ≥18 years of age from the National Health and Nutrition Examination Survey (NHANES) 2017-2018 with BMI <25 in 18 years of age from the National Health and Nutrition Examination Survey (NHANES) 2017-2018 with BMI <25 in

SAT-438

Utility of SomaSignalTM panels for drug response and monitoring disease progression in patients with advanced fibrosis due to non-alcoholic steatohepatitis

Kris Kowdley1, Kaiyi Zhu2, Jun Xu2, Jason Melehan2, Lisa Boyette2, Timothy R. Watkins2, Sharlene Lim3, Vlad Malkov4, Andrew Billin5, Mazen Noureddin6, Rohit Loomba1.
1Liver Institute Northwest, Seattle, United States; 2Gilead Sciences, Inc., United States; 3Houston Research Institute, United States; 4NAFLD Research Center, Division of Gastroenterology and Hepatology, Medicine, United States
Email: roloomba@health.ucsd.edu

Background and aims: Non-alcoholic steatohepatitis (NASH) is characterized by liver steatosis, inflammation, and hepatocellular ballooning and may lead to progressive fibrosis and cirrhosis. Changes in NASH activity score (NAS) and fibrosis stage by histology are commonly used to assess treatment response in clinical trials. However, liver biopsy is subject to sampling variability, invasive, and expensive; thus reliable non-invasive tests to measure treatment response are needed. SomaSignalTM NAS scores provide a predictive probability and binary classification of the presence of the individual histological components of liver biopsy (Fibrosis, Inflammation, Steatosis, Ballooning). Our study aimed to apply composite serum biomarker panels, SomaSignalTM NAS scores, to evaluate hepatic steatosis, lobular inflammation, hepatocyte ballooning and liver fibrosis in a randomized, placebo-controlled, phase 2b NASH clinical study.

Method: A total of 198 patients with bridging fibrosis or compensated cirrhosis (F3-F4) due to NASH were randomized to placebo, cilofexor (CIL) 30 mg or firsocostat (FIR) 20 mg alone, or two-drug combination groups. Fibrosis stage and NAS were staged according to NAS CRN. Serum proteome was analyzed in 166 subjects with paired baseline (BL) and Week 48 (W48) samples via SomaScan® (SomaLogic, Boulder, CO). Associations of SomaSignalTM scores with NAS components and fibrosis stage were assessed by Jonckheere’s trend test, and the binary classification results were evaluated by Fisher’s exact test. The changes in SomaSignalTM NAS scores at W48 from BL (on the logit scale) among the treatment groups were compared by a linear model adjusting for age, gender, diabetes, and baseline cirrhosis status.

Results: NAS SomaSignalTM scores showed strong correlation with histologic features (p < 0.001), and the binary classification prediction results were largely consistent with biopsy histology (AUC >0.72; p < 0.005). At W48, combination therapy significantly reduced all SomaSignalTM scores compared to placebo (all p < 0.05). FIR monotherapy significantly reduced the SomaSignalTM fibrosis and hepatocyte ballooning scores but not the other SomaSignalTM scores; CIL monotherapy numerically reduced the SomaSignalTM score (Figure). Through W48, 15 of 67 NASH patients had reduced (reduction ≥1) fibrosis stage by biopsy in the combo cohort. Compared to patients without histological improvement, NASH patients with improved
Table 1. Odds Ratios and 95% CI of predictors associated with NAFLD among lean U.S. Adults

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Unadjusted OR (95% CI)</th>
<th>p-value</th>
<th>Adjusted OR (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-39</td>
<td>Reference</td>
<td></td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>40-59</td>
<td>3.43 (2.55 - 4.60)</td>
<td>&lt;0.0005</td>
<td>1.91 (1.40 - 2.60)</td>
<td>&lt;0.0005</td>
</tr>
<tr>
<td>≥ 60</td>
<td>4.22 (3.23 - 5.52)</td>
<td>&lt;0.0005</td>
<td>2.22 (1.59 - 3.11)</td>
<td>&lt;0.0005</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>Reference</td>
<td>0.004</td>
<td>Reference</td>
<td>0.03</td>
</tr>
<tr>
<td>Male</td>
<td>1.52 (1.16 - 1.96)</td>
<td></td>
<td>1.47 (1.04 - 2.06)</td>
<td></td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NH White</td>
<td>Reference</td>
<td></td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>NH Black</td>
<td>0.59 (0.43 - 0.82)</td>
<td>0.03</td>
<td>0.65 (0.50 - 0.85)</td>
<td>0.004</td>
</tr>
<tr>
<td>NH Asian</td>
<td>0.96 (0.70 - 1.33)</td>
<td>0.82</td>
<td>1.85 (1.26 - 2.70)</td>
<td>0.004</td>
</tr>
<tr>
<td>Mexican/Other Hispanic</td>
<td>1.46 (1.13 - 1.88)</td>
<td>0.007</td>
<td>1.41 (1.02 - 1.96)</td>
<td>0.04</td>
</tr>
<tr>
<td>Others</td>
<td>1.76 (0.98 - 3.16)</td>
<td>0.06</td>
<td>1.36 (0.73 - 2.53)</td>
<td>0.31</td>
</tr>
<tr>
<td><strong>BMI</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;18.5</td>
<td>Reference</td>
<td>0.17</td>
<td>Reference</td>
<td>0.61</td>
</tr>
<tr>
<td>18.5 - 24.4</td>
<td>0.49 (0.16 - 1.55)</td>
<td></td>
<td>0.64 (0.14 - 3.05)</td>
<td></td>
</tr>
<tr>
<td>25 - 29.9</td>
<td>3.82 (3.11 - 4.69)</td>
<td>&lt;0.0005</td>
<td>3.13 (2.33 - 4.21)</td>
<td>&lt;0.0005</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>Reference</td>
<td></td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>Widowed</td>
<td>0.97 (0.59 - 1.58)</td>
<td>0.90</td>
<td>0.66 (0.34 - 1.11)</td>
<td>0.11</td>
</tr>
<tr>
<td>Divorced</td>
<td>0.74 (0.43 - 1.26)</td>
<td>0.25</td>
<td>0.72 (0.37 - 1.34)</td>
<td>0.28</td>
</tr>
<tr>
<td>Separate</td>
<td>0.88 (0.47 - 1.63)</td>
<td>0.67</td>
<td>1.33 (0.51 - 3.45)</td>
<td>0.53</td>
</tr>
<tr>
<td>Never married</td>
<td>0.28 (0.21 - 0.38)</td>
<td>&lt;0.0005</td>
<td>0.68 (0.42 - 1.10)</td>
<td>0.11</td>
</tr>
<tr>
<td>Living with partner</td>
<td>0.48 (0.31 - 0.74)</td>
<td>0.001</td>
<td>0.74 (0.50 - 1.09)</td>
<td>0.12</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than high school</td>
<td>Reference</td>
<td></td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>High school graduate</td>
<td>0.70 (0.53 - 0.92)</td>
<td>0.015</td>
<td>0.96 (0.76 - 1.21)</td>
<td>0.39</td>
</tr>
<tr>
<td>Some college or AA degree</td>
<td>0.74 (0.53 - 1.03)</td>
<td>0.07</td>
<td>1.19 (0.86 - 1.65)</td>
<td>0.85</td>
</tr>
<tr>
<td>College graduate or higher</td>
<td>0.65 (0.47 - 0.90)</td>
<td>0.014</td>
<td>0.89 (0.62 - 1.27)</td>
<td>0.31</td>
</tr>
<tr>
<td><strong>Chronic medical Conditions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>0.43 (0.35 - 0.53)</td>
<td>&lt;0.0005</td>
<td>0.89 (0.59 - 1.35)</td>
<td>0.57</td>
</tr>
<tr>
<td>Hypertension</td>
<td>2.63 (1.99 - 3.49)</td>
<td>&lt;0.0005</td>
<td>0.88 (0.73 - 1.07)</td>
<td>0.18</td>
</tr>
<tr>
<td>Diabetes or Prediabetes</td>
<td>2.97 (2.12 - 4.15)</td>
<td>&lt;0.0005</td>
<td>0.98 (0.78 - 1.24)</td>
<td>0.87</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>2.20 (1.66 - 2.92)</td>
<td>&lt;0.0005</td>
<td>1.18 (0.86 - 1.61)</td>
<td>0.28</td>
</tr>
<tr>
<td>cardiovascular disorders</td>
<td>2.39 (1.80 - 3.15)</td>
<td>&lt;0.0005</td>
<td>1.03 (0.77 - 1.39)</td>
<td>0.24</td>
</tr>
<tr>
<td><strong>HbA1c</strong></td>
<td>2.48 (2.09 - 2.93)</td>
<td>&lt;0.0005</td>
<td>1.54 (1.25 - 1.91)</td>
<td>0.001</td>
</tr>
<tr>
<td>Total Cholesterol</td>
<td>1.006 (1.003 - 1.000)</td>
<td>0.001</td>
<td>1.00 (0.99 - 1.004)</td>
<td>0.89</td>
</tr>
<tr>
<td>Triglyceride</td>
<td>1.01 (1.009 - 1.01)</td>
<td>&lt;0.0005</td>
<td>1.006 (1.004 - 1.009)</td>
<td>&lt;0.0005</td>
</tr>
<tr>
<td>HDL</td>
<td>0.97 (0.97 - 0.98)</td>
<td>&lt;0.0005</td>
<td>1.004 (0.99 - 1.02)</td>
<td>0.99</td>
</tr>
</tbody>
</table>

*Adjusted for age, gender, race, BMI, marital status, education level, chronic medical conditions, total cholesterol, triglyceride, and HDL level.

*Includes heart failure, coronary heart disease, angina, heart attack, stroke.
The least square means with the 95% confidence interval (CI) of the predicted NASH SomaSignal score changes at W48 from BL (A. Fibrosis B. Lobular inflammation C. Hepatocyte ballooning D. Steatosis) are shown for each treatment arm. Statistical significance of each treatment arm against placebo is annotated as follows: **** for \( P < 0.001 \), *** for \( P < 0.01 \), ** for \( P < 0.05 \), “ns” for \( P > 0.05 \).

**Conclusion:** The proteomic SomaSignal™ NASH scores including measures of hepatic steatosis, lobular inflammation, hepatocyte ballooning and liver fibrosis showed significant correlations with NASH CRN fibrosis stage and NAS components. Greater reductions of SomaSignal™ fibrosis and NAS scores were observed in the combo treatment group, consistent with the observed histological changes. We propose that SomaSignal platform may be useful to assess treatment responses in NASH trials.

SAT-439

**Wearable technology utilizing an electrical impedance tomography (EIT) system for hepatic steatosis quantification and the role in ambulatory monitoring**

Lung Yi Loey Mak¹, James H.W. Li²,³, Adrien Touboul¹, Fedi Zouari¹, Pak-To Cheung², Eddie Wong¹,², Iris Y. Zhou⁴, Ellie Wei¹, Man-Fung Yuen¹, Russell Chan³, Wai-Kay Seto¹. ¹The University of Hong Kong, School of Clinical Medicine, Hong Kong; ²The Hong Kong University of Science and Technology, Hong Kong; ³Gense Technologies Ltd, Hong Kong; ⁴Massachusetts General Hospital and Harvard Medical School, Radiology, Massachusetts, United States

Email: wkseto@hku.hk

Figure: (abstract: SAT-438): Combination Therapy with Cilofexor and Firsocostat Reduced SomaSignal™ NASH Scores Compared to Placebo
Background and aims: The current effective treatment for patients with non-alcoholic fatty liver disease (NAFLD) is achieving weight loss through lifestyle modifications. We developed a wearable device using the electrical impedance tomography (EIT) technology to quantify hepatic steatosis (part 1). In this pilot study, we then explored the role of ambulatory monitoring of hepatic steatosis using the EIT system (part 2).

Method: In part 1, 21 healthy controls and 43 patients with known NAFLD were recruited for cross-sectional evaluation by vibration controlled transient elastography (VCTE), which can measure hepatic steatosis by controlled attenuation parameter (CAP). The EIT examination was performed after VCTE with a 16-electrode belt worn on the waist connected to a portable non-ionizing non-invasive system, which is designed for use without the need of trained operators. A random subgroup of subjects with NAFLD (n=27) also underwent magnetic resonance imaging proton density fat fraction (MRI-PDFF) to further validate the accuracy of the wearable EIT system (Figure A). In part 2, 8 subjects (2 with NAFLD, 6 healthy controls) were recruited and underwent EIT scan at baseline and every 2 weeks. VCTE was performed at baseline and week 8 for CAP values. Significant CAP reduction was defined as ≥40 dB/m decline from baseline.

Results: Part 1: The predicted CAP by EIT system achieved area under the receiver-operating characteristic curve (AUROC) of 0.799 (Figures B and C), with 86.1% sensitivity and 71.4% specificity. The predicted MRI-PDFF score by EIT system achieved AUROC of 0.782 (Figures D and E), with 77.8% sensitivity and 80% specificity. Part 2: All 8 subjects underwent ambulatory monitoring using the EIT system at a frequency of ≥3 times over the 8-week observation period, confirming feasibility of this approach. 5/8 (62.5%) subjects, including the 2 subjects with known NAFLD, achieved significant CAP reduction (Figure F). EIT and CAP values at baseline and week 8 yielded 8 pairs of values, with 14/16 (87.5%) concordance in categorizing liver fat quantity. Most subjects agreed the wearable was easy to use (87.5%), confident to self-administer at home (75%), and accept the need to use on a long-term basis (62.5%). No subjects experience intractable discomfort.

Conclusion: The novel portable EIT system can predict VCTE-derived CAP and MRI-PDFF, allowing a safe, well-tolerated and low-cost ambulatory alternative for hepatic steatosis quantification.

SAT-440
Head-to-head comparison of Agile 3+, LSM-VCTE, NFS, and FIB-4 scores for detecting advanced fibrosis in patients with type 2 diabetes seen in diabetes clinic
Laurent Castéra1, Tiphaine Vidal-Trecan2, Tania Khoury3, Jean-Baptiste Julla2, Valérie Paradis4, Jean-Pierre Riveline5, Dominique Valla1, Jean-François Gautier5, Beaugen hospital, Université Paris Cité, Hepatology, Clichy, France; 2Lariboisiere hospital, Diabetology, Paris, France; 3Beaugen hospital, Hépato, Clichy, France; 4Beaugen hospital, Université Paris Cité, Pathology, Clichy, France; 5Lariboisiere hospital, Université Paris Cite, Diabetology, Paris, France
Email: laurent.castera@bjn.aphp.fr

Background and aims: Among patients with type 2 diabetes (T2D), prevalence of NAFLD and advanced fibrosis is high. Identification of these patients is a priority as advanced fibrosis is the main prognostic factor associated with liver outcomes and overall mortality. Non-invasive tests (NITs) based on vibration-controlled transient elastography (VCTE), including Agile 3+, LSM (liver stiffness measurement), and serum-based scores such as FIB-4, and NAFLD fibrosis score (NFS) have been proposed recently for this purpose. Data comparing the performance of these tests in patients with T2D are lacking. The aim of this study was to compare head-to-head, the performance of Agile 3+, LSM, FIB-4 and NFS, for detecting advanced fibrosis in a large cohort of T2D patients with suspected NAFLD.

Method: Among 1620 T2D outpatients seen in a diabetes clinic between June 2019 and February 2022 screened for NAFLD (steatosis and or elevated ALT) who had VCTE, 174 underwent a liver biopsy (LB). Agile 3+, FIB-4, and NFS scores were calculated according to published cutoffs used were those published for Agile 3+ (<0.351, ≥0.679) as well as those recommended by guidelines for NFS (<1.455, >0.676), FIB-4 (<1.3, >2.67) and LSM (<8, ≥12 kPa)), Comparison of performance was done by comparing AUCs using the DeLong’s test for paired data, and percentage of correctly
POSTER PRESENTATIONS

classified patients (true positive and true negative) taking liver biopsy as a reference.

Results: 163 patients had all data available for head-to-head comparison. Their characteristics were as follows: male 58%; median age 59 years; BMI 32 kg/m²; waist circumference 108 cm; HbA1c 7.7%; AST 35 IU/L; ALT 47 IU/L; advanced fibrosis 30%. Performances of scores are shown in the Table. LSM and Agile 3+ had similar accuracy (AUROCs 0.87 vs. 0.85, p = 0.43) but LSM outperformed FIB-4 (0.87 vs. 0.75; p = 0.009) and NFS (0.87 vs. 0.66; p < 0.0001). The grey zone (patients between the two cutoffs) was higher for NFS than for Agile 3+, LSM and FIB-4. LSM and Agile 3+ had a higher rate of correctly classified patients than NFS and FIB-4.

Table: Comparison of performance of Agile 3+, NFS, FIB-4 and LSM in 163 T2D patients with liver biopsy.

<table>
<thead>
<tr>
<th>Scores</th>
<th>AUROC (95% CI)</th>
<th>P value</th>
<th>Cut-offs</th>
<th>Se</th>
<th>Sp</th>
<th>PPV</th>
<th>NPV</th>
<th>Grey Zone</th>
<th>Correctly classified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agile 3+</td>
<td>0.85 (0.79-0.91)</td>
<td>0.43</td>
<td>&lt;0.351</td>
<td>0.94</td>
<td>0.47</td>
<td>0.95</td>
<td>35%</td>
<td>54%</td>
<td></td>
</tr>
<tr>
<td>NFS</td>
<td>0.66 (0.56-0.75)</td>
<td>-10.4</td>
<td>-1.455</td>
<td>0.82</td>
<td>0.30</td>
<td>0.79</td>
<td>57%</td>
<td>31%</td>
<td></td>
</tr>
<tr>
<td>FIB-4</td>
<td>0.75 (0.66-0.83)</td>
<td>0.009</td>
<td>&lt;1.3</td>
<td>0.69</td>
<td>0.63</td>
<td>0.83</td>
<td>39%</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>LSM</td>
<td>0.87 (0.82-0.93)</td>
<td>ref</td>
<td>&lt;8 KPa</td>
<td>0.96</td>
<td>0.60</td>
<td>0.97</td>
<td>36%</td>
<td>57%</td>
<td></td>
</tr>
</tbody>
</table>

*Performance comparisons of NTFs with respect to histologic results using De Long’s test for paired data.

Conclusion: LSM and Agile 3+ score outperformed FIB-4 and NFS for identifying advanced fibrosis in T2D patients with suspected NAFLD.

SAT-441
Screening for advanced fibrosis due to NAFLD in patients with type 2 diabetes in a retina scanning facility
Andrea Lindfors1,2, Rickard Strandberg1, Hannes Hagström1,2
1Karolinska Institutet, Department of Medicine, Huddinge, Sweden; 2Karolinska University Hospital, Division of Hepatology, Department of Upper GI Diseases, Stockholm, Sweden
Email: andrea.lindfors@ki.se

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is prevalent in patients with type 2 diabetes (T2D), and international guidelines suggest specific screening for advanced fibrosis. However, how this should be implemented is less clear. Here, we evaluated the feasibility of offering patients with T2D that attended a retina scanning facility as part of their routine care to also undergo vibration-controlled transient elastography (VCTE) to detect NAFLD and advanced fibrosis.

Method: Patients with T2D who attended retina scanning at a single facility between 2020 and 2022 were asked for participation. Patients were assessed for clinical characteristics and underwent VCTE after a two-hour fasting period. NAFLD and advanced fibrosis were defined as controlled attenuation parameter (CAP) values of ≥280 dB/m and ≥12 kPa, respectively. Patients with liver stiffness ≥8 kPa were referred to the Karolinska University Hospital for a liver evaluation, a second VCTE examination and offered standard clinical care.

Results: 1102 eligible patients were asked for participation, of which 818 (74%) were included. The mean age was 65 years (SD 9.6) and 62% were men. 51% had a CAP value of 280 dB/m or more, indicating NAFLD, and 137 (17%) had a liver stiffness above or equal to 8 kPa, with 45 (6%) having values suggestive of advanced fibrosis (≥12 kPa). Of those with values above or equal to 8 kPa, 93/137 patients (68%) have so far accepted and been referred for a liver evaluation, while 28 (20%) were lost to follow-up and 16 (12%) are waiting for a follow-up.

At repeat VCTE measurement, 41/93 persons (44%) had a normal VCTE (<8 kPa), and 29 (31%) had values between 8 and 11.9 kPa, while advanced fibrosis was found in 23/93 persons (25%).

Conclusion: Offering patients with T2D opportunistic screening with VCTE at the time of routine retina scanning is accepted by a high proportion. NAFLD and advanced fibrosis are common in this population, however false-positive findings are also frequent and risks of overdiagnosis needs to be considered if implementing this in routine clinical care.

SAT-442
MRI-PDFF captures the whole spectrum of lipid composition beyond traditional histological evaluation of macrosteatosis
David Marti-Aguado1,2, María Pilar Ballestero1,2, Victor Merino2, Salvador Benítez2, Ana Crespo2, Elena Coello1, Victoria Aguilerasanchez2, Cristina Montón2, Mercedes De La Torre Sanchez2, Moises Diago3, Matias Fernandez-Patón1, Amadeo Ten-Esteve2, Alba Sánchez-Martín4, Clara Alfaro-Cervello5,6,9,10, Judith Pérez11, Monica Bauza11, Victor Puglia12,13, Alexander Perez Girbes7,13, Desamparados Escudero-García1,2,10, Luis Martín-Bonmati7,13,14, INCLIVA Institut d’Investigació Sanitària, Hepatology Department, Valencia, Spain; 2Hospital Clinico Universitari, Hepatology Department, Valencia, Spain; 3Hospital Arnau de Vilanova, Hepatology Department, Valencia, Spain; 4La Fe University and Polytechnic Hospital, Hepatology Department, Valencia, Spain; 5Hospital de Investigació Sanitària, Valencia, Spain; 6Institut d’Investigació Sanitària La Fe de Valencia, Valencia, Spain; 7Hospital Arnau de Vilanova, Hepatology Department, Valencia, Spain; 8University of Valencia, Valencia, Spain; 9INCLIVA Institut d’Investigació Sanitària, Valencia, Spain; 10University of Valencia, Valencia, Spain; 11La Fe University and Polytechnic Hospital, Pathology Department, Valencia, Spain; 12Hospital Arnau de Vilanova, Pathology department, Valencia, Spain; 13La Fe University and Polytechnic Hospital, Radiology, Valencia, Spain
Email: davidmmaa@gmail.com

Background and aims: The histologic evaluation of hepatic steatosis is based on the percentage of hepatocytes with macrovesicular steatosis, ignoring the lipid composition. MRI-PDFF is the most accurate non-invasive method for detecting hepatic steatosis. We aimed to evaluate the influence of lipid droplets composition in PDFF values.

Method: Prospective, multicenter study including chronic liver disease patients with paired liver biopsy and MRI between 2017-2022. MR examination included the MECSE sequence to measure PDFF after automatic whole-liver segmentation. Histologic samples were evaluated with conventional microscope and digital image analysis (Ventana iScan HT). Slides were stained with HandE for semiquantitative scoring of steatosis according to NAS-CRN system (0−3 macrosteatosis grade and presence/absence of microsteatosis) and IHQ adipophilin for digital pathology assessment. Lipid droplets were categorized as large macrovesicular steatosis (≥80 μm²), small
macrovesicular (<80 μm²) and microsteatosis (non-droplet positive adipophilin). Fat proportionate areas (FPA) and number of lipid droplets were measured with digital pathology. Total FPA was calculated as: large-droplet FPA + small-droplet FPA + microsteatosis FPA. Total lipid droplets were calculated as: number of large-droplets + small-droplets macrovesicular steatosis.

**Results:** There were 206 patients (57% women; 55 ± 12 years) with mean PDFF of 11.9 ± 4.9%. Main liver disease aetiology was fatty liver (61% NAFLD, 6% ALD), followed by autoimmune diseases (22%) and viral hepatitis (6%). Histologic steatosis distribution included 37% S0, 23% S1, 19% S2, 21% S3. The strength of PDFF-FPA correlation increased with lipid droplet size as follows: r = 0.74 for microsteatosis, r = 0.78 for small-droplet macrovesicular, r = 0.84 for large-droplet macrovesicular; being higher (r = 0.88) for total FPA. The correlation between PDF and number of lipid droplets also increased as follows: r = 0.70 for small-droplet macrovesicular, r = 0.85 for large-droplet macrovesicular; being higher (r = 0.87) for total lipid droplets. In all steatosis grades (S0-S3) PDFF values were higher if microsteatosis was present (Figure 1). Overall, mean PDFF was 10.8% if microsteatosis was absent vs. 14.3% if microsteatosis was present (p < 0.01).

**Conclusion:** Pathologists grading system of steatosis should consider lipid droplet composition, unifying macro and microsteatosis assessment, as MRI-PDFF correlates with the whole spectrum of hepatic steatosis.

**SAT-443**

**Two steps algorithm for the diagnosis of advanced liver fibrosis in general population. Real-life data**

Ana Pérez, Marta Hernández Conde, Christie Perelló, Diana Karen Tapia Calderón, Elba Llop, Francisco A. Bernabeu-Andreu, Javier Vega, Marta López-Gómez, Natalia Fernández Puga, Javier Abad Guerra, Carlos Fernández-Carrillo, José Luis Martínez Porras, María Traperó, Enrique Fraga, José Luis Calleja Panero. Hospital Universitario Puerta de Hierro, Spain; “Guadalajara, Guadalajara, Mexico

**Background and aims:** Chronic liver disease is an increasingly prevalent entity. Additionally, due to its silent evolution, it is an underdiagnosed disease.

**Method:** In this cohort study, Fibrosis-4 index (FIB4) was performed on all patients between 18 and 65 years old from area 6 of Madrid Community with a request for glycated hemoglobin in the routine analysis of primary care. We suggested the request of a transient elastography (TE) by the primary care physician in patients with FIB4 ≥ 1.3 in a medium time of 1 month. If TE was >8kPa, patient was referred to the Hepatology consultation. According to medical indication, a complete study was performed on those patients.

**Results:** Between April and September 2022, 1,635 patients were included (1,155 patients –70.6%- with low-risk FIB4, 439–26.9%- with indeterminate FIB4 and 41–2.5%- with high-risk FIB4). Of the 480 patients (29.4%) with FIB4 ≥ 1.3, TE was requested for 400 patients (83.3%). Of which, 376 TE (94%) were performed. The reasons for not performing TE were: not attending the appointment (22 patients), technical limitations due to obesity (2 patients). The data of the first 166 patients with TE were analyzed. The prevalence of significant fibrosis (TE>8 kPa) was 15.5% in the indeterminate FIB4 group and 55.6% in the high-risk FIB4 group (p < 0.01). In addition, the prevalence of advanced fibrosis (>9.6 kPa) was significantly higher in the high-risk FIB4 group in relation to the indeterminate FIB4 group (50 vs. 10.3%; p < 0.01).
Figure:

Baseline Characteristics (n = 383) Results

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Met</th>
<th>Confirmed by additional criteria</th>
<th>Did not meet criterion</th>
<th>Did not meet criterion but met other criteria</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>FibroScan (FS) ≤ 15 kPa</td>
<td>79%</td>
<td>94% (MRE/Plts/ELF)</td>
<td>21%</td>
<td>10% (MRE/Plts/ELF)</td>
<td>89%</td>
</tr>
<tr>
<td>FibroScan ≥ 20 kPa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MRE ≥ 4.2</td>
<td>53%</td>
<td>47%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Platelets &lt; 140 K</td>
<td>87%</td>
<td>13%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>and/or ELF ≥ 10.25</td>
<td>92%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(MRE/Plts/ELF)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FibroScan ≥ 20 kPa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MRE ≥ 4.2</td>
<td>74%</td>
<td>26%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ELF ≥ 10.25</td>
<td>66%</td>
<td>34%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Platelets &lt; 140 K</td>
<td>49%</td>
<td>51%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fib ≥ 2.35</td>
<td>32%</td>
<td>68%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: NASH cirrhosis may be predicted using imaging and biomarker tests in the absence of liver biopsy. Patients with metabolic syndrome and a history consistent with NASH and VCTE of ≥15 could be screened with other tests (ELF, MRE, platelet level) to determine a likelihood of NASH cirrhosis.

SAT-445
Assessment of hepatic fibrosis screening in primary care using the Fib-4 score, followed in second line by an ELF (Enhanced liver Fibrosis) test

Denis Ouzan1,2, Guillaume Penaranda3, Jaiel Malick4, Cornelle Jeremie5, Institut Arnauld Tzanch, France; RHECCA, France; BIOGROUP ALPHABIO-Laboratoire Européen, France; BIOGROUP BIOESTEREL-Laboratoire Mandelieu-Passero, France.

Background and aims: Screening for liver fibrosis in the general population is a public health issue. We have shown in a previous study (1) that Fib-4, a simple score combining age, ALT, AST, and platelet count, could be screened with other tests (ELF, MRE, platelet level) to determine a likelihood of NASH cirrhosis.

Method: The Fib-4 score was performed prospectively from March to September 2022 in all consecutive patients seen by 17 general practitioners (GP). Outside the emergency. When the Fib-4 was ≥1.3, it was defined as positive and confirmatory ELF test was systematically performed. The positive Fib-4 test was confirmed when the second line ELF test was ≥9.8 (indicating an advanced fibrosis).

Results: Among the 3427 patients included, 869 (25%) had a positive Fib-4 score, which was confirmed by the ELF test in 509 (59%) of cases. 35% of them were older than 65 years. Among the 869 Fib-4 positive patients, 784 (90%) were at intermediate risk (Fib-4 between 1.3 and 2.67) and 85 (10%) at high risk of fibrosis (Fib-4 ≥2.67). Fib-4 positivity was significantly linked to age over 65 years, ASAT >N and

≥15 kPa and at least one additional test (Table, "MRE/Plts/ELF"). About half of the 10% of patients excluded by these tests had confirmed F4 on biopsy. The threshold, Fib-4 ≥2.35, was not independent of low platelet criteria and was not a useful index for this CP-A population. Statin use was associated with reduced AST (AST, mean 42.28 [no statin] vs 35.16 [statin]) and Fib-4 in this population. Highly significant correlations with increasing Fib-4 (rho = 0.7), reduced platelet count (rho = −0.4), and other markers of cirrhosis progression were observed in the subgroup of patients as a function of reduced liver function as determined by HepQuant.

NASH resolution without worsening of fibrosis.
platelets levels <150 000 p < 0.001. Confirmation by ELF was observed among 80% of the patients with high risk of fibrosis, and among 51% of the patients with intermediate risk of fibrosis (p < .0001). Clinical information was obtained in 680 out of 869 (78%) of the FIB-4 positive patients. The confirmation by ELF test was significantly higher in patient with patients over 65 years (83 vs 57%, p < .0001), in patients with FIB-4 ≥2.67 (80 vs 56%, p < .0001), BMI >25 (47 vs 37%, p = 0.0121), and in those with a diabetes (24 vs 14%, p = 0.0010), but not in those with excessive alcohol consumption (15 vs 14%, p = 0.9283). Only 8% of the patients were known to have a liver disease. In the patients without known liver disease (92%), the GP define a cause in nearly one third of cases, mainly NASH.

Reference

SAT-446
Fully automated approach of machine learning combined with deep learning to forecast the coronary artery disease in patients with non-alcoholic fatty liver disease
Antonio Cirella1, Gaia Sinatti2, Angelica Bracci1, Laura Evangelista1, Pierangela Brino2, Silvano Junior Santini1, Gianluigi Greco2, Antonella Guzzo2, Francesco Calimeri2, Ernesto di Cesare1, Clara Balsamo1.1Università degli studi di L’Aquila, Italy; 2Università della Calabria, Italy
Email: cirella.nt@gmail.com

Background and aims: Non-alcoholic fatty liver disease (NAFLD) has become the most prevalent liver disease worldwide, affecting a quarter of world’s population. Growing evidence indicates that in these patients, the presence of NAFLD increases the risks cardiovascular disease (CVD) and morbidity and mortality. CVD represent the principal outcome greater than the progression of liver disease. Coronary arteries disease (CAD) is detected by Coronary CT, moreover CT is also used for the determination liver steatosis. The aim of our study was to implement ML/DL models to analyse CT images integrated with clinical parameters, in order to develop a comprehensive prognostic stratification model to forecast, in NAFLD patients, the onset of CAD.

Method: Our retrospective study analyzed clinical data and CT images of 401 patients (217 males and 184 females), who underwent coronary CT between 2017 and 2021. Images were acquired by cardiovascular synchronic technique. Hounsfield Unit (HU), Agatston score, Fib-4 score were used to measure radiodensity, calcium score (CS) and the degree of fibrosis, respectively. In order to perform disease classification, we used a combination of Machine Learning (ML) and Deep Learning (DL) algorithms. In particular, the algorithms are first trained on clinical data and CT images, respectively, and then the obtained models are properly combined. We performed an ablation study to identify the most appropriate methods, resulting in Densely Connected Convolutional Networks (Densenet-169) and K-nearest neighbors (KNN).

Results: In order to show the viability of our approach, we first test the ML algorithm on the task of binary classification using clinical data of 84 patients and, then, the DL algorithms using CT images. The results reveal that our combined approach is able to predict absent and severe CAD with a mean accuracy of 94% in NAFLD and healthy patients. Furthermore, we tested ML and DL algorithms in the task of multi classification using only clinical data of 401 patients. Our algorithms were able to distinguish patients in 5 classes from healthy patients to patients affected by NAFLD and CVD, with a mean accuracy of 87% and a mean specificity of 86% for ML and a mean accuracy of 77% and a mean specificity of 76% for DL. To improve the performance of these prediction models, we are integrating them with DL algorithms for liver CT images for all the patients.

Conclusion: Liver fibrosis was suspected by FIB4 score in 25% of patients who consulted a GP. The percentage of confirmation by the second line ELF test was significantly higher in patients with a FIB4 ≥2.67 and in those with a risk factor of liver disease overweight or diabetes, who need to be confirmed in priority. For FIB-4 positive patients without known liver disease, the FIB-4 allow the GP to recognize a liver disease in nearly one third of cases, mainly NASH.

SAT-447
Low risk FIB-4 results in patients under 50 years accurately risk assessed patients for adverse liver outcomes over a follow-up of up to 35 years
Jenny Gallacher1,2, Stuart Mcpherson1,2, Quentin Anstee1,2.1Translational and Clinical Research Institute, Faculty of Medical Sciences, Newcastle University, Newcastle upon Tyne, United Kingdom; 2Liver Unit, Newcastle NIHR Biomedical Research Centre, Newcastle upon Tyne Hospitals Foundation Trust, Newcastle upon Tyne, United Kingdom
Email: jennifer.gallacher@nhs.net

Background and aims: Non-invasive tests of fibrosis such as the FIB-4 score are routinely used by clinicians to assess patients with NAFLD and guide management. Current EASL and AASLD guidelines suggest those who fall into the “low risk” category (FIB-4 <1.30) can be managed in a primary care setting, with advice to repeat these tests every 2 years. This practice has been widely adopted as a way to cost-effectively screen for advanced fibrosis, from an ever-growing number of patients with NAFLD, given the components of FIB-4 are routinely clinically available and the high negative predictive value of the score. However, there are few long-term studies which explore the outcomes of those deemed “low risk.” This study aims to review outcomes of interest including incident HCC, liver transplantation and mortality in “low risk” patients aged <50yrs over a period of up to 35 years.

Method: Participants with biopsy proven NAFLD were prospectively recruited from the Newcastle Hospitals, U.K., between 1990 and 2018 with a minimum of 12 months follow-up. Data was collected at clinical events and outcomes explored including survival analysis with Kaplan Meier log-rank tests.

Results: 158 participants were included with a mean follow-up of 14.3 ± 7.2 years (1–35.4 years). 74.1% were male, mean age 37 ± 9 and BMI 34.3 ± 5.6 kg/m². T2DM was present in 24.7% (39), HTN 24.8% (34) and MetS 63.8% (74). The prevalence of these co-morbidities increased over the course of the follow-up to 55.3% (84) T2DM, 51.0% (76) HTN and 87.1% (81) MetS. Five patients died, with cardiovascular disease, the most common cause (60%). Mean time to death was 11.7 ± 7.2 years. No liver related deaths, incident HCC or liver transplantation were observed in the cohort. Survival of this cohort was compared to a larger cohort of patients aged <50 years from the same centre, recruited during the same time frame but including all FIB-4 patients. Our study assumes that patients with FIB-4 <1.30 and no co-morbidities have a very low risk of adverse liver outcomes.
Background and aims: Type IV collagen 7S (COL4-7S) is one of the simple non-invasive tests for detecting liver fibrosis. However, it was not clarified whether COL4-7S can detect the advanced fibrosis (stage 3/4) and predict the prognosis of non-alcoholic fatty liver disease (NAFLD). In this study, we estimated the clinical efficacy of COL4-7S for detection of advanced fibrosis and prognosis of NAFLD.

Method: The total of 881 Japanese patients with biopsy-prove NAFLD from 1994 to 2020 were enrolled. Serum levels of COL4-7S were determined by the method of radioimmunoassay. Two cutoff points were set on specificity 90% and sensitivity 90% by ROC analysis of the patients were assigned to three groups on the settled cutoff points. Cox regression analysis were performed to estimate the predictive capacity of COL4-7S for liver-related mortality (LRM) and events (LREs).

Results: The median follow-up period were 4.3 years. 31 patients developed liver-related events and 9 patients died by LREs. The AUROC of COL4-7S was 0.847. The low and high cutoff points were set on 4.8 and 6.8 ng/ml, respectively. The adjusted hazard ratio (aHR) of the high-risk group by COL4-7S for LRM was 46.22 (p < 0.01), while aHR of advanced fibrosis was 1.38 (p = 0.683). The aHR for LREs of the intermediate and high-risk by COL4-7S were 5.94 (p < 0.01) and 27.17 (p < 0.01). The aHR of advanced fibrosis by liver biopsy was 1.61 (p = 0.248). In the same fibrosis stage, the incidence of LRM/LREs was more frequent with a higher risk stratification.

Conclusion: Serum levels of COL4-7S has good diagnostic accuracy for predicting advanced fibrosis and can accurately predict LRM and LREs. COL4-7S help physicians estimate both fibrosis stage and patient prognosis in clinical practice.
SAT-449
The genetic background of NAFLD patients markedly affects their metabolomic and lipidomic signatures
Lina Jegodzinski1, Ashok Rout2, Friedhelm Sayk1, Franziska Schmelter3, Bandik Foh4, Henrike Dobbermann1, Monika Herr1, Sebastian Meyhöfer1,5, Svenja Meyhöfer1,5, Monika Rau6, Susanne N Weber7, Marcin Krawczyk7, Andreas Geier6, Ulrich Gunther2, Jens Marquardt1. 1University of Lübeck, Institute of Chemistry and Metabolomics, Lübeck, Germany; 2University Hospital Schleswig-Holstein, Lübeck, Department of Medicine I, Lübeck, Germany; 3University Hospital Schleswig-Holstein and University of Lübeck, Institute of Nutritional Medicine, Lübeck, Germany; 4University Hospital Schleswig-Holstein and University of Lübeck, Institute of Schleswig-Holstein, Lübeck, Department of Medicine I, Lübeck, Germany; 5University Hospital Würzburg, Department of Medicine II, Würzburg, Bayern, Germany; 6Gemeinschaftspraxis im Gesellenhaus, Lübeck, Germany; 7University Hospital Saarland, Department of Medicine II, Homburg, Germany

Background and aims: Non-alcoholic fatty liver disease (NAFLD) encompasses a heterogeneous spectrum of patients with different clinical and molecular characteristics. Pathophysiologically, obesity, diabetes and the metabolic syndrome are major exogenous determinants for metabolic liver diseases. In recent years, several common genetic variants have been identified with significant impact on NAFLD development and progression. Herein, the patatin-like phospholipase domain-containing 3 (PNPLA3) p.I148M polymorphism was performed using TaqMan assays. Proteo-metabolomics of patient sera was performed by NMR spectroscopy, covering a range of ca. 30 metabolites as well as 100 lipoprotein and glycoprotein parameters.

Results: Homozygous PNPLA3 p.148MM variant was present in 42 patients (16.4%), whereas 90 patients (35.2%) carried the p.148IM genotype. We were able to show clear differences in analysed serum metabolites as well as in lipoprotein subtype profiles between patients with different PNPLA3 genotypes. For example, there was a significantly higher proportion of LDL triglyceride and VLDL cholesterol subfractions in serum of patients carrying the p.148MM genotype. Additionally, we observed differences in the amino acid status of the patients, especially in the levels of phenylalanine, tyrosine and glutamine.

Conclusion: The PNPLA3 p.I148M polymorphism has a profound impact on metabolomic and lipidomic profil of NAFLD patients. Results might contribute to our understanding how the variant affects progression in NAFLD patients. A detailed characterization of key molecules could provide a useful tool for the identification of patients at risk in the future.

SAT-450
Prevalence of diagnosed advanced liver fibrosis in high-risk population with metabolic-dysfunction associated fatty liver disease screened in diabetology using transient elastography
Adrien Aubin1, Marianne Maynard2,3, Bérénice Ségregin1, Yasmina Chouik2, Laurent Milot4, Valerie Hervieu5, Fabien Zoulim2,3, Emmanuel Disse1,4, Massimo Levrero1,2, Cyrielle Caussy1,6, 1Hospices Civils de Lyon, Endocrinology, Diabetes and Nutrition, Pierre-Bénite, France; 2Hospices Civils de Lyon, Hepatology, Lyon, France; 3Centre de Recherche sur le Cancer de Lyon, INSERM 1052, Lyon, France; 4Hospices Civils de Lyon, Radiology, Lyon, France; 5Hospices Civils de Lyon, Pathology, Lyon, France; 6Université Lyon 1, CarMen Laboratory, Pierre-Bénite, France

Background and aims: The systematic screening for advanced fibrosis (AF) is recommended in high-risk population such as patients with type 2 diabetes (T2D) and/or obesity and metabolic dysfunction-associated fatty liver disease (MAFLD). However, there are limited data regarding clinical care pathways using liver assessment by transient elastography (TE) performed in diabetology. Therefore, we aimed at assessing the prevalence of diagnosed AF in patients with MAFLD screened for the presence of AF in diabetology prior to hepatology referral.

Method: This is a cross-sectional study including consecutive adult patients with T2D and/or obesity and MAFLD who underwent a liver assessment by TE using a Fibroscan® performed at the Department of Endocrinology, Diabetes and Nutrition, Lyon South Hospital at Hospices Civils de Lyon, France between January 2020 and October 2022. Pseudonymized clinical data, fasting labs including a medical electronic records and informed consents were obtained. The presence of suspected AF was defined by a reliable TE≥8 kPa. The confirmed presence of AF was recorded according to assessment of hepatology defined as composite end point including either histological stage ≥F3 or overt imaging diagnosis of cirrhosis on magnetic resonance imaging (MRI) or concordant TE≥8kPa and Fibrotest≥F3 according to EASL guidelines. Patients with discordant TE and Fibrotest® without histological assessment that underwent a
third line magnetic resonance elastography <3.62 kPa were considered as patients without AF in the analysis.

Results: The study included 727 patients with DT2 and/or obesity and MAFLD. The mean age was 54.3 years (± SD 13.6) and the BMI 37.2 kg/m² (± 7.9), 50.3% were female, 36.6% had a BMI ≥40 kg/m², 69.9% had T2D. Sixty-one patients (8.4%) had an unreliable TE. Among the 666 patients with reliable TE, the prevalence of suspected AF with TE ≥8 kPa was 28.4% (n = 189) and 10.2% (n = 68) had a TE ≥12 kPa. In the whole population, the prevalence of confirmed AF was 7.4% (n = 54) including 24 patients with histological stage ≥F3, 23 with concordant TE and Fibrotest® for stage ≥F3, and 7 with a diagnosis of cirrhosis by MRI. In this population, 18.8% (n = 137) had an undetermined stage of fibrosis. Severe obesity BMI of cirrhosis by MRI. In this population, 18.8% (n = 137) had an undetermined stage of fibrosis. Severe obesity BMI ≥40 kg/m² was significantly associated with increased odds of undetermined stage of fibrosis (OR 3.4; 95%CI: 2.27–5.09; p < 0.001) in a multivariable model adjusted for age and sex and remained significant even when excluding individuals with unreliable TE (OR 4.4; 95%CI: 2.65–7.40; p < 0.001).

Conclusion: In high-risk individuals with MAFLD consecutively enrolled in a screening for AF in diabetology using TE, the prevalence of diagnosed AF was 7.4%. Severe obesity was significantly associated with undetermined status of AF highlighting the need to optimize the screening strategy in these individuals.

SAT-451
Serological biomarkers of extracellular matrix related disease activity are elevated in patients at risk of NASH with significant liver stiffness
Thomas Møller1,2, David Provenghi3, Peder Frederiksen1, Heidi Guthrie3, Morten Karsdal1, Marcus Hompesch2, Diana Leeming1, Nordic Bioscience A/S, Denmark;2University of Copenhagen, Department of Biomedical Sciences, Denmark;3ProSciento, Inc, United States
Email: twm@nordicbio.com

Background and aims: In non-alcoholic steatohepatitis (NASH), inflammation of the hepatic tissue leads to an increased formation and deposition of extracellular matrix proteins, such as collagens. Over time accumulation of collagens causes hepatic fibrosis, which is associated with increased liver stiffness (LS). Type III, IV, and VI collagen formation may be assessed non-invasively using PRO-C3, PRO-C4, and PRO-C6 assessing the pro-peptide of type III and VI collagen, and the 7S domain of type IV collagen. We aimed to investigate how PRO-C3, PRO-C4, and PRO-C6 may identify patients with increased liver stiffness measure (LSM), in patients identified as at risk of NASH, due to obesity and presence of type 2 diabetes (T2D).

Method: 958 patients from the NASH-PASS study, were identified as at risk of NASH due to obesity and presence of type 2 diabetes. 958 patients were included (mean follow-up 17.9 ± 5.3 years [3.3–35.4 years]); 62% male; mean age at baseline 47 ± 13 years). Using vibration-controlled transient elastography (VCTE) by Fibroscan. Blood samples were collected at the time of LSM. PRO-C3 and PRO-C6 were assessed using fully validated competitive immunoassays, and PRO-C4 was assessed using a fully validated automated competitive chemiluminescent immunoassay. Between groups comparisons of biomarker levels were performed using Mann-Whitney or Kruskal-Wallis test.

Results: The median (Q1, Q3) age and BMI of the 958 included patients were 56.4 (48.3, 63.7) years and 35.1 (31.7, 38.9) kg/m², respectively, and 473 patients had T2D. 22% of the patients had significant LS (VCTE >8 kPa). While weak Spearman correlation between LS and our biomarkers was observed, the levels of PRO-C3, PRO-C4, and PRO-C6 were significantly elevated in patients with significant LS, compared to those without (VCTE <8 kPa), (p < 0.0001, p < 0.05, and p < 0.0001), (AUROC = 0.672, 0.546, and 0.623).

SAT-452
Prognostic value of the Enhanced Liver Fibrosis (ELF) test to predict long-term outcomes in a NAFLD cohort with up to 35 years follow-up
Jenny Gallacher1,2, Stuart Mcpherson 1,2, Quentin Anstee 1,2.
1Translational and Clinical Research Institute, Faculty of Medical Sciences, Newcastle University, Newcastle upon Tyne, United Kingdom; 2Liver Unit, Newcastle NIHR Biomedical Research Centre, Newcastle upon Tyne Hospitals Foundation Trust, Newcastle upon Tyne, United Kingdom
Email: jennifer.gallacher@nhs.net

Background and aims: There are emerging data that non-invasive tests (NIT) can predict long-term clinical outcomes and mortality however the majority of studies are of short duration. ELF is an established biomarker panel, developed to detect advanced fibrosis (≥F3). Fifteen years after the original publication demonstrating the performance of ELF as a diagnostic biomarker in NAFLD1, we report the long-term follow-up of the same cohort of patients and assess the performance of ELF in comparison to FIB-4 as prognostic biomarkers for predicting liver-related and all-cause mortality.

Method: Patients recruited at a UK tertiary centre in the original NAFLD-ELF study1 were followed until 2020 to explore outcomes of interest including progression to cirrhosis, incident HCC and mortality. Cox regression analysis was performed to explore the prognostic ability of ELF and FIB-4 to predict mortality.

Results: 95 patients were included (mean follow-up 17.9 ± 5.3 years [3.3–35.4 years]; 62% male; mean age at baseline 47 ± 13 years). Using cut-offs to group patients as “low,” “intermediate” and “high” risk (ELF = 9.80, 9.80–11.1, >11.1. FIB-4 = <1.30, 1.30–2.67, >2.67) the distribution of ELF results in the cohort were 56.8% (54 low, 27.4% (26 intermediate and 15.8% (15 high at baseline. FIB-4 results were similar with 68.9% (62), 25.6% (23) and 5.6% (5) respectively. 17.9% (17) of patients had advanced fibrosis (F3–F4) at baseline, with 11.6% (11) being classified as cirrhotic. ELF performed well at identifying presence of advanced fibrosis (AUROC 0.954, 95% CI 0.91–1.00; FIB-4 AUROC 0.824, 95% CI 0.72–0.93). The number of patients with cirrhosis by the end of the study increased to 24.1% (21), 8.4% (8) developed HCC and 18.9% (18) died. Liver-related death was the most common cause (44.5%), followed by extrahepatic malignancy (16.7%) and cardiovascular disease (11.1%). Hazard ratios for all-cause mortality were generated using the risk categories above and
adjusted for age. Patients in the “high risk” categories had an increased association with all-cause mortality compared to those “low risk”: ELF aHR 9.05, 95% CI 2.35–34.88, p = 0.001, FIB-4 aHR 16.04, 95% CI 3.46–74.33, p < 0.001. 10 year survival rates were 98%, 92% and 60% in those with low, intermediate, and high ELF results. 

Conclusion: Consistent with the recognised link between fibrosis stage and outcomes, ELF and FIB-4 exhibited prognostic value for prediction of mortality in patients with NAFLD. These NITs offer clinically utility for both the diagnostic and prognostic contexts of use in NAFLD.

Reference

SAT-453

Utilization of fibroscan-AST scoring system to risk-stratify non-alcoholic steatohepatitis patients for clinical trials and novel therapies

Phillip Leff1,2, Prido Polanco1, Rida Nadeem1, Aria Raman1, Gagana Ameneni1, Shray Patel1, Rayan Ahmed1, Anushka Kadharia1, Naim Alkhouri1, 1Arizona Liver Health, United States; 2Creighton University, United States

Email: phillipleff@creighton.edu

Background and aims: The Fibroscan-AST (FAST) score is a non-invasive test that utilizes liver elastography with a complex formula to determine a patient’s risk of progressive Non-Alcoholic Fatty Liver Disease (NAFLD). Multiple studies have validated the FAST score at predicting the patient’s risk of progressing to Non-Alcoholic Steatohepatitis (NASH) more accurately than other non-invasive tests (NIT) i.e. NAS, FIB4, and the APRI score. The aim of this study was to determine if the FAST score would be an effective NIT to stratify high risk patients to receive medical therapies for NASH in conjunction with the AGA guidelines for hepatology referrals for NAFLD.

Method: This was a retrospective chart review, in the setting of an outpatient hepatology clinic. Patients 18 years and older who presented to the outpatient clinic that underwent liver elastography, with a complete metabolic panel were included. Patients that did not undergo liver elastography were excluded from the study. NAFLD fibrosis score was calculated using: FAST = {exp (-1.65 + 1.07 × ln (LSM) + 2.66 × 10−8 × CAP−63.3 × AST−1))/(1 + exp (-1.65 + 1.07 × ln (LSM) + 2.66 × 10−8 × CAP−63.3 × AST−1))}. AGA guidelines were followed, patients were initially screened using Fib-4, Fib-4 > 1.6 underwent elastography. Fib-4 was calculated using Fib-4 = age×AST/PLT×ALT. Elastography cut-off was kPa ≥8. In addition to this protocol, patients with kPa ≥8 were selected for FAST scoring.

Results: Our cohort included 925 patients. 593 were female (64.11%), 499 were Caucasian (53.95%), 25 were African American (2.70%), 19 were Asian (2.05%), 6 were Native American (0.65%), 172 were other (18.59%), and 172 declined to answer (18.59%). 377 (40.76%) patients were non-Hispanic, 192 (20.76%) were Hispanic, and 356 (38.49%) were unknown/declined to answer. 350 (37.84%) had diabetes mellitus, 288 (31.14%) had dyslipidaemia, and 420 (45.41%) had hypertension. The average FAST score was 0.45. 263 had a FAST score ≥0.67 (28.43%). 662 (71.57%) were <0.67. 492 patients had Fib-4 ≥1.3, of those 492 patients 367 had a kPa ≥8. Out of those 367 patients, 207 patients had a FAST score ≥0.67.

Conclusion: With the advent of new therapies currently in clinical trials awaiting approval for commercial use, there is need for a standardized method of risk stratifying patients to receive these limited therapeutics. The FAST score with a cut-off of ≥0.67 had a high specificity and PPV compared to biopsy. This notion implies patients with high FAST scores have a high risk of F2 or greater fibrosis. The decision to start new/limited medication should be reserved for the highest-risk patients, the results of this study conclude patients should follow the AGA guidelines but could consider adding a FAST score to screen for patients that would be the most at need for pharmaceutical therapy.
SAT-454
A screening strategy of hidden compensated advanced chronic liver disease in diabetic outpatients using sequential and automatic fibrosis-4 and enhanced liver fibrosis scores
Clara Amiama Roig1, Miriam Romero1, María Sanz de Pedro2, Alexa Pamela Benitez Valderrama3, Cristina Suárez Ferrer1, Carlota Siljestrom Berenguer1, Mariana Serres Gómez2, Carmen Amor1, Irene Gonzalez Diaz1, Noemi González Pérez de Villar1, Antonio Buño Soto2, Antonio Olivea Martin1, 1La Paz University Hospital, Gastroenterology and Hepatology Department, Madrid, Spain; 2La Paz University Hospital, Laboratory Medicine Department, Madrid, Spain; 3La Paz University Hospital, Endocrinology Department, Madrid, Spain
Email: camiamaroig2@gmail.com

Background and aims: The high prevalence of metabolic liver disease (MAFLD) requires efficient screening and referral strategies. Probably a high number of patients are suffering unknown advanced chronic compensated liver disease (cACLD). The usual non-invasive tests have low positive predictive value, so that the referral of patients based exclusively on one of them is an inefficient overload for our offices. Objective: to efficiently stabilize the prevalence of unknown cACLD in a cohort of patients with type 2 diabetes.

Method: Ongoing prospective study. In the Diabetes analytical offices. Normally distributed quantitative variables were described using the mean; respectively, were not statistically different according to Delong’s test (p value; 0.94, 0.90, 0.60, respectively).

Results: Between March and November 2022 FB4 was performed in 1958 patients, 491 (25.1%) with FB4 >1.3 (>2 in >65 years). In agreement with Endocrinology and with the Ethics Committee approval, the Laboratory generated a referral to Hepatology in those with FB4 >1.3/2. According to Baveno VII, cACLD was considered absent if Fibroscan <10 kPa and cACLD if ≥15 kPa. Between 10–15 kPa (suggestive of cACLD) we considered cACLD when ≥12 kPa (Papatheodoridi. J Hepatol 2020). ELF cut-off for cACLD was ≥9.8. Exclusion criteria were age <35/>80 years, already diagnosed MAFLD or other liver diseases, patient refusal and severe comorbidities (advanced cancer, degenerative diseases...). Normally distributed quantitative variables were described using the mean; otherwise, the median was calculated. Diagnostic performance of ELF was assessed with receiver operating characteristic curves (AUROC).

Conclusion: the prevalence of unknown cACLD is high in Diabetes outpatient clinic. The sequential use of FB4 and ELF is very effective in its detection. Its automated determination would be very efficient avoiding unnecessary referrals.

SAT-455
Diagnostic efficacy of Mac-2 binding protein glycosylation isomer for predicting liver fibrosis in patients with metabolic associated fatty liver disease: multicenter cohort study
Dae Won Jun1, Se Young Jang2, Ki Tae Yoon3, Young Youn Cho4, Hoon Gil Jo5, Yang-Hyun Baek6, Sang Yi Moon7, Aejeong Jo8, Yoon Chang University College of Medicine, Department of Internal Medicine, Korea, Rep. of South; 2Kyungpook National University Hospital, Department of Internal Medicine, Korea, Rep. of South; 3Chung-Ang University Hospital, Department of Internal Medicine, Korea, Rep. of South; 4Wonkwang University College of Medicine and Hospital, Department of Internal Medicine, Korea, Rep. of South; 5Dong-A University College of Medicine, Department of Internal Medicine, Korea, Rep. of South; 6Andong National University, Department of Information Statistics, Korea, Rep. of South
Email: gongori1004@gmail.com

Background and aims: The definition of metabolic associated fatty liver disease (MAFLD) has newly been proposed. We aimed to investigate the efficacy of Mac-2 binding protein glycosylation isomer (M2BPGi), non-invasive fibrosis marker, for discriminating significant and advanced fibrosis, and cirrhosis, respectively according to MAFLD and NAFLD definitions.

Method: Serum M2BPGi levels were collected and analyzed from 2,177 patients among 6 tertiary hospitals between April 2020 and May 2021. Liver fibrosis was graded by transient elastography. Diagnostic efficacy of serum M2BPGi and other serum based liver fibrosis markers [AST to platelet index (APRI), fibrosis index based on four factors (FIB-4), and NAFLD fibrosis score (NFS)] was evaluated using area under the ROC curve (AUC) and Delong’s test.

Results: There were 1,379 patients and 1,194 patients by the MAFLD and NAFLD definition, respectively. The AUC values of M2BPGi were 0.682, 0.711, and 0.814 for predicting F >1, F >2, and F >3, respectively in NAFLD group. The AUC values of M2BPGi were 0.68, 0.711, and 0.814 for predicting F >1, F >2, and F >3, respectively in MAFLD group. The AUC values of M2BPGi for predicting severity of fibrosis were greater than those of serum based liver fibrosis markers. The diagnostic efficacies of M2BPGi predicting significant and advanced fibrosis, and cirrhosis in NAFLD and MAFLD patients, respectively, were not statistically different according to Delong’s test (p value; 0.94, 0.90, 0.60, respectively).

Figure: Table 1: (abstract: SAT-454): Baseline patients’ characteristics.

<table>
<thead>
<tr>
<th>Sex</th>
<th>Age</th>
<th>BMI (kg/m²)</th>
<th>GPT (U/L)</th>
<th>GOT (U/L)</th>
<th>Fibroscan (kPa)</th>
<th>CAP (dB/m)</th>
<th>Diabetes Comorbidities</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women</td>
<td>63.7±5.7</td>
<td>23.9±18.2</td>
<td>33.4±16.8</td>
<td>9.8±9.3</td>
<td>274±67</td>
<td></td>
<td>Nephropathy</td>
<td>Metformin</td>
</tr>
<tr>
<td></td>
<td>78.6±(45.5)</td>
<td>34.1±18.2</td>
<td>35.3±16.8</td>
<td>9.8±9.3</td>
<td>274±67</td>
<td></td>
<td>Neurupathy</td>
<td>GLP1 Inhibitors</td>
</tr>
</tbody>
</table>

SAT-456
Shortcomings of “FIB-4 First” strategy in screening for non-alcoholic fatty liver disease (NAFLD) patients at risk for disease progression in a real life setting: will we be detracting therapeutic opportunities from patients?

Simone Cappelli1, Antonio Salvati1, Giovanni Petralli2, Laura De Rosa3, Gabriele Ricco3, Lidia Surace1, Piero Colombatto1, Barbara Coco1, Veronica Romagnoli1, Filippo Oliveri1, Ferruccio Bonino4, Maurizia Brunetto1,2, 3Hepatolgy Unit, Pisa University Hospital, Italy; 2Department of surgical, Medical, Molecular and Critical Area Pathology, University of Pisa, Italy; 3Department of Information engineering and computer Science, University of Trento, Italy; 4Biostructure and bio- imaging institute of National reasrch council of Italy, Italy
Email: brunettomaurizia@gmail.com

Background and aims: The Fibrosis 4 score (FIB-4) is a non-invasive scoring system derived from Age, Aspartate aminotransferase (AST), Alanine aminotransferase (ALT) and Platelets (PLTs), that has been recently promoted in AASLD guidelines as a tool in the Primary Care setting to screen for clinically significant fibrosis (CSF) in NAFLD patients (pts); A value ≥1.30 identifies pts at a higher risk for progressive liver disease that need a hepatologist referral for Liver Stiffness Measurement (LSM).

In this retrospective study, we evaluated the overall performance of the score among different clinical sub-groups.

Method: 367 NAFLD pts between 35 and 65 years (yrs) (M : F = 213 : 154; 51.7 yrs ± 7.5) followed at the Hepatology Unit in Pisa from January 2017 to October 2022 underwent clinical evaluation including: AST, ALT, GGT, ALP , blood count, p.glucose, insulin, HBa1c, lipid profile, body mass index (BMI), waist circumference (WC) and LS by transient elastography (TE, Fibroscan®).

Results: 262 pts (71.3%) had FIB-4 <1.30 (M : F = 149 : 113, 50.5 yrs ± 7.6), among them 34 (13%) had a TE >8 kPa, of which 18 (7% of the total) even higher than 9.7 kPa, indicative of CSF. Compared to the general population, in this group of pts where the FIB-4 score failed in identify CSF we found a statistically significant higher prevalence of Obesity, Type 2 Diabetes Mellitus (T2DM), and T2DM along with Obesity, with a Risk Ratio of 2.3 (CI 95%, 1.1–4.9, p = 0.026), 4.4 (CI 95%, 2.9–6.6, p < 0.0001) and 5.5 (CI 95%, 2.3–12.8, p < 0.0001), respectively.

Given an overall prevalence of TE >8 kPa of 21.1%, the FIB-4 held a negative predictive value (NPV) of 88.5% in non diabetic and lean/overweight pts, 78.3% in diabetic pts, while the performance of the score dropped to a NPV of 65.4% in obese and diabetic pts.

Figure:

Conclusion: These data show that the categories of patients where the proposed “FIB-4 first” strategy has a worse screening performance are also the one that could benefit more from a specialist referral for the inclusion in a lifestyle change program, a tailoring of their therapy, or even bariatric surgery. These findings should guide the physician not to rely on the FIB-4 score alone when screening NAFLD patients, but rather on a more comprehensive evaluation of the patients clinical characteristics and comorbidities.

SAT-457
Analysis of correlation and predictive ability of oral glucose tolerance tests with insulin assays for liver stiffness measurement in non-cirrhotic overweight and obese patients

Valentino Osti1,2, Michele Steczchi1, Michela Genovese2, Lucia Brodosti1,2, 1Azienda USL di Bologna, Department of Public Health, Bologna, Italy; 2University of Bologna, Department of Medical and Surgical Sciences, Bologna, Italy; 3IRCCS Azienda Ospedaliero-Universitaria di Bologna, Department of Digestive, Liver and Endocrine-Metabolic Diseases, Bologna, Italy
Email: valentino.osti@ausl.bologna.it

Background and aims: Non-Alcoholic and Metabolic Associated Fatty Liver Disease (NAFLD/MAFLD) is the leading cause of steatohepatitis and end-stage liver disease. Aberrations of glucose metabolism, such as insulin-resistance, Impaired Glucose Tolerance (IGT), Impaired Fasting Glucose (IFG) or Type 2 Diabetes Mellitus (T2DM), and obesity are described as the main metabolic diseases related to NAFLD; to the best of our knowledge, there’s no evidence of a quantitative relationship between the post-prandial glucosinsulineemic response in obese patients and Liver Stiffness Measurement (LSM). As an audit in our third level nutrition center in Italy, we investigated the potential of data extraction from Oral Glucose Tolerance Tests (OGTTs) with insulin assay in predicting liver stiffness measured with an elastography.

Method: We analyzed data from 267 non cirrhotic patients with obesity or morbid overweight (Body Mass Index, BMI ≥27 kg/m²) who underwent both a 75 g OGT with insulin assay at 0’, 60’ and 120’, and a liver elastography (FibroScan) within a 12 week window. The analysis was performed with R, and we excluded subjects who reported significant alcohol consumption (>1 IU/day women, >2 IU/day men), and those who lost weight or underwent metabolic or weight pharmacotherapy in that time window. After data collection, total insulin and glucose (∆0′–120′) were calculated with the trapezoidal rule, including baseline determinations. Data are reported as median ± IQR (Interquartile Range), hypothesis testing was lead with a 1% alpha error, and 95% confidence intervals are identified as [CI95%].

Results: We evaluated several linear regression models derived from the analysis of the OGTTs. Considering the most practical and efficient model, FIB4 and fasting insulin are necessary, and it has a 33% [20.2–44.1] correlation coefficient, and a median difference of 0.52 ± 0.25 kPa, between estimated and measured LSM. When compared to the measured LSM as a reference, the model predicts subjects with significant liver stiffness (LSM ≥8.0 kPa) with a 4% [1–20.4] sensibility and a 98.4% [95.5–99.7] specificity. Post-prandial insulin-resistance MATSUDA index displays a high diagnostic accuracy for an LSM ≥8.0 kPa, as expressed by an AUC of 0.7 [0.598–0.802], with a Youden’s best cut-off of 1.82 associated to a 76.4% specificity and a 100% [92.8–100] specificity.
Conclusion: Our results support the relationship between fasting and post-prandial insulin levels and liver stiffness in subjects with obesity and morbid overweight. The key strength of our work lies in the innovation of finding a formula that could potentially help rule out significant liver stiffness, strongly linked to fibrosis and advanced liver disease. The main limitations of this work are the relatively small sample size and the possible interaction between hypolipidemic agents and glucose homeostasis. The most practical model to predict liver stiffness in dysmetabolic subjects needs a single blood test with liver enzymes, blood count and fasting insulin, but further studies are needed to either verify our formula or to create more accurate algorithms to screen patients with obesity at risk for advanced metabolic liver disease.

SAT-458
Lower ALT levels are associated with increased all-cause and cardiovascular mortality in patients with NAFLD in the United States population
Bo Feng1, Zheng Jiariu2, 1Peking University Hepatology Institute, Peking University People’s Hospital, Beijing, China; 2Peking University Hepatology Institute, Peking University People’s Hospital, Beijing, China
Email: fengbo@pkuph.edu.cn

Background and aims: The serum alanine aminotransferase (ALT) level is often considered as a marker to evaluate the activity of liver disease and the severity of liver injury. In this study, we aimed to investigate the association between ALT levels and all-cause and cause-specific mortality in non-alcoholic fatty liver disease (NAFLD) patients.

Method: National Health and Nutrition Examination Survey (NHANES)-III from 1988 to 1994 and NHANES-III related mortality data from 2019 were used. NAFLD was defined as hepatic steatosis diagnosed by ultrasound, without other liver diseases. ALT levels were categorized into four groups according to different recommended upper limit of normal in men and women: <0.5 upper limit of normal (ULN), 0.5–1 ULN, 1–2 ULN, ≥2 ULN. The hazard ratios (HRs) for all-cause mortality and cause-specific mortality were analyzed with Cox proportional hazard model.

Results: Multivariate logistic regression analysis demonstrated odds ratio of NAFLD correlated positively with increasing serum ALT levels. In patients with NAFLD, all-cause mortality and cardiovascular mortality are the highest when ALT<0.5ULN, yet cancer-related mortality is the highest when ALT ≥2ULN. The same results could be found in both men and women. Univariate analysis showed that severe NAFLD with normal ALT level had the highest all-cause and cause-specific mortality, but the difference was not statistically significant after adjustment for age and multivariate factors.

Conclusion: The risk of NAFLD was positively correlated with ALT level, but all-cause and cardiovascular mortality were the highest when ALT<0.5ULN. Regardless of the severity of NAFLD, normal or

<table>
<thead>
<tr>
<th>ALT level</th>
<th>Total population</th>
<th>No NAFLD</th>
<th>NAFLD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular</td>
<td>HR (95% CI)</td>
<td>P value</td>
<td>HR (95% CI)</td>
</tr>
<tr>
<td>&lt;0.5ULN</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>0.5–1ULN</td>
<td>0.74 (0.65–0.85)</td>
<td>&lt;0.001</td>
<td>0.82 (0.68–0.97)</td>
</tr>
<tr>
<td>1–2ULN</td>
<td>0.63 (0.50–0.79)</td>
<td>&lt;0.001</td>
<td>0.78 (0.56–1.09)</td>
</tr>
<tr>
<td>≥2ULN</td>
<td>0.63 (0.35–1.12)</td>
<td>0.113</td>
<td>0.70 (0.26–1.86)</td>
</tr>
<tr>
<td>Cancer</td>
<td>HR (95% CI)</td>
<td>P value</td>
<td>HR (95% CI)</td>
</tr>
<tr>
<td>&lt;0.5ULN</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>0.5–1ULN</td>
<td>0.74 (0.64–0.86)</td>
<td>&lt;0.001</td>
<td>0.70 (0.58–0.84)</td>
</tr>
<tr>
<td>1–2ULN</td>
<td>0.67 (0.52–0.86)</td>
<td>0.002</td>
<td>0.61 (0.42–0.88)</td>
</tr>
<tr>
<td>≥2ULN</td>
<td>1.11 (0.67–1.86)</td>
<td>0.682</td>
<td>0.86 (0.52–2.11)</td>
</tr>
<tr>
<td>Others</td>
<td>HR (95% CI)</td>
<td>P value</td>
<td>HR (95% CI)</td>
</tr>
<tr>
<td>&lt;0.5ULN</td>
<td>0.89 (0.80–0.99)</td>
<td>0.029</td>
<td>0.92 (0.81–1.05)</td>
</tr>
<tr>
<td>0.5–1ULN</td>
<td>0.98 (0.83–1.16)</td>
<td>0.159</td>
<td>1.25 (0.98–1.60)</td>
</tr>
<tr>
<td>≥2ULN</td>
<td>0.75 (0.51–1.09)</td>
<td>0.131</td>
<td>0.69 (0.33–1.45)</td>
</tr>
</tbody>
</table>

Note: The multivariate model was adjusted for age, sex, race/ethnicity, body mass index, waist circumference, AST, Alb, TG, TC, HDL, smoking status, diabetes, hypertension, and sedentary lifestyle.

Abbreviations: CI, confidence interval; HR, hazard ratio; NAFLD, nonalcoholic fatty liver disease.

Figure: (abstract: SAT-458).
lower ALT levels are associated with higher mortality than elevated ALT levels. Clinicians should be aware of not only high ALT, indicating liver injury, but also low ALT associated with higher risk of death.

**SAT-459**

**ABDA score: a non-invasive model to identify subjects with fibrotic non-alcoholic steatohepatitis in the community**

Shalimar1, Abhinav Anand1, Sagnik Biswas1, Manas Vaishnav1, Nikhil Tandon2. 1All India Institute of Medical Sciences, New Delhi, Gastroenterology and Human Nutrition, Delhi, India; 2All India Institute of Medical Sciences, New Delhi, Endocrinology, Delhi, India

**Background and aims:** Non-alcoholic fatty liver disease (NAFLD) and non-alcoholic steatohepatitis (NASH) are prevalent in the community, especially among those with metabolic syndrome. Patients with fibrotic NASH are at increased risk of liver-related events. Currently available non-invasive tests have not been utilized for screening for fibrotic NASH among the community. We aimed to develop a screening tool for fibrotic NASH among community members.

**Method:** We included two large cohorts aimed at assessing cardiovascular disease among community members. Fibrotic NASH was defined using FibroScan-AST (FAST) score of ≥0.67 that identifies ≥F2 fibrosis and NASH activity score ≥4 with a specificity of 90%. Metabolic parameters, biochemical tests, and anthropometry were used to develop a multivariate model.

**Results:** The derivation cohort (n = 1660) included a population with median age 45 years, 42.5% males, metabolic syndrome in 66%, and median BMI 30 kg/m2. In addition, we assessed the concordance to confirm or exclude NAFLD using Cohen’s Kappa index (k) and the correlation between the different indices and TE-CAP using Pearson’s linear test (r).

**Conclusion:** ABDA score utilizes four easily available parameters to identify fibrotic NASH with high accuracy in the community.

**SAT-460**

**Evaluation of serum biomarkers for the diagnosis of non-alcoholic fatty liver disease in the general population: a cross-sectional Spanish population-based study**

Jesús Rivera1,2,3, Paula Iruzubieta4, Alba Jiménez-Masip1, Ramiro Manzano1,2, Elba López2, Christie Perelló3, Marta Hernández Conde5, María Teresa Arias Loeve6, María Del Barrio Azaceta4, Desamparados Escudero-García6, Miguel Serra2, Juan M Pericas1,2, José Luis Calleja Panero5, Javier Crespo4, Vall d’Hebron Hospital Universitari, Liver Unit, Spain; Vall d’Hebron Institut of Research (VHIR), Spain; Universitat Autònoma de Barcelona, Bellaterra, Barcelona, Spain; Hospital Universitario Marqués de Valdecilla, Spain; Hospital Universitario Puerta de Hierro, Spain; Hospital Clinico de Valencia, Spain

**Email:** jesusriveraes@gmail.com

**Background and aims:** Non-alcoholic fatty liver disease (NAFLD) is a highly prevalent entity that relies on non-invasive tests (NITs) for disease detection and stratification. Serological NITs for steatosis are useful tools for the initial assessment of NAFLD, whereas validation studies in different populations are needed. The study aimed to evaluate the diagnostic accuracy of serological NITs in the general population from Spain and to investigate the correlation between these tests and the controlled attenuation parameter (CAP) of transient elastography (TE).

**Method:** Multicentric, cross-sectional study based on a representative cohort of the general adult population in Spain (PREVHEP-ETHON) with TE and CAP data. We excluded subjects with suspected viral hepatitis or excessive alcohol consumption (>15 units/day). The reference test was the TE-CAP and a value >275 dB/m was considered diagnostic of NAFLD. A liver stiffness ≥8 kPa was considered suggestive of significant fibrosis. We evaluated the diagnostic ability of Fatty Liver Index (FLI), Fatty Liver Disease (FLD) index, Hepatic Steatosis Index (HSI), Lipid Accumulation Product (LAP) index, NAFLD index, Visceral Adiposity Index (VAI), and Zhejiang University (ZJU) index. The area under the curve (AUC) and the predictive values (PV) for NAFLD applying the foreknown cut-offs were calculated in the overall cohort and specifically in obese patients (body mass index ≥30 kg/m2). In addition, we assessed the concordance to confirm or exclude NAFLD using Cohen’s Kappa index (k) and the correlation between the different indices and TE-CAP using Pearson’s linear test (r).

Figure: (abstract: SAT-459): (A) Hosmer Lemeshow calibration plot, with Loess smoothing, for the prediction model in the overall derivation cohort showing satisfactory fit. EO: expected/observed ratio; CITL: calibration-in-the-large; AUC: area under the curve; Loess (B) Receiver operating characteristic (ROC) curve for the ABDA score in predicting fibrotic non-alcoholic steatohepatitis (NASH) in the derivation cohort.
**Results:** We included 9637 patients, 4268 (44.2%) of whom had TE-CAP data. The estimated prevalence of NAFLD was 33.0%. NAFLD subjects were predominantly male (54.8 vs 37.5%; p < 0.001), had a higher median age (55 (47–64) vs 48 (42–57) years; p < 0.001), and a higher metabolic burden than those without NAFLD (p < 0.001 for all metabolic diseases). Overall, serological NITs showed an adequate diagnostic ability (AUC >0.70), showing FLI the highest diagnostic accuracy (AUC 0.81; 95%CI 0.79–0.82), a NPV of 89.6% and a PPV of 63.2% for FLI 30 and 60, respectively. Besides, FLI had a proper concordance (k = 0.45) and linear correlation (r = 0.55) with TE-CAP. In obese individuals, the diagnostic accuracy of serological NITs decreased significantly, presenting FLI an AUC of 0.72 (95%CI 0.69–0.76), and an AUC <0.70 for the rest of the indices. Finally, when tested for significant fibrosis evaluation, FLI showed the highest AUC (0.72–95%CI 0.67–0.76-) of the studied NITs.

**Conclusion:** The serological indices of steatosis, particularly FLI, represent a valid option for NAFLD approaches in the general Spanish population. Further data are needed in high-risk populations, such as people living with obesity, along with histologically-back tested and cost-effectiveness studies to define the best diagnostic strategy for NAFLD at the population level.

**SAT-461**

MorphoQuant, the first fully-automated morphometric software for the assessment of liver biopsy, identified significant differences between non-alcoholic fatty liver disease and steatohepatitis biopsies

Cindy Serdjebi1, Bastien Lepoivre 2, Florine Chandes 2, Linda Willis 3, Jûle Yvon 2.

1Biocellvia, Marseille, France; 2Biocellvia, Marseille, France; 3Histologix Ltd, United Kingdom

Email: cindy.serdjebi@biocellvia.com

**Background and aims:** Non-alcoholic steatohepatitis (NASH) is the most severe form of fatty liver diseases, and no treatment has been approved so far. Among the reasons for this lack of valid pharmacological treatment, the subjectivity and variability in the pathology reading has been identified as a confounding factor, probably weakening the ability to assess a treatment effect. We have developed the first fully-automated user-independent morphometric software (MorphoQuant) allowing the assessment of liver biopsies and investigated its performance.

**Method:** 271 liver biopsies were collected and analyzed. Patients were scored by a blinded expert pathologist according to the NASH CRN for steatosis, inflammation, ballooning and fibrosis using hematoxylin-eosin (HandE) and Masson’s trichrome stained slides. MorphoQuant, a fully automated and deterministic artificial intelligence, based on morphometry and expert system-completely independent from pathologist’s annotations, was developed to assess NASH features. For digital quantification, slides were stained with HandE (inflammation area, and number of foci), picrosirius red (PSR) alone or combined with CK19 (steatosis, vesicle size, total Table (abstract: SAT-461): Comparison of MorphoQuant readouts in non-NASH versus NASH biopsies

<table>
<thead>
<tr>
<th>MorphoQuant Readout</th>
<th>Non-NASH biopsies* (mean; min-max; n)</th>
<th>NASH biopsies** (mean; min-max; n)</th>
<th>Mann-Whitney p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steatosis (%)</td>
<td>7.89 (0.01 - 23.55; 74)</td>
<td>10.24 (1.186 - 28.23; 175)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Steatosis (%)</td>
<td>8.609 (1.044 - 1.358; 74)</td>
<td>11.28 (1.358 - 30.13; 175)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Vesicle area (μm²)</td>
<td>119.9 (34.93 - 273.5; 73)</td>
<td>137.1 (43.23 - 422.2; 175)</td>
<td>0.002</td>
</tr>
<tr>
<td>Inflammation area (mm²)</td>
<td>4.781 (0 - 13.96; 68)</td>
<td>8.094 (0.035 - 25.70; 164)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Number of foci (mm²)</td>
<td>19.81 (0 - 58.34; 68)</td>
<td>28.99 (0.447 - 78.5; 164)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>CD68 (%)</td>
<td>2.943 (1.885 - 5.031; 42)</td>
<td>2.955 (1.586 - 5.118; 61)</td>
<td>0.4291</td>
</tr>
<tr>
<td>hCLS (n/mm²)</td>
<td>0.1441 (0 - 0.909; 42)</td>
<td>0.2018 (0 - 3.771; 61)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Shh (%)</td>
<td>3.270 (0.046 - 18.35; 63)</td>
<td>6.428 (0.06 - 44.88; 149)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Ballooned/injured area (%)</td>
<td>1.943 (0 - 14.15; 63)</td>
<td>6.632 (0 - 82.06; 149)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Collagen S (%)</td>
<td>7.470 (1.917 - 20.22; 74)</td>
<td>7.195 (1.246 - 19.96; 174)</td>
<td>0.2195</td>
</tr>
<tr>
<td>Collagen T (%)</td>
<td>8.918 (2.671 - 24.44; 74)</td>
<td>8.909 (1.580 - 22.34; 174)</td>
<td>0.4887</td>
</tr>
<tr>
<td>Periductular collagen (%)</td>
<td>3.098 (0.508 - 8.441; 40)</td>
<td>4.774 (0.5230 - 13.84; 53)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Perisinudosal collagen (%)</td>
<td>3.134 (0.8860 - 8.031; 75)</td>
<td>2.444 (0.4790 - 5.857; 174)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Perivascular collagen (%)</td>
<td>2.969 (0.465 - 12.86; 75)</td>
<td>3.179 (0.181 - 11.60; 174)</td>
<td>0.2372</td>
</tr>
<tr>
<td>Septal collagen (%)</td>
<td>0.6122 (0.0780 - 4.919; 75)</td>
<td>0.8740 (0.0270 - 3.469; 174)</td>
<td>0.0001</td>
</tr>
<tr>
<td>CK19 (%)</td>
<td>0.1438 (0.002 - 0.4890; 40)</td>
<td>0.2049 (0.003 - 0.970; 52)</td>
<td>0.02</td>
</tr>
</tbody>
</table>

* NAFLD Activity Score (NAS) < 5
** NAS >=5

bold italic: significant

hCLS: hepatic crown-like structures
collagen, periductular, perisinusoidal, perivascular and septal collagens), labelled with CD68 (CD68 and hepatic crown-like structures) or with Sonic hedgehog (Shh and ballooning/injury), and digitized as whole slide images. MorphoQuant readouts of NASH (NAS ≥5) and non-NASH (NAS <5) biopsies were compared using a Mann-Whitney test.

**Results:** A total of 929 slides were processed for histology and digitized for quantitative image analysis by MorphoQuant. Steatosis and size of lipid vesicles were significantly higher in NASH patients. The inflammation area, the number of foci and of hepatic crown-like structures were also higher in NASH patients, while CD68 expression did not increase. Ballooning, as investigated through the expression of Shh and injury area, were also shown to be significantly higher in NASH patients. Regarding collagen, collagen proportionate area and perivascular collagen was equivalent in both NASH and non-NASH patients, while perisinusoidal collagen was lower in NASH patients. Periductular and septal collagen were more important in NASH patients, along with CK19 expression.

**Conclusion:** The current study demonstrates that MorphoQuant is a powerful image analysis tool, using current and original histological methods. In addition, this study highlights that a reliable digital pathology software can be developed independently from pathologist's annotations.

**SAT-462**

**Diagnostic performance of fibrosis-4 index and NAFLD fibrosis score in at-risk group from low prevalence population**

Huiyul Park¹, Mimi Kim², Sang Bong Ahn³, Hyo Young Lee⁴, Jun-Hyuk Lee⁵, Eileen Yoon⁶, Chul-min Lee⁷, Bo-Kyeong Kang², Joohyun Sohn¹, Jiyoung Ahn⁷, Joohyun Oh², Hye-Lin Kim⁷, Hyunwoo Oh³, Jang Han Jung⁸, Dae Won Jun⁹, Eun Chul Jang⁹, ¹Myoungji Hospital, Hanyang University College of Medicine, Korea, Rep. of South; ²Hanyang University, College of Medicine, Department of Radiology, Korea, Rep. of South; ³Nowon Eulji Medical Center, Eulji University School of Medicine, Korea, Rep. of South; ⁴Uijeongbu Eulji Medical Center, Eulji University College of Medicine, Department of Internal Medicine, Korea, Rep. of South; ⁵Nowon Eulji Medical Center, Eulji University School of Medicine, Department of Family Medicine, Korea, Rep. of South; ⁶Hanyang University, College of Medicine, Department of Internal Medicine, Korea, Rep. of South; ⁷Sahmyook University, College of Pharmacy, Korea, Rep. of South; ⁸Dongtan Sacred Heart Hospital of Hallym University Medical Center, Korea, Rep. of South; ⁹Soonchunhyang University College of Medicine, Korea, Rep. of South

**Background and aims:** A non-invasive screening test for hepatic fibrosis is recommended in at-risk group (those with fatty liver, elevated liver enzymes, diabetes, and ≥2 metabolic risk factors). The performances of fibrosis-4 index (FIB-4) and non-alcoholic fatty liver disease (NAFLD) fibrosis score (NFS) have not been evaluated in at-risk group. We aimed to evaluate the diagnostic performance of FIB-4.
and NFS in at-risk group with advanced hepatic fibrosis in a population with low prevalence of hepatic fibrosis.

**Method:** This retrospective, cross-sectional study included 8,545 participants who underwent magnetic resonance elastography (MRE) at 13 nationwide health-promotion centers during a routine health check-up. The area under the receiver-operating characteristic (AUROC) curves of FIB-4 and NFS were compared using DeLong’s test.

**Results:** Overall, 67.4% of individuals in health check-up cohort without the risk of viral or alcoholic hepatitis was at-risk group. At-risk group and those with NAFLD had comparable rates of significant and advanced (9.2% vs. 8.9% and 2.8% vs. 2.3%, respectively) hepatic fibrosis; furthermore, the AUROCs of FIB-4 (0.832 vs. 0.826, respectively; p = 0.873) and NFS (0.772 vs. 0.803, respectively; p = 0.457) in advanced hepatic fibrosis were similar. However, the AUROC (0.772 vs. 0.832, respectively; p < 0.001) and sensitivity (61.7% vs. 71.6%, respectively) in the at-risk group were lower for NFS than those for FIB-4. This feature was consistently observed, regardless of the kinds of guidelines such as American Gastroenterological Association (AGA) (0.832 in FIB-4 vs. 0.777 in NFS, p < 0.001), American Association for the Study of Liver Diseases (AASLD) (0.834 in FIB-4 vs. 0.773 in NFS, p = 0.004), and European Association for the Study of Liver (EASL) (0.837 in FIB-4 vs. 0.783 in NFS, p < 0.001).

**Conclusion:** The diagnostic performance of FIB-4 in at-risk group in a low-prevalence population is comparable to that in individuals with NAFLD. However, the diagnostic performance and sensitivity of NFS in at-risk group were low.

**SAT-463**

A diagnostic non-invasive model for liver advanced fibrosis and cirrhosis in chronic hepatitis B (CHB) concurrent with non-alcoholic fatty liver disease (NAFLD) based on machine learning (ML)  

Jie Li1, Yayan Xu2, Fajuan Rui3, Xiaorong Tian3, Qi Xue4, Qi Zheng4, Qing-Lei Zeng6, Zebao He7, Jian Wang1, Weimao Ding8, Chuanwu Zhu9, Yuanwan Qiu10, Yunliang Chen3, Junqing Fan3, Junping Shi11, Chao Wu1. 1Nanjing Drum Tower Hospital, The Affiliated Hospital of Nanjing University Normal University, Hangzhou, Zhejiang, China; 2Shandong Provincial Hospital, Shandong University, Jinan, Shandong, China; 3School of Computer Science, China University of Geosciences, Wuhan, China; 4Shandong Provincial Hospital Affiliated to Shandong First Medical University, Jinan, Shandong, China; 5Hepatology Research institute, the First Affiliated Hospital, Fujian Medical University, Fuzhou, China; 6The First Affiliated Hospital of Zhengzhou University, Zhengzhou, Henan, China; 7Taizhou Enze Medical Center (Group) Enze Hospital, Taizhou, Zhejiang, China; 8Huainan No. 4 People’s Hospital, Huainan, Jiangsu, China; 9The Affiliated Infectious Diseases Hospital of Soochow University, Suzhou, Jiangsu, China; 10The Fifth People’s Hospital of Wuxi, Wuxi, Jiangsu, China; 11The Affiliated Hospital of Hangzhou Normal University, Hangzhou, Zhejiang, China  

Email: lijier@sina.com

**Background and aims:** As NAFLD is prevalent globally, the concurrence of chronic hepatitis B (CHB) with non-alcoholic fatty liver disease (NAFLD) is increasing. But there are still lack of non-invasive models to accurately evaluate liver advanced fibrosis and cirrhosis in those patients. This study aimed to establish a novel diagnostic model for liver advanced fibrosis and cirrhosis in CHB patients concurrent with NAFLD based on machine learning (ML).

**Method:** This study consecutive enrolled CHB patients concurrent with NAFLD underwent liver biopsy and laboratory examination from six medical centers of China between April 2004 and September 2021 as training cohort and patients from other three medical centers of China between April 2004 and October 2020 as independent external validation cohort. We implemented ML models including gaussian naive bayes (GNB) and logistic regression (LR) to predict advanced fibrosis (S≥3) and cirrhosis (S = 4). Pearson correlation coefficient was used to explore the correlation between 29 clinical features and fibrosis grade. The features with the absolute value >0.2 of Pearson correlation coefficient were included in the diagnostic model. To avoid overfitting, 5-fold cross validations were used in the ML models building process. Model performance was compared to fibrosis index based on the four factors (FIB-4), activated partial thromboplastin time (APRI), and NAFLD Fibrosis Score (NFS) in patients of CHB concurrent with NAFLD.

**Results:** A total of 1427 CHB patients with NAFLD underwent liver biopsy were enrolled, with an average age of 38 (32–47) years (1093 males and 334 females). 298 cases (20.9%) have advanced fibrosis (S≥3), and 118 cases (8.3%) have cirrhosis (S = 4). Prothrombin time (PT) was positively associated with advanced fibrosis and cirrhosis, and albumin (ALB), platelet (PLT) were negatively associated with advanced fibrosis and cirrhosis. GNB model had the best performance, and its AUC for the diagnosis of advanced fibrosis and cirrhosis were 0.770 (0.714–0.827), 0.844 (0.795–0.893) in training cohort, and 0.716 (0.669–0.762), 0.812 (0.772–0.853) in validation cohort, which was significantly better than that of FIB-4, APRI and NFS (all P < 0.05).

**Conclusion:** GNB model performed better overall than FIB-4, APRI, and NFS. ML could be an effective tool for identifying clinically liver fibrosis and cirrhosis in CHB patients concurrent with NAFLD.

**Figure:** (abstract: SAT-463): AUC of machine learning models for fibrosis grade in training cohort and validation cohort: A. Advanced fibrosis (≥S3) in training cohort; B. Advanced fibrosis (≥S3) in validation cohort; C. Cirrhosis (S = 4) in training cohort; D. Cirrhosis (S = 4) in validation cohort.
SAT-464
Effect of diabetes mellitus and fatty liver on hepatic fibrosis
Byung Ik Kim1, Yong Kyun Cho2, Jung Hee Kim3, Ju-Yeon Cho4, Jae Yoon Jeong5, Won Sohn1, Kangbuk Samsung Hospital, Sungkyunkwan University School of Medicine, Korea, Rep. of South; 2Hallym University Dongtan Sacred Heart Hospital, Korea, Rep. of South; 3Chosun University Hospital, Korea, Rep. of South; 4National Medical Center, Korea, Rep. of South
Email: hand0827@naver.com

Background and aims: Diabetes mellitus is associated with fatty liver and hepatic fibrosis. However, it is unclear whether there is a risk of hepatic fibrosis in diabetes without fatty liver or does not have diabetes with fatty liver. This study aimed to investigate the risk factors for significant fibrosis in patients according to the presence of diabetes and fatty liver.

Method: A cross-sectional study was conducted based on a cohort from a health examination program which included magnetic resonance elastography (MRE). We classified four groups according to diabetes mellitus and fatty liver: Group 1, no diabetes without fatty liver; Group 2, no diabetes with fatty liver; Group 3, diabetes without fatty liver; Group 4, diabetes with fatty liver. Fatty liver was evaluated by ultrasonography. Significant fibrosis was defined as liver stiffness measurement (LSM) ≥2.97 kPa on MRE. We evaluated the difference in significant fibrosis by four groups and analyzed the risk factors for significant fibrosis after adjusting for confounding factors.

Results: A total of 1,899 subjects were included. The number of Group 1, Group 2, Group 3, and Group 4 was 902 (47%), 796 (42%), 47 (3%), and 154 (8%), respectively. Mean values of LSM in Group 1, 2, 3, and 4 were 2.34 ± 0.31 kPa, 2.42 ± 0.37 kPa, 2.49 ± 0.51 kPa, and 2.66 ± 0.70 kPa, respectively (p < 0.001). There was a significant difference in significant fibrosis (≥2.97 kPa) between four groups: 2.3%, 3.6%, 6.4%, and 19.5% in Group 1, 2, 3, and 4, respectively (p < 0.001). The multivariable-adjusted hazard ratios (aHR) with 95% confidence intervals (CI) for significant fibrosis comparing Group 4, Group 3, and Group 2 to Group 1 were 4.35 (2.14–8.85), 2.43 (0.65–9.12), and 0.96 (0.50–1.85), respectively (p < 0.001, p = 0.197, and p = 0.907).

Conclusion: The risk of significant fibrosis is high in patients with diabetes and fatty liver rather than those who have one of each. Although all patients with fatty liver have the risk of hepatic fibrosis, it is needed to assess and manage hepatic fibrosis in patients accompanied by diabetes in particular.

SAT-465
High performance of serological indexes in the non-invasive assessment of liver steatosis
Beatriz Pillado Pérez1, Carlota Siljestrom Berenguer1, Luis Eduardo Patiño Zorrilla2, Marta Abadía3, Gloria Ruiz-Fernández1, Joaquín Poza1, Eva Marín1, Carmen Amor1, Clara Amiama Roig1, Irene González Díaz1, Miriam Romero1, Araiceli García-Sánchez1, María Dolores Martín-Arranz1, Antonio Olivera Martín1, 1Hospital La Paz, Spain
Email: beapillado@gmail.com

Background and aims: Steatosis biomarkers are well validated by clinical guidelines but are not used frequently in daily practice. They are mainly used for epidemiological studies or in situations in which other techniques such as ultrasound or controlled attenuation parameter (CAP) are not available. Their real diagnostic value is limited because most studies compare them with ultrasound, CAP or magnetic resonance imaging (MRI) and not with liver biopsy which is still currently the gold standard. We aimed to determine diagnostic value and limitations of steatosis biomarkers using liver biopsy as reference.

Method: We performed a prospective study that included all patients undergoing hepatic biopsy. Clinical, anthropometric, laboratory, ultrasonographic and CAP (EchoSens’ Fibroscan 502 Touch) were measured on the same day before the liver biopsy. Hepatic Steatosis Index (HSI: sex, body mass index [BMI], alanine aminotransferase [ALT], aspartate aminotransferase [AST], diabetes, fatty Liver Index (FLI: BMI, waist circumference, gamma-glutamyl transferase [GGT], triglycerides) and TyG (triglycerides, glucose) were calculated. Biopsies were performed percutaneously using Tru-cut 16/18G needles. Exclusion criteria were biopsy length <1.5 cm or <11 portal tracts, focal lesions, acute hepatitis. Steatosis was diagnosed if liver fat content >5% on biopsy. Receiver operating characteristic (ROC) curves were performed to calculate the performance of the three steatosis biomarkers and CAP.

Results: 245 patients were included between March/20 and October/22. The majority of patients were male (59.8%), and the mean age was 54 years. Mean BMI was 27.4 kg/m2. With regard to liver histology, 42% of patients did not have steatosis, mild steatosis (6–33%), was detected in 23% and moderate (33–66%) or severe steatosis (>66%) in the remaining 35%. Liver fibrosis was not present in 48.4% of patients, mild fibrosis (F1/F2) was detected in 33.9% and advanced fibrosis (F3–F4) was seen in 17.7%. According to the aetiology, 44% of patients had Metabolic-associated Fatty Liver Disease, 18.5% autoimmune diseases, 2.4% genetic diseases, 1.6% alcoholic diseases, 22% normal biopsies and 11.5% other findings. Figure 1 summarises results.

Figure:

<table>
<thead>
<tr>
<th>N = 245</th>
<th>Optimal cut-off value</th>
<th>Sens (%)</th>
<th>Spec (%)</th>
<th>PPV (%)</th>
<th>NPV (%)</th>
<th>AUC</th>
<th>CI 95%</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAP (dB/m)</td>
<td>254</td>
<td>78</td>
<td>78</td>
<td>81.1</td>
<td>74.6</td>
<td>0.83</td>
<td>0.78–0.88</td>
</tr>
<tr>
<td>FLI</td>
<td>60.2</td>
<td>74.8</td>
<td>75.9</td>
<td>78.5</td>
<td>71.9</td>
<td>0.81</td>
<td>0.76–0.87</td>
</tr>
<tr>
<td>TyG</td>
<td>4.42</td>
<td>91</td>
<td>58</td>
<td>72</td>
<td>84.4</td>
<td>0.81</td>
<td>0.75–0.86</td>
</tr>
<tr>
<td>HSI</td>
<td>41.8</td>
<td>60.9</td>
<td>73.2</td>
<td>73</td>
<td>61.2</td>
<td>0.72</td>
<td>0.66–0.79</td>
</tr>
</tbody>
</table>


Conclusion: Steatosis biomarkers FLI and TyG are an excellent tool for the non-invasive diagnosis of steatosis.
Background and aims: The advanced hepatic fibrosis screening strategy using FIB-4-based non-invasive tests (NITs) in diabetes has been shown low sensitivity and specificity, so it is recommended to perform transient elastography (TE) or MR elastography (MRE) first, or combination with NITs. However, TE or MRE is often not available to primary care physicians (PCPs), and screening algorithm in which PCPs first use NITs followed by further evaluation at a tertiary hospital may increase the rates of unnecessary referrals. This study aimed to find out whether the FIB-4 and M2BPGi combination screening algorithm reduces unnecessary referral rates and is cost-effective for diabetic patients in PCPs setting.

Method: We constructed a combined model of the decision tree model and Markov model to compare expected costs and quality-adjusted life-years (QALYs) between ‘screening’ and ‘no screening’ groups from healthcare system perspectives. CVD and extrahepatic malignancy conditions potentially related to diabetes and hepatic fibrosis were also included in the model. Patients diagnosed with advanced fibrosis in the screening group were given intensive lifestyle intervention (ILI). Screening strategies compared in our model were (1) M2BPGi, (2) Fibrosis-4 (FIB-4), (3) NAFLD fibrosis score (NFS), (4) AST to platelet ratio index (APRI) (5) FIB4+M2BPGi (6) NFS +M2BPGi (7) APRI+M2BPGi. The prevalence of advanced fibrosis (7.9%) and diagnostic performance of each screening strategy were obtained from cohort data of 9,850 health check-up examiners from 13 health examination centers, and 809 diabetes patients from six tertiary hospitals, respectively. The incremental cost-effectiveness ratio (ICER) was calculated for 20-year horizon. We conducted various sensitivity analyses for varying input values and assumptions.

Results: In the base-case analysis, the estimated ICERs for all the screening strategies were shown below $25,000/QALY which is regarded as an implicit ICER threshold in Korea. FIB-4 with M2BPGi combination screening was not only cost-effective but also was shown to have a lower false positive rate than others, which led to decreasing referral rate to a tertiary hospital. This tendency was more pronounced when the MRE, which has a more precise performance than the TE, was used in the second step. The unnecessary referral rate was 45.4%-46.3% in the single algorithm of M2BPGi and FIB-4, but it decreased to 23.0% in their combination.

Conclusion: The FIB-4 and M2BPGi combination screening algorithm reduces 23.3% unnecessary referral rate compared to FIB-4 screening and is cost-effective for diabetic patients in PCPs setting.

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is the most common liver disease worldwide. It is an umbrella term for a spectrum of disease including hepatic steatosis, non-alcoholic steatohepatitis, fibrosis and cirrhosis. Evaluation for presence and degree of fibrosis is essential in prognostication, determining treatment plans and monitoring response to therapy. Historically, liver biopsy has been the gold standard for achieving this. However, significant shortcomings such as procedural complications, poor patient acceptance, cost and availability issues, sampling error and intra/inter-observer variability have driven development and adoption of non-invasive tests. We aim to evaluate the performance of various NITs in evaluating fibrosis in a multi-ethnic Asian cohort of biopsy-proven NAFLD patients.

Table 1. Base-case analyses by screening strategy (compared to ‘No screening’)

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>ICER ($)</th>
<th>TP</th>
<th>FP</th>
<th>TN</th>
<th>FN</th>
<th>Refer rate</th>
<th>Unnecessary referral proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>M2BPGi</td>
<td>0.8</td>
<td>73.1%</td>
<td>54.1%</td>
<td>12,048</td>
<td>5.1%</td>
<td>4.2%</td>
<td>67.9%</td>
<td>2.9%</td>
<td>9.3%</td>
</tr>
<tr>
<td>FIB4, 1.3</td>
<td>85.3%</td>
<td>44.3%</td>
<td>11,142</td>
<td>5.9%</td>
<td>5.1%</td>
<td>87.0%</td>
<td>2.0%</td>
<td>11.1%</td>
<td>46.3%</td>
</tr>
<tr>
<td>NFS, 1.455</td>
<td>84.4%</td>
<td>27.3%</td>
<td>12,463</td>
<td>5.9%</td>
<td>6.7%</td>
<td>85.4%</td>
<td>2.0%</td>
<td>12.6%</td>
<td>53.3%</td>
</tr>
<tr>
<td>APRI, 0.5</td>
<td>69.5%</td>
<td>78.5%</td>
<td>9,261</td>
<td>4.8%</td>
<td>2.0%</td>
<td>90.1%</td>
<td>3.1%</td>
<td>8.8%</td>
<td>28.0%</td>
</tr>
<tr>
<td>FIB4+M2BPGi</td>
<td>57.5%</td>
<td>87.0%</td>
<td>11,079</td>
<td>4.0%</td>
<td>1.2%</td>
<td>90.9%</td>
<td>3.9%</td>
<td>5.2%</td>
<td>23.0%</td>
</tr>
<tr>
<td>NFS+M2BPGi</td>
<td>74.7%</td>
<td>68.8%</td>
<td>11,629</td>
<td>5.2%</td>
<td>2.9%</td>
<td>89.2%</td>
<td>2.7%</td>
<td>8.1%</td>
<td>35.6%</td>
</tr>
<tr>
<td>APRI+M2BPGi</td>
<td>68.2%</td>
<td>63.1%</td>
<td>12,375</td>
<td>4.7%</td>
<td>3.4%</td>
<td>88.6%</td>
<td>3.2%</td>
<td>8.1%</td>
<td>41.7%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Followed by TE (Sensitivity 85% Specificity 78%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M2BPGi 0.8</td>
</tr>
<tr>
<td>FIB4, 1.3</td>
</tr>
<tr>
<td>NFS, 1.455</td>
</tr>
<tr>
<td>APRI, 0.5</td>
</tr>
<tr>
<td>FIB4+M2BPGi</td>
</tr>
<tr>
<td>NFS+M2BPGi</td>
</tr>
<tr>
<td>APRI+M2BPGi</td>
</tr>
</tbody>
</table>

APRI, aspartate aminotransferase to platelet ratio; FIB-4, fibrosis-4; FN, false negative; FP, false positive; ICER, incremental cost-effectiveness ratio; MRE, MR elastography; NFS, NAFLD fibrosis score; TE, transient elastography; TN, true negative; TP, true positive; QALY, quality-adjusted life-year.

Figure: (abstract: SAT-466).
Figure: (abstract: SAT-467).

AUCs

**Performance of NITs in identifying Fibrosis (F1-4)**

<table>
<thead>
<tr>
<th>Test</th>
<th>AUC (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIB-4</td>
<td>0.702 (0.651 - 0.754)</td>
</tr>
<tr>
<td>APRI</td>
<td>0.763 (0.716 - 0.811)</td>
</tr>
<tr>
<td>NFS</td>
<td>0.655 (0.596 - 0.712)</td>
</tr>
<tr>
<td>VCTE</td>
<td>0.852 (0.855 - 1.000)</td>
</tr>
<tr>
<td>Agile 3+</td>
<td>0.759 (0.642 - 0.954)</td>
</tr>
<tr>
<td>FAST</td>
<td>0.898 (0.825 - 0.974)</td>
</tr>
</tbody>
</table>

**Performance of NITs in identifying Clinically Significant Fibrosis (F2-4)**

<table>
<thead>
<tr>
<th>Test</th>
<th>AUC (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIB-4</td>
<td>0.769 (0.719 - 0.819)</td>
</tr>
<tr>
<td>APRI</td>
<td>0.785 (0.737 - 0.832)</td>
</tr>
<tr>
<td>NFS</td>
<td>0.650 (0.525 - 0.741)</td>
</tr>
<tr>
<td>VCTE</td>
<td>0.827 (0.752 - 0.902)</td>
</tr>
<tr>
<td>Agile 3+</td>
<td>0.806 (0.729 - 0.882)</td>
</tr>
<tr>
<td>FAST</td>
<td>0.797 (0.709 - 0.885)</td>
</tr>
</tbody>
</table>

**Performance of NITs in identifying Advanced Fibrosis (F3/4)**

<table>
<thead>
<tr>
<th>Test</th>
<th>AUC (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIB-4</td>
<td>0.869 (0.814 - 0.906)</td>
</tr>
<tr>
<td>APRI</td>
<td>0.858 (0.816 - 0.900)</td>
</tr>
<tr>
<td>NFS</td>
<td>0.760 (0.708 - 0.815)</td>
</tr>
<tr>
<td>VCTE</td>
<td>0.841 (0.776 - 0.905)</td>
</tr>
<tr>
<td>Agile 3+</td>
<td>0.872 (0.814 - 0.930)</td>
</tr>
<tr>
<td>FAST</td>
<td>0.828 (0.753 - 0.902)</td>
</tr>
</tbody>
</table>

**Performance of NITs in identifying At-Risk NASH**

<table>
<thead>
<tr>
<th>Test</th>
<th>AUC (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIB-4</td>
<td>0.727 (0.674 - 0.779)</td>
</tr>
<tr>
<td>APRI</td>
<td>0.793 (0.746 - 0.840)</td>
</tr>
<tr>
<td>NFS</td>
<td>0.578 (0.521 - 0.635)</td>
</tr>
<tr>
<td>VCTE</td>
<td>0.624 (0.511 - 0.737)</td>
</tr>
<tr>
<td>Agile 3+</td>
<td>0.581 (0.486 - 0.695)</td>
</tr>
<tr>
<td>FAST</td>
<td>0.770 (0.623 - 0.974)</td>
</tr>
</tbody>
</table>
Method: Patients with biopsy-proven NAFLD were enrolled from National University Health System, Singapore to undergo various non-invasive tests. Patients with any other causes for their liver disease were excluded. Fibrosis-4 index (FIB-4), AST to Platelet Ratio Index (APRI), NAFLD Fibrosis Score (NFS), BMI AST/ALT ratio and Diabetes score (BARD), as well as vibration-controlled transient elastography (VCTE), AGILE 3+ and FibroScan-AST score were evaluated for performance in assessment for fibrosis. These NITs were evaluated for performance in identifying clinically significant (F2–4) or advanced (F3–4) fibrosis and “at-risk NASH,” a commonly used cutoff for recruitment into clinical trials.

Results: 399 multi-ethnic Asian patients with biopsy-proven NAFLD were recruited to undergo non-invasive tests from 2014 to 2021. Area under receiver-operator-characteristics (AUC) values for identifying clinically significant fibrosis for FIB-4, APRI, NFS, VCTE, AGILE 3+ and FAST were 0.769, 0.785, 0.688, 0.827, 0.806 and 0.797 respectively. AUC values for identifying advanced fibrosis were 0.860, 0.858, 0.760, 0.841, 0.872 and 0.828. AUC values for identifying at-risk NASH were 0.727, 0.793, 0.578, 0.624, 0.581 and 0.770. BARD performed poorly across all analyses, with AUCs of 0.435 to 0.569. Analysis on subgroups with different histological score of steatosis revealed that FIB-4, APRI and NFS performed worse with increasing steatosis, while the performance of VCTE appeared better preserved across grades of steatosis.

Conclusion: VCTE, FIB-4 and APRI performed significantly better than NFS and BARD in identifying clinically significant and advanced fibrosis. VCTE performed well in identifying fibrosis of all severities but performed poorer in identifying at-risk NASH. APRI and FAST were superior to all other indices in prediction of at-risk NASH. FAST and AGILE 3+ scores did not otherwise show benefit over VCTE alone. Composite scores performed worse with more severe steatosis, suggesting VCTE may be the preferred NIT in such cases.

SAT-468
Impact of obesity on transient elastography accuracy among patients with non-alcoholic fatty liver disease
Maria Del Barrio Azaceta1, Paula Izuruibia1, Rebeca Sigüenza2, Carolina Jiménez-González2, Luis Ibañez2, Laura Izquierdo-Sánchez4, Jesús Rivera2, Javier Abad Guerra2, Javier Ampuero2, Isabel Graupera2, Carmelo García-Monzón2, Judith Gómez-Camareno2, Rosa M Morillas11, Vanesa Bernal Monterde12, Rosa Martín-Mateos13, Patricia Aspichueta14, Mercedes De La Torre Sanchez15, Salvador Benilloc16, Juan Turnes17, María Teresa Arias Loste1, Manuel Romero Gomez2, José Luis Calleja Panero6, Juan M Pericás5, Rafael Bañares3, Jesús M. Bañales4, Rocío Aller2, Javier Crespo1.

1Gastroenterology and Hepatology Department, Clinical and Translational Research in Digestive Diseases, Valdecilla Research Institute (IDIVAL), Marqués de Valdecilla University Hospital, Santander, Spain; 2Servicio de Aparato Digestivo, Hospital Clínico Universitario de Valladolid, CiberINFECC, Universidad de Valladolid, Valladolid, Spain; 3Servicio de Gastroenterología y Hepatología, Hospital Universitario Gregorio Marañón-Instituto de Investigación Sanitaria Gregorio Marañón (ISGGM), Universidad Complutense de Madrid, Madrid, Spain; 4Departamento de Enfermedades Hepáticas y Gastrointestinales, Instituto de Investigación Sanitaria Biodonostia-Hospital Universitario Donostia, Universidad del País Vasco (UPV/EHU), San Sebastián, Spain; 5Unidad de Hepatología, Hospital Universitario Vall d’Hebron-Instituto de Investigación Vall d’Hebron (VHIR), Universidad Autónoma de Barcelona, Barcelona, Spain; 6Servicio de Aparato Digestivo, Unidad de Hepatología, Hospital Universitario Puerta de Hierro-IDIFHISA, Madrid, Spain; 7Digestive Diseases Unit, Hospital Universitario Virgen del Rocío, Seville Group, Institute of Biomedicine of Seville (HUVR/CSIC/US), Department of Medicine, University of Seville, Seville, Spain; 8Unidad de Hepatología, Hospital Clinic-Instituto de Investigaciones Biomédicas August Pi i Sunyer (IDIBAPS), Universidad de Barcelona, Barcelona, Spain; 9Unidad de Investigación, Hospital Universitario Santa Cristina-Instituto de Investigación Sanitaria del Hospital Universitario de La Princesa, Madrid, Spain; 10Unidad de Hepatología, Servicio de Aparato Digestivo, Hospital Universitario de Burgos, Burgos, Spain; 11Servicio de Aparato Digestivo, Hospital Universitario Germans Trias i Pujol, Badalona, Barcelona, Spain; 12Departamento de Gastroenterología y Hepatología, Hospital Miguel Servet, Zaragoza, Spain; 13Departamento de Gastroenterología y Hepatología, Hospital Universitario Ramón y Cajal, Instituto Ramón y Cajal de Investigación Sanitaria (IRYCS), Madrid, Spain; 14Departamento de Fisiología, Universidad del País Vasco UPV/EHU, Instituto de Investigación Sanitaria Biocruces Bizkaia, Vizcaya, Spain; 15Unidad de hepatología, Consorcio Hospital General Universitario de Valencia, Valencia, Spain; 16Hospital Universitari i Politécnic La Fe, Valencia, Spain; 17Servicio de Digestivo, Hospital Universitario de Pontevedra, Pontevedra, Spain

Email: javiercrespo1991@gmail.com

Figure: (abstract: SAT-468).
Background and aims: Liver stiffness measurement by transient elastography (TE) is the most widely used and validated non-invasive method for the assessment of liver fibrosis in non-alcoholic fatty liver disease (NAFLD). However, the presence of obesity can affect the result of TE. Our aim was to evaluate the impact of obesity in the diagnostic performance of TE for NAFLD patients in specialized care centres.

Method: Multicentre and cross-sectional study with biopsy-proven NAFLD patients from the national HEPAmet registry. Inclusion criteria: Non-surgical liver biopsy and valid TE measure, with less than 6 months of difference from the biopsy. Exclusion criteria: Hepatocellular carcinoma, liver transplantation, portal thrombosis and use of beta-blockers.

Results: A total of 1,124 NAFLD patients were included (mean age 55.7 ± 11.0 years, 47% diabetic, 65.7% obese, 11.5% morbid obese). Advanced fibrosis (F3–F4) was present in 32.8% of patients. The 8 kPa cut-off point for advanced fibrosis had a sensitivity, specificity, PPV, and NPV of 94.6%, 39.6%, 43.3%, and 93.7%, respectively. The figure shows the distribution of fibrosis stages among different TE ranges in the overall cohort and according to the presence of obesity/morbid obesity. TE values of 10–15 kPa overestimates advanced fibrosis with more frequency among obese patients than non-obese (68.5% vs. 54.3%; p = 0.03). Obesity and controlled attenuation parameter (CAP) were associated with overestimation of advanced fibrosis by TE. The areas under the curve for diagnosis of advanced fibrosis in non-obese, obese, and morbidly obese patients were 0.84 ± 0.02, 0.80 ± 0.02 and 0.76 ± 0.04, respectively. Among patients with a TE ≥ 15 (n = 273), 33 patients had gastroscopy, of whom 12 (36.4%) presented oesophageal varices and/or portal hypertensive gastropathy. Of these 12 patients, 2 (16.7%) had F2 and both were obese.

Conclusion: In NAFLD patients, obesity may overestimate the value of TE and decrease its accuracy to detect advanced fibrosis. However, TE would predict liver-related outcomes better than liver biopsy.

SAT-469
A sequential use of transient elastography followed by Agile 3+ score significantly improves the screening of advanced fibrosis in patients with NAFLD with or without severe obesity
Adrien Aubin,1 Marianne Maynard,2,3 Bérénice Ségrestin,1 Yasmina Chouik,2 Laurent Milot,4 Valerie Hervieu,4 Fabien Zoulim,2,3

Background and aims: The Agile 3+ (A3+) score has been proposed to significantly improve the detection of AF in patients with or without severe obesity.

SAT-470
Cost-effectiveness of screening for advanced hepatic fibrosis by non-invasive test in general population
Bo-Kyeong Kang,1 Mimi Kim,1 Hye-Lin Kim,2 Huiyul Park3

Background and aims: The prevalence of advanced fibrosis in the general population of Koreans is significant at 2.2%, and diagnosis of advanced fibrosis is important for the prognosis of patients. However, the diagnostic performance of non-invasive tests [Fibrosis-4 (FIB4), and NAFLD fibrosis score (NFS)] differs according to age in the general population, and there is insufficient evidence for screening for advanced fibrosis in the general population. This study aimed to evaluate the cost effectiveness of screening strategy using sequential combination of non-invasive test followed by transient elastography (TE) for advanced hepatic fibrosis in the general population, as well as evaluating whether there is an optimal age for effective screening.

Method: We constructed a combined model of decision tree model and Markov model to compare expected costs and quality-adjusted life-years (QALYs) between ‘screening’ and ‘no screening’ groups from healthcare system perspectives. CVD and extraplastic malignancy conditions that potentially lead to advanced hepatic fibrosis were also
including the model. Patients diagnosed with advanced fibrosis in the screening group were given intensive lifestyle intervention (ILI), and the failure rate of ILI was assumed to be 60%. According to the age of the population (30 s to 70 s), the prevalence of advanced fibrosis was applied as 1.2% to 6.9%. The sensitivity/specificity of test was applied as 37.5% to 81.8%/44.0% to 96.7% in FIB4 and 16.7% to 73.5%/62.3% to 96.3% in NFS based on a data from 9850 health check-up examiners who underwent magnetic resonance elastography. Other input parameters applied to the model were obtained from literature review. Incremental cost-effectiveness ratio (ICER) was calculated for 20-year horizon. We conducted various sensitivity analyses for varying input values, including the screening starting age.

**Results:** In the base-case analysis, the estimated ICERs (for FIB4 and NFS) were $28,609 and $27,963 per QALY, which exceeded the $25,000 which is regarded as an implicit ICER threshold in Korea. However, considering the effects of CVD and extrahepatic cancer, the ICERs were decreased under the threshold, which indicates screening is cost-effective. In the subgroup analysis for screening starting age, the ICER of the age group over 40 years old was calculated below the cost-effectiveness threshold. In the various sensitivity analyses, the most influential parameters on cost-effectiveness were the ILI failure rate and effect of CVD and extrahepatic cancer.

**Conclusion:** Screening using non-invasive tests followed by TE in the general population is not cost-effective, but, it could be cost-effective, so: how) to screen for NAFLD in the general population. We tested the hypothesis that elevated plasma alanine transaminase (ALT) can be used as a screening tool for NAFLD in overweight and obese individuals from the Danish general population.

**Method:** This study screened adults in the Copenhagen General Population Study (CGPS), a population-based cohort of the Danish general population. Individuals with a body mass index (BMI) above 25 kg/m² and elevated plasma ALT at baseline (>71 U/L for men and >51 U/L for women) were invited to a hepatalogical evaluation, including a detailed medical history, extensive blood tests, and fibroscan. Individuals with clinical sign of NASH, evidence of fibrosis on fibroscan or elevated fibrosis-4 score (FIB-4), were offered further clinical assessment with a liver biopsy. Those who fulfilled the inclusion criteria for FLINC, an ongoing prospective NASH-cohort were included in this study. We aim to follow the participants from FLINC for >5 years.

**Results:** Of 997 individuals invited from the CGPS, 344 were enrolled (51.5% male, mean age: 60.6 years, mean BMI: 30.9 kg/m²). A total of 204 individuals (59.3%) were diagnosed with simple steatosis, whereas 61 (17.8%) had no sign of liver disease, and 15 were diagnosed with alcohol-related liver disease. A total of 53 (15.4%) had clinical signs of NASH fibrosis on fibroscan. Of these, 20 underwent liver biopsy, which identified various degrees of NASH fibrosis, that is, 5 with F0, 5 with F1, 3 with F2, and 7 with F3. In addition, 6 participants were diagnosed with advanced fibrosis and cirrhosis by biopsy due to alcohol-related liver disease (3 with F3 and 3 with F4). Finally, two serious incidental findings of cancer (premalign colon cancer and multiple myeloma), and one case of previously undiagnosed hepatitis C and autoimmune hepatitis were identified.

**Conclusion:** Screening using non-invasive tests followed by TE in the general population is not cost-effective, but it could be cost-effective, considering not only the liver-related condition but the effects of CVD and extrahepatic malignancies aged over 40.

**SAT-471**

Using elevated plasma alanine transaminase to screen for non-alcoholic fatty liver disease in overweight and obese individuals from the Danish general population

Elias Rashu1, Mikkel Werge1, Mira Thing1, Liv Hetland1, Puria Nabilou1, Anders Junker1, Anne-Sofie Houlberg Jensen1, Børge Nordegaard2, Stefan Stender1, Lise Lotte Gluud1, 1Gastro Unit, Copenhagen University Hospital Hvidovre, Denmark, Denmark; 2Department of Clinical Biochemistry, Copenhagen University Hospital Herlev and Gentofte, Denmark; 3Department of Clinical Biochemistry, Rigshospitalet, Copenhagen, Denmark; Email: elias.badal.rashu@regionh.dk

**Background and aims:** Affecting up to 30% of the general population, non-alcoholic fatty liver disease (NAFLD) is one of the leading causes of liver disease. The disorder covers a broad clinical spectrum ranging from hepatic steatosis through non-alcoholic steatohepatitis (NASH) to fibrosis and cirrhosis. A major unresolved issue is whether (and if...
SAT-472
Analysis of the diagnostic accuracy of the non-invasive fibrosis indices NFS, HFS, and FIB-4 in the staging of advanced fibrosis in patients with metabolic fatty liver: meta-analysis of comparative studies
Carmen Lara Romero 1,2, Jia-Xu Liang 1, Javier Ampuero 1,2, Javier Castell 1, Isabel Fernández-Lizaranzu 1, Manuel Romero Gomez 1,2, Hospital Universitario Virgen del Rocío, Department of Digestive and Liver Diseases, Seville, Spain; 6Institute of Biomedicine of Seville, Seville, Spain; 2Hospital Universitario Virgen del Rocío, Department of Radiology, Spain; 3Institute of Biomedicine of Seville, Interdisciplinary physics group, Spain
Email: carmenlarorro@gmail.com

Background and aims: Advanced fibrosis is related to a greater number of liver-related outcomes in patients with Metabolic Associated Fatty Liver Disease. Several non-invasive tests (NITs) have been developed to evaluate liver fibrosis in these patients to minimize the number of liver biopsies. We have performed a metaanalysis to evaluate the diagnostic performance of the following NITs: Fibrosis-4 (FIB-4) - NAFLD Fibrosis Score (NFS) and Hepamet Fibrosis Score (HFS).

Method: We have analyzed 4 databases until December 2022. Data has been taken from original studies showing data about the diagnostic accuracy of FIB-4, NFS and HFS, using standard cut-offs of biopsy-proven MAFLD patients. We extracted data according to the lower cut-off, higher cut-off and double cut-off methods. We included data of true positives, true negatives, false negatives and false positives patients. ROC curves were estimated using a random effects model.

Results: We included 7 studies with 5143 patients with MAFLD biopsy-proven patients. In the FIB-4 group, for the lower cut-off: S = 0.76[0.67–0.84], E = 0.65[0.49–0.78]; for the upper cut-off: (2.67): (S: 0.34[0.28–0.40], E: 0.96[0.92–0.98]). In the NFS group, for the lower cut-off (-1.455): (S: 0.80[0.71–0.87], E = 0.48[0.34–0.62]); for the upper cut-off: (0.675): (S: 0.37[0.28–0.47], E = 0.94[0.87–0.97]). In the HFS group, for the lower cut-off (0.12): (S: 0.78[0.70–0.84], E: 0.66 [0.49–0.80]); for the upper cut-off (0.47): (S: 0.43[0.38–0.49], E: 0.92 [0.87–0.95]). ROC curves for FIB-4, HFS, NFS to predict advanced fibrosis (≥F3) were 0.80 [0.76–0.83], 0.78[0.74–0.81], 0.73 [0.69–0.77], respectively. With the double cut-off method, we found a lower prevalence of indeterminate values for HFS (27% [20%–34%]).

Conclusion: In our metaanalysis, HFS and FIB-4 showed higher diagnostic accuracy than NFS to identify advanced fibrosis in MAFLD patients, while HFS showed a lower rate of patients in the grey zone (indeterminate values).

SAT-473
Correlation between serial Fibrosis-4 scores and liver stiffness measurements in patients with low-risk non-alcoholic fatty liver disease
Tanvi Goyal 1, Jing Hong Loo 2, Michael Song 1, Tianyu Qiu 1, Esteban Urias 1, Yu Jun Wong 3, Vincent Chen 1, Karrn Wijarnpreetcha 4, 1Michigan Medicine, Internal Medicine, Ann Arbor, United States; 2National University of Sinapar, Yong Loo Lin School of Medicine, Singapore; 3Changi General Hospital, Singapore; 4University of Arizona, United States
Email: tagoyal@med.umich.edu

Background and aims: In patients with non-alcoholic fatty liver disease (NAFLD) at baseline low risk, major professional societies recommend risk stratification using non-invasive tests such as Fibrosis-4 (FIB-4) score in lieu of liver stiffness measurement (LSM) by vibration-controlled transient elastography (VCTE). However, there are limited data on how changes in FIB4 and LSM correlate, and on whether meaningful changes in LSM can occur without changes in FIB4. Here, we evaluated associations between changes in FIB4 and LSM in NAFLD patients with serial VCTE studies.

Methods: This was a retrospective study of consecutive patients at Michigan Medicine in the United States with NAFLD who had at least two VCTE studies, spaced at least two years apart. We excluded patients with baseline LSM ≥20 kPa. The primary predictors were change between follow-up FIB4 (FIB4-2) and initial FIB4 (FIB4-1), which we call delta-FIB4. The primary outcome was a ≥25% increase in the second LSM (LSM-2) relative to baseline (LSM-1). The secondary outcome, which was applied to only patients with LSM-1 <8 kPa, was disease progression defined as a ≥25% increase in LSM-2 vs. LSM-1 and new advanced fibrosis (LSM-2 ≥8 kPa).

Results: We included 311 patients. Median age was 54 years, 53% were male, and 84% were white. Median follow-up time between VCTEs was 38.6 months. On follow-up, 30% of patients had a ≥25% increase in LSM, 24% had a ≥25% decrease, and 46% had a <25% change. 15% of low-risk NAFLD patients developed incident advanced fibrosis (LSM-2 ≥8 kPa and ≥25% increase vs. LSM-1). Delta-FIB4 correlated strongly with delta-LSM: r = 0.31 (p < 0.0001). Among patients with ≥25% increase in LSM, FIB4 did not change over time (delta-FIB4 = 0.15, p = 0.025 for difference from 0). In contrast, among patients with no LSM change or with LSM decrease, FIB4 did not change (delta-FIB4 = 0.02, p = 0.61 for difference from 0). Similarly, among patients with baseline LSM <8 kPa and disease progression, FIB4 increased over time with delta-FIB4 = 0.31 (p = 0.044 for difference from 0), but there was no change in FIB4 in those with baseline LSM <8 kPa and without disease progression (delta-FIB4 = 0.04, p = 0.31).

Figure: (abstract: SAT-472): Summary Receiving Operator Curves of the different non-invasive tests: FIB-4, NFS and HFS.
SAT-475

Diagnostic performance of NAFLD fibrosis score in lean NAFLD

Huiyul Park1, Eileen Yoon2, Sang Bong Ahn3, Hye-Lin Kim4, Jun-Hyuk Lee5, Mimi Kim6, Chul-min Lee6, Bo-Kyeong Kang6, Joo Hyun Sohn7, Jihyun An7, Joo Hyun Oh4, Hyo Young Lee7, Hyunwoo Oh7, Jang Han Jung7, Dae Won Jun2, Eun Chul Jang3.

1Myoungui Hospital, Hanyang University College of Medicine, Department of Family Medicine, Korea, Rep. of South; 2Hanyang University College of Medicine, Department of Internal Medicine, Korea, Rep. of South; 3Nowon Eulji Medical Center, Eulji University School of Medicine, Department of Internal Medicine, Korea, Rep. of South; 4Sahmyook University, College of Pharmacy, Korea, Rep. of South; 5Nowon Eulji Medical Center, Eulji University School of Medicine, Department of Family Medicine, Korea, Rep. of South; 6Hanyang University College of Medicine, Department of Radiology, Korea, Rep. of South; 7Korea University, College of Medicine, Department of Occupational and Environmental Medicine, Korea, Rep. of South

Email: noshin@hanyang.ac.kr

Background and aims: Diagnostic performance of fibrosis-4 index (FIB-4) and non-alcoholic fatty liver disease (NAFLD) fibrosis score (NFS) for advanced fibrosis in lean patients with NAFLD is limited. We aimed to evaluate the diagnostic performance and current cut-offs of FIB-4 and NFS in individuals with NAFLD.

Method: This multicenter, retrospective, cross-sectional study analyzed 1,501 patients with biopsy-proven NAFLD. The difference in diagnostic performance of FIB-4 and NFS between lean (body mass index (BMI) <23 kg/m²) and non-lean (BMI ≥23 kg/m²), and their sensitivity and specificity at the current cut-off value were also evaluated.

Results: Diagnostic performance and area under the receiver operating characteristic curves (AUROCs) of FIB-4 and NFS were comparable between the lean and non-lean groups. The AUROC of FIB-4 and NFS were not different in the lean group (0.807 vs. 0.790). The sensitivity and specificity of the current FIB-4 cut-off values did not change. But, the sensitivity of the current NFS cut-off values was lower in the lean group than in the non-lean group (54.4% vs. 72.7%). The NFS sensitivity decreased with the BMI quartiles. The FIB-4 sensitivity and specificity did not change according to BMI quartiles.

CONCLUSION: The overall diagnostic performance (AUROC) of FIB-4 and NFS in diagnosing advanced fibrosis did not differ between the lean and non-lean groups. However, the sensitivity of NFS at the current cut-off value decreased in lean individuals. FIB-4 at the current cut-off value would be a better screening parameter of advanced NAFLD fibrosis in lean individuals.

Figure: 1. Sensitivity (black square) and specificity (red circle) (red circle) of FIB-4 (a) and NFS (b) for diagnosing patients with advanced fibrosis. The current cut-off values are indicated by black triangles and red circles, respectively. The threshold for NFS is 0.70. The reference values for BMI are: <23 kg/m². The reference values for NFS are: 0.70.
SAT-476
Fatty liver score: a novel fatty liver index based on magnetic resonance imaging-proton density fat fraction
Chul-min Lee1, Bo-Kyeong Kang1, Minji Kim1, Eileen Yoon2, Sang Bong Ahn3, Jun-Hyuk Lee4, Joohyun Oh5, Jihyun An2, Dae Won Jun3.
1Hanyang University, College of Medicine, Department of Radiology, Korea, Rep. of South; 2Sahmyook University, College of Pharmacy, Korea, Rep. of South; 3Hanyang University, College of Medicine, Department of Internal Medicine, Korea, Rep. of South; 4Nowon Eulji Medical Center, Eulji University School of Medicine, Department of Internal Medicine, Korea, Rep. of South; 5Hanyang University College of Medicine, Department of Radiology, Korea, Rep. of South; 6Hanyang University College of Medicine, Department of Internal Medicine, Korea, Rep. of South; 7Dong-A University College of Medicine, Busan, South Korea, Korea, Rep. of South; 8Dong-A University College of Medicine, Busan, South Korea, Korea, Rep. of South

Background and aims: We aimed to develop a simple and intuitive model with high accuracy for predicting hepatic steatosis based on the gold standard method.

Method: We collected retrospective data from 2,111 participants who underwent magnetic resonance imaging-proton density fat fraction (MRI-PDFF) at six referral centers in three countries (Korea, Japan, and the United States). The full cohort was randomly assigned to a training cohort and a validation cohort at a ratio of 7:3. Variables were selected via multivariate logistic analysis, and additional linearity was confirmed using the smoothing spine method. Finally, a model maintaining a reasonable area under the receiver operating characteristics curve [AUROC] = 0.756, followed by the multivariate regression analysis revealed that M2BPGi was an independent risk factor for advanced liver fibrosis (odds ratio (OR): 1.33, p < 0.001). M2BPGi at a cut-off of 0.6 showed a similar diagnostic performance to the low cut-off of other NITs (sensitivity: 85.4% in M2BPGi vs. 84.4–85.3% in other NITs; specificity: 34.8% in M2BPGi vs. 27.3–43.3% in other NITs). The sequential combination of FIB4 followed by M2BPGi showed the sensitivity, specificity, positive predictive value, and negative predictive value of 94.4%, 19.1%, 38.5%, and 86.5%, respectively.

Conclusion: A combination of M2BPGi and APRI can help to exclude advanced hepatic fibrosis in diabetic patients. Through the two-step pathway, diabetic patients with advanced fibrosis could be referred to liver specialists.

SAT-477
The role of M2BPGi in screening for advanced hepatic fibrosis in diabetic patients
Mimi Kim1, Hye-Lin Kim2, Eileen Yoon1, Se Young Lang3, Ki Tae Yoon4, Young Yooun Cho2, Hoon Gil Jo2, Yang-Hyun Baek2, Sang Yi Moon2, Dae Won Jun3, Ajejong Jo1.
1Hanyang University, College of Medicine, Korea, Rep. of South; 2Sahmyook University, College of Pharmacy, Korea, Rep. of South; 3Kyungpook National University, Kyungpook National University Hospital, Daegu, South Korea, Korea, Rep. of South; 4Pusan National University, Korea, Rep. of South; 5Chung-Ang University Hospital, Seoul, Korea, Rep. of South; 6Wonkwang University College of Medicine, Korea, Rep. of South

Background and aims: There is a lack of algorithms that can identify and predict advanced hepatic fibrosis in diabetic patients, despite much evidence of a high rate of hepatic fibrosis in subjects with diabetes. The purpose of this study is to determine whether Mac-2-binding protein glycan isomer (M2BPGi) and other non-invasive test (NIT) and their combinations can help to exclude advanced hepatic fibrosis in diabetic clinics.

Method: 2,177 patients visiting the endocrinology clinic of six tertiary hospitals and performing M2BPGi and transient elastography (TE) between April 2020 and May 2021 were included. Of them, only patients with diabetes were included. FIB-4 and NAFLD fibrosis score (NFS) were calculated for all subjects and evaluated the diagnostic performance of single or combined tests for advanced fibrosis. Advanced fibrosis was defined by TE ≥ 8.0kPa.

Results: Of them, 641 diabetic patients with mean age, of 58.5 ± 12.6 years were included. Diagnostic performance of predicting advanced hepatic fibrosis was highest in FIB4 (the area under the receiver operating characteristics curve [AUROC] = 0.756), followed by M2BPGi and NFS (AUROC = 0.702 and 0.690, respectively). The multivariate regression analysis revealed that M2BPGi was an independent risk factor for advanced liver fibrosis (odds ratio (OR): 1.33, p < 0.001). M2BPGi at a cut-off of 0.6 showed a similar diagnostic performance to the low cut-off of other NITs (sensitivity: 85.4% in M2BPGi vs. 84.4–85.3% in other NITs; specificity: 34.8% in M2BPGi vs. 27.3–43.3% in other NITs). The sequential combination of FIB4 followed by M2BPGi showed the sensitivity, specificity, positive predictive value, and negative predictive value of 94.4%, 19.1%, 38.5%, and 86.5%, respectively.

Conclusion: A combination of M2BPGi and APRI can help to exclude advanced hepatic fibrosis in diabetic patients. Through the two-step pathway, diabetic patients with advanced fibrosis could be referred to liver specialists.

SAT-478
One-step diagnosis: detection and stratification of incidental hepatic steatosis by multiparametric abdomen ultrasound
Irene Gonzalez Diaz1, Carlota Siljestrom Berenguer1, Luis Eduardo Pariente Zorrilla1, Marta Abadia1, Eva Marin2, Gloria Ruiz-Fernandez3, Joaquin Poza1, Clara Amiaima Roig4, Carmen Amor1, Maria Dolores Martin-Arranz5, Antonio Oliveveira Martin6, 1Hospital la Paz, Gastroenterology and Hepatology Service, Spain; 2Hospital la Paz, Spain

Background and aims: The high prevalence of hepatic steatosis requires an efficient screening and stratification strategy. Non-invasive tests have low positive predictive value, and the referral of patients based exclusively on one of them is an excessive, inefficient overload for Liver Clinics. Within this broad population, a specific subgroup is incidental hepatic steatosis (IncHS) or hepatic steatosis not previously suspected on imaging tests, in which the risk of advanced liver fibrosis strategy is unknown (AASLD Guidelines 2018). Our aim was to determine the prevalence of IncHS, its characteristics, and the most efficient referral strategy of these patients from an Ultrasound Unit.

Method: Longitudinal and prospective study between November 2021 and June 2022. Consecutive patients presenting for abdominal ultrasound (Aplio i800, Canon) with criteria of hepatic steatosis (1) Liver hyperechogenicity with respect to renal cortex plus at least one of the following: Posterior beam attenuation, portal or hepatic veins blurring, gallbladder wall blurring or 2) Attenuation Imaging (AI) ≥ 0.63 dB/cm/MHz. Steatosis not previously diagnosed and not suspected based on the ultrasound request was considered
incidental. Patients with a previous diagnosis of steatosis, liver disease, or any reason for suspecting a liver disease according to the ultrasound request were excluded. Simultaneously, shear-wave elastography (2D-SWE) was performed, with a risk of advanced fibrosis if ≥7 kPa. In the same ultrasound room, the FIB-4 index was calculated according to available results (<1 year).

**Results:** 1724 patients were included in the study period. 762 (44.2%) showed steatosis, of which 198 (26%; 95% CI: 23–29.2) were considered incidental: mean age 58 years, women 56.5%, liver test alteration 25%. Factors associated with steatosis were: metabolic dysfunction 48% (obesity 77.9%, diabetes 13%, hypertension/dyslipidemia 45.5%), alcohol 6.5%, steatogenic medication 0.5%. The most frequent reasons for ultrasound requests were biliopancreatic (31%) and abdominal pain (19.6%). In the 198 with InHS, the mean elastography value was 4.7 ± 1.5 kPa, 67 (44%) had FIB-4 >1.3 and 17 (8.6%) 2D-SWE ≥7 kPa. Only 11/198 patients (5.6%; 95% CI: 3.1–9.7) had FIB-4 >2.67 and 2D-SWE ≥7 kPa, and were referred primarily to the Liver Clinic; the remaining 187 (94.4%) followed their standard pathway.

**Conclusion:** Incidental hepatic steatosis is frequent in a Gastroenterology Ultrasound Unit. As expected, the prevalence of risk of advanced fibrosis is low. Multiparametric ultrasound allows for a one-step diagnosis, and stratification, avoiding unnecessary referrals.

**SAT-479**

**High performance of new multiparametric ultrasound in the non-invasive assessment of liver disease**

Gloria Ruiz-Fernandez1, Marta Abadia2, Miriam Romero1, Cristina Suárez3, Joaquín Poza1, Eva Marín1, Clara Amiama Roig1, Carmen Amor1, Irene González Díaz1, Carlota Siljestrom Berenguer1, Beatriz Pillado Pérez1, Luis Eduardo Pariente Zorrilla1, María Dolores Martín-Arranz1, Antonio Olivera Martín1. 1Hospital La Paz, Gastroenterology, Spain; 2Hospital La Paz, Spain; 3Hospital La Paz, Spain

Email: gloria.ruizf@gmail.com

**Background and aims:** Liver diseases affect millions of people worldwide. There is an increasing interest in accessible, reliable tools in the non-invasive assessment of liver disease. We assessed the performance of new Attenuation Imaging and Shear-Wave elastography multiparametric ultrasound tools for the diagnosis of steatosis and advanced fibrosis.

**Method:** Adult patients consecutively programmed for liver biopsy were prospectively included between February 2020–November 2022. On the same day of percutaneous liver biopsy and prior to it, we conducted the following procedures: transient elastography (TE) and controlled-attenuation parameter (CAP); Fibroscan S02 Touch, EchoSens, France; and bidimensional shear-wave (2D-SWE) and Attenuation Imaging (ATI): Aplio i800, Canon, Japan. We excluded patients with acute liver disease, biopsy <11 portal tracts, and contraindication for liver biopsy. 16–18G Tru-cut needle was used under ultrasound guidance. Metabolic-associated fatty liver disease (MAFLD) was staged according to non-alcoholic steatohepatitis Clinical Research Network scoring (NASH CRN). Chronic hepatitis was classified according to META VIR. Normally distributed quantitative variables were described using the mean. Diagnostic performances for steatosis (fatty content >5%) and advanced fibrosis (F3–F4) were assessed with receiver operating characteristic curves.

**Results:** A total of 249 patients were included, the mean age was 51 years, 60% were female, the mean BMI was 27.4 kg/m², and the mean GPT was 70 UI/L. The mean biopsy length was 25 mm, 15 portal tracts. The distribution of final diagnosis after biopsy was as follows: MAFLD (n = 115, 46%) of which steatohepatitis 68 (60%), AH (n = 32, 13%), CBP (n = 10, 4%), others or minimal changes (n = 92, 37%). Fibrosis grades were: F0 123 (49%), F1/F2 80 (32%), F3/F4 44 (17%). Considering the liver biopsy as reference variable, for steatosis the performances were: CAP 0.83, ATI 0.91. For advanced fibrosis (F3/F4), the performances were: TE 0.93, 2D-SWE 0.95. In the subgroup of MAFLD, the performances for advanced fibrosis were: TE 0.89, 2D-SWE 0.95 (table 1)

Table: ATI and CAP accuracy for >5% steatosis detection. ET, 2D-SWE accuracy for advanced fibrosis detection in the total group and in the MALD subgroup.

<table>
<thead>
<tr>
<th></th>
<th>N = 249</th>
<th>AUROC</th>
<th>95% CI; p</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;5% Steatosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAP (dB/m)</td>
<td>0.83</td>
<td>0.78–0.88</td>
<td>0.0001</td>
</tr>
<tr>
<td>ATI (dB/cm Hz)</td>
<td>0.91</td>
<td>0.87–0.95</td>
<td>0.0001</td>
</tr>
<tr>
<td>F3/F4 Fibrosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TE (kPa)</td>
<td>0.93</td>
<td>0.90–0.97</td>
<td>0.0001</td>
</tr>
<tr>
<td>2D-SWE (kPa)</td>
<td>0.95</td>
<td>0.91–0.99</td>
<td>0.0001</td>
</tr>
<tr>
<td>F3/F4 Fibrosis MAFLD (N = 115)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TE (kPa)</td>
<td>0.89</td>
<td>0.82–0.96</td>
<td>0.0001</td>
</tr>
<tr>
<td>2D-SWE (kPa)</td>
<td>0.95</td>
<td>0.91–1.00</td>
<td>0.0001</td>
</tr>
</tbody>
</table>

AUROC: area under the receiver operating characteristic curve; CI: confidence interval; CAP: controlled-attenuation parameter; ATI: attenuation imaging; TE: transient elastography; 2D-SWE: bidimensional shear wave elastometry; MAFLD: metabolic-associated fatty liver disease.

**Conclusion:** Bidimensional shear-wave and Attenuation Imaging technologies using multiparametric ultrasound are very reliable tools in the non-invasive assessment of liver disease, including MAFLD.
SAT-480
Inclusion of the fatty liver-associated variants in the clinical workup of patients: results of an eight years’ experience in a tertiary referral center with genotyping facility
Susanne N Weber1, Mathias Straub2, Frank Lammert2, Marcin Krawczyk1,3. 1Department of Medicine II, Saarland University Medical Center, Homburg, Germany; 2Hannover Medical School (MHM), Hannover, Germany, 3Laboratory of Metabolic Liver Diseases, Medical University of Warsaw, Warsaw, Poland
Email: marcin.krawczyk@uksh.de

Background and aims: Genetic testing has become increasingly available in clinical practice. In our center we have introduced the genotyping of fatty liver-associated variants in the clinical work-up of patients with chronic liver diseases in 2013. Here, we present the genotyping results of patients treated in our department up to the year 2021.

Method: In total, we analysed 462 patients with fatty liver phenotypes who were referred by the physicians working in our department for genetic testing of the two common fatty liver-associated variants, namely PNPLA3 p.I148M and MBOAT7 p.E17G. In addition to our panel, we genotyped the newly detected MTARC1 rs2642438 variant that was recently shown to have protective effects on liver status (Fairfield et al. Hepatol Commun 2022). Genotyping procedures were performed using allelic discrimination assays. Liver steatosis and fibrosis were quantified non-invasively using controlled attenuation parameter (CAP) and liver stiffness measurement (LSM) by transient elastography.

Results: The results of genotyping procedures were provided to the admitting physicians within an average time of 24 days from blood sampling. The minor allele frequencies (MAF) of the PNPLA3, MBOAT7 and MTARC1 variants were 25.2%, 40.8%, and 21.5%, respectively, and did not significantly differ from reference data available for Europeans. Among the three tested variants, the PNPLA3 p.I148M genotype correlated with increased serum ALT, AST as well as serum transferrin (all p < 0.01) and iron concentrations (p = 0.02) in carriers of the homozygous [MM] genotype. These patients also presented with significantly (p < 0.01) higher CAP values (299 ± 62 dB/m) as compared to carriers of the common allele (267 ± 74 dB/m), but we did not find any major effect of this variant on LSM (p = 0.09). The only correlation for MBOAT7 p.E17G was found with increased levels of leukocytes (p = 0.02), but not with liver phenotypes (all p > 0.05).

Finally, we did not find any relevant associations between the MTARC1 variant and liver steatosis, fibrosis markers or other patient characteristics.

Conclusion: Our data underscore the central role of PNPLA3 p.I148M variant in the fatty liver phenotype. Routine genotyping of this variant in clinical practice can be rapidly performed and might help to identify at-risk patients with worse liver status.

SAT-481
Performance of novel collagen turnover biomarkers in relation to FIB-4 to detect advanced fibrosis in NAFLD
Hannes Hegmar1, Thomas Møller2, Patrik Nasr3, Johan Vessby4, Stergos Kechagias3, Nils Nyhlin5, Hanns-Ulrich Marschall6, Åsa Danielsson Borsén7, Morten Karsdal2, Diana Leeming2, Mattias Ekstedt2, Hannes Hagström1. 1Karolinska Institutet (Karolinska University Hospital, Department of Medicine, Huddinge, Sweden; 2Nordic Bioscience Biomarkers and Research AS, Denmark; 3Department of Health, Medicine and Caring Sciences, Linköping University, Sweden; 4Department of Medical Sciences, Gastroenterology Research Group, Uppsala University, Sweden; 5School of Medical Sciences, Örebro University, Sweden; 6Department of Molecular and Clinical Medicine, University of Gothenburg, Sweden; 7Department of Public Health and Clinical Medicine, Umeå University, Sweden
Email: hhegmar@gmail.com

Background and aims: Cleavage products from different types of collagens that reflect the formation, and degradation, of fibrosis are potential novel biomarkers to detect advanced fibrosis in patients with non-alcoholic fatty liver disease (NAFLD). Here, we investigated the diagnostic performance of PRO-C3, PRO-C6, C4M, PRO-C18L, ADAPT, a score based on PRO-C3 and clinical parameters, and FIB-4 to diagnose advanced fibrosis, based on liver biopsy or liver stiffness measurement (LSM) by vibration-controlled transient elastography (VCTE).

Method: Serum from 299 patients with NAFLD from six Swedish university hospitals were analyzed with an ELISA-based method for PRO-C3, PRO-C6, C4M and PRO-C18L. LSM by VCTE was performed at inclusion, and when clinically motivated, a liver biopsy was performed (n = 134). Blood samples were collected at the time of the LSM. FIB-4 and ADAPT scores were calculated. Advanced fibrosis was defined as fibrosis stage 3–4 on liver biopsy, or an LSM ≥15 kPa in patients without biopsy data. The area under the receiver operating characteristic curve (AUROC) was calculated for all biomarkers to evaluate their ability to diagnose advanced fibrosis.

Results: Advanced fibrosis was found in 48 (14.6%) patients. These were older than patients without advanced fibrosis (64.5 years vs 55 years, p < 0.001) and more commonly had type 2 diabetes (75% vs 43%, p < 0.001). When investigating the diagnostic performance of advanced fibrosis, PRO-C3 had an AUROC of 0.73 (95% confidence Interval [CI] = 0.65–0.80), PRO-C6 0.56 (95%CI = 0.48–0.64), C4M 0.57 (95%CI = 0.48–0.66), and PRO-C18L 0.46 (95%CI = 0.38–0.54). The ADAPT score had the highest AUROC for diagnosis of advanced fibrosis (0.85 (95%CI = 0.79–0.90). However, ADAPT was not significantly better than the FIB-4 score (AUROC 0.83, 95%CI = 0.78–0.89, p = 0.54) (Figure). None of the biomarkers could accurately diagnose presence of NASH.

Conclusion: Among the evaluated novel biomarkers in this cohort, PRO-C3 had a good diagnostic performance, which improved when implemented in the score ADAPT. FIB-4 and ADAPT had an excellent performance in detecting advanced fibrosis. These results suggest that FIB-4 remains a favorable biomarker to, as a first-line test, predict presence of advanced fibrosis in patients with NAFLD.

SAT-482
Evaluating the role of novel magnetic resonance imaging-based biomarkers in non-invasive assessment of hepatic fibrosis and activity in non-alcoholic fatty liver disease
En Ying Tan1, Sin Hui Melissa Chua1, Eunice Tan1, Daniel Huang1, Jonathan Lee1, Margaret Teng1, Nur Halisah Binte Jumat1, Yock Young Dan1, Mark Muthiah1. 1National University Hospital (NUH)-Singapore, Department of Gastroenterology and Hepatology, Singapore, Singapore
Email: tanenying@hotmail.com

Background and aims: Non-alcoholic fatty liver disease (NAFLD) encompasses a spectrum of disease including hepatic steatosis, non-alcoholic steatohepatitis, fibrosis and cirrhosis. It is the most common...
liver disease worldwide. Identification of those with significant fibrosis and disease activity is the cornerstone of risk stratification of NAFLD patients and preventing progression to irreversible liver disease. Liver biopsy is considered the gold standard for diagnosis and assessment of NAFLD, but drawbacks such as procedural risks, sampling error, cost, poor acceptability and limited availability highlight the need for robust non-invasive tests (NITs). We aimed to evaluate the performance of LiverMultiScan (LMS) and Body Composition Profiling (BCP). We also aimed to correlate BCP to disease activity to generate novel associations in the disease.

**Method:** Patients at the National University Health System, Singapore who had NAFLD and underwent liver biopsy were recruited to undergo LMS and BCP. All patients were extensively evaluated for alternative causes of liver disease and results were negative. LMS cT1 and various BCP indices were evaluated for their performance in assessment of fibrosis and activity.

**Results:** 106 multi-ethnic Asian patients with biopsy-proven NAFLD were recruited from 2020 to 2022 to undergo the two scans. PDFF had AUCs of 0.979 for any steatosis, 0.867 for S2–S3 steatosis and 0.906 for S3 steatosis. AUC values for cT1 were 0.702, 0.740, 0.702 and 0.714 for identifying NAFLD Activity Score (NAS) of at least 5, SAF activity score of at least 3, NASH and at-risk NASH respectively. cT1 appeared to perform well for the above metrics regardless of grade of steatosis. AUCs improved when combining cT1 with some NITs (PDFF, FIB-4, APRI) via logistic regression modelling, but this did not reach statistical significance. In particular, cT1 with APRI achieved the highest AUC of 0.824. Logistic regression models including all BCP indices achieved much higher performance compared to individual indices, with AUCs of 0.803, 0.846, 0.846 and 0.780 for at-risk NASH, advanced fibrosis, NAS ≥5 and SAF ≥3. BCP indices relating to visceral adiposity had the largest AUCs for predicting fibrosis, activity and steatosis. HOMA-IR score is correlated to visceral adipose tissue index (VATi). On multiple linear regression, VAT (VATi) and HOMA-IR both independently correlate with stage of fibrosis, while VATi correlates independently with activity.

**Conclusion:** Quantitative MRI-based biomarkers from both LMS and BCP scans were able to identify patients with more advanced or more aggressive NAFLD. There may be a role for novel predictive models that combine multiple biomarkers to enhance diagnostic performance. BCP has a role in investigating the mechanisms linking NAFLD, visceral adiposity and insulin resistance.
SAT-484
Diagnostic performance of non-invasive fibrosis markers in patients with immune-mediated disease and hepatic steatosis
María Del Barrio Azaceta 1, Paula Iruzuibia 1, Juan Carlos Rodríguez Duque 1, Carolina Jiménez-González 2, Marta Hernández Conde 3, Coral Rivas 1, Álvaro Santos-Laso 1, Laura Rasines 1, Lorena Cayon 1, Ana Álvarez Canuego 1, Sara Arias-Sánchez 1, Andrea Fernández-Rodríguez 1, Christie Perelló 2, María Teresa Arias Loste 3, José Luis Calleja Panero 2, Javier Crespo 1.
1Gastroenterology and Hepatology Department, University Hospital Diego Vives, Girona, Spain; 2Servicio de Aparato Digestivo, Unidad de Hepatología, Hospital Universitario Puerta de Hierro-IDIPHISA, Madrid, Spain; 3Servicio de Aparato Digestivo, Unidad de Hepatología, Hospital Universitario de La Princesa, Madrid, Spain
Email: javiercrespo1991@gmail.com

Background and aims: High prevalence of non-alcoholic fatty liver disease (NAFLD) has been evidenced in patients with immune-mediated diseases (IMID), regardless of classical metabolic factors. However, the performance of non-invasive fibrosis tests in these patients is unknown. Our aim was to assess the accuracy of non-invasive tests in identifying advanced fibrosis (AdF) among patients with NAFLD and IMID.

Method: Multicentre, cross-sectional study that included patients with IMID (inflammatory bowel disease, psoriasis, hidradenitis suppurativa, and/or spondyloarthritides) who attended to two university hospitals (Santander and Madrid) between March 2018 and December 2019. Liver stiffness was obtained using FibroScan® and with scores based on blood tests. The cut-off value of the CAP score was accepted as 274 dB/m. The sensitivity, specificity, positive (PPV) and negative (NPV) predictive value of the tests were calculated considering the liver histological result as reference in patients with liver biopsy.

Results: Among the 1,535 patients with valid FS, fatty liver without other causes of liver disease was detected in 668 (43.5%) (mean age 54 ± 11.5 years; 57% men; 41.2% obese; 12.1% diabetics). A FS ≥8 kPa was detected in 20.2% of patients, while a FS ≥12 kPa was evidenced in 5.5% of patients. Risk of AdF measured by NFS, FIB-4, APRI, and HFS was obtained in 1.7%, 4.9%, 0.5%, and 0.5% of patients, respectively. Liver biopsy was proposed to all patients with FS ≥8 kPa and/or increased ALT values (n = 217), accepting a total of 85 patients (mean age 54 ± 11.5 years; 57% men; 41.2% obese; 12.1% diabetics). A FS ≥8 kPa was detected in 20.2% of patients, while a FS ≥12 kPa was accepted as advanced fibrosis (F3-F4) in FibroScan® measurements. Fibrosis and steatosis was compared with non-invasive fibrosis markers of patients with T1DM and T2DM. Fibrosis values in patients with T2DM were found to be significantly higher in all kinds of non-invasive markers (p = 0.001). When the factors affecting fibrosis are investigated; age, BMI, waist/hip ratio, and DM duration were found to be significantly correlated with fibrosis. The mean CAP score in patients with and without diabetes mellitus were observed more frequently in the presence of significant fibrosis (p = 0.03). The mean CAP score in patients with and without microvascular complications was 267.24 ± 56.74, 256.51 ± 58.13 dB/m (p = 0.05), and in patients with and without macrovascular complications was 267.24 ± 56.74, 256.51 ± 58.13 dB/m (p = 0.05).

Conclusion: APRI, FIB-4, and FS are the most useful screening tools for the detection of AdF among patients with NAFLD and IMID.

SAT-485
The liver worsens in non-alcoholic fatty liver disease patients as diabetes mellitus worsens and lasts longer
Zihal İstemihan 1, Fatih Bektaş 2, Ali Emre Bardak 2, Cansu Kızılıslı 3, Gamze Kemen 2, Ziya İmanol 2, Volkan Senkal 2, Kanan Nuriyev 2, Ay núre Rüstemzade 1, Sezen Genç 1, Hülya Hac shaftınogulları 2, Kubilay Karşıdağ 2, Bilger Çağuş 1, Aslı Çiçbi Baş Ormeç 1, Filiz Akyüz 1, Kadir Demir 1, Fatih Beşik 1, Sabahattin Kaymakoglu 2, 1Istanbul University, Istanbul Faculty of Medicine, Department of Internal Medicine, Division of Gastroenterology, Istanbul, Turkey; 2Istanbul University, Istanbul Faculty of Medicine, Department of Internal Medicine, Division of Endocrinology and Metabolic Diseases, Istanbul, Turkey; 3Istanbul University, Istanbul Faculty of Medicine, Department of Internal Medicine, Istanbul, Turkey
Email: kaymakoglus@hotmail.com

Background and aims: Type 2 diabetes mellitus (T2DM) is a major driver of non-alcoholic fatty liver disease (NAFLD). It was aimed to investigate the frequency of NAFLD with non-invasive tests and the factors affecting liver fibrosis in type 1 diabetes mellitus (T1DM) and T2DM patients.

Method: We prospectively evaluated the frequency of NAFLD and liver fibrosis with biomarkers based on blood tests and FibroScan® in adult (≥18 years) patients with T1DM and T2DM who were followed up from the diabetes mellitus (DM) outpatient clinic in a tertiary center. ≥8 kPa was accepted as significant fibrosis (F2), and ≥9.6 kPa was accepted as advanced fibrosis (F3-F4) in FibroScan® measurements. The cut-off value of the CAP score was accepted as 274 dB/m in FibroScan® measurements. Fibrosis and steatosis was compared with FibroScan® and with scores based on blood tests.

Results: A total of 520 diabetic patients (55.6% female, 82.1% T2DM) who follow-up consecutively were included in our study. The mean age of the patients was 56.28 ± 14.78 years, DM duration was 13.27 ± 8.96 years, body mass index (BMI) was 28.63 ± 6.06 kg/m², waist circumference was 101.38 ± 14.27 cm, hip circumference was 107.76 ± 12.87 cm. Liver stiffness measurements (LSM) and CAP scores with serum scores of the study group are summarized in Fig. The frequency of NAFLD was higher in patients with T2DM than in patients with T1DM (48.7%, 12.9%, respectively, p = 0.01). When fibrosis scores were compared with non-invasive fibrosis markers of patients with T1DM and T2DM, fibrosis values in patients with T2DM were found to be significantly higher in all kinds of non-invasive biomarkers (p = 0.001). When the factors affecting fibrosis are investigated; age, BMI, waist/hip ratio, and DM duration were found to be significantly correlated with fibrosis. The incidence of significant fibrosis was higher in patients with T2DM compared to T1DM (29%, 5%, respectively, p = 0.01). Advanced fibrosis rate was found to be higher in patients with T2DM than in T1DM (20%, 5%, respectively, p < 0.05). Microvascular complications of diabetes mellitus were observed more frequently in the presence of significant fibrosis (p = 0.03). The mean CAP score in patients with and without microvascular complications was 267.24 ± 56.74, 256.51 ± 58.13 dB/m (p < 0.05), and in patients with and without macrovascular complications was 267.24 ± 56.74, 256.51 ± 58.13 dB/m (p < 0.05).
POSTER PRESENTATIONS

complications, the mean CAP score was 266.44 ± 54.01, 260.9 ± 58.78 dB/m (p < 0.05), respectively. While LSM was most significantly correlated with FIB4 and NAFLD fibrosis scores (p <0.01, r = 0.518; p <0.01, r = 0.361, respectively), CAP score was correlated with fatty liver index and hepatic steatosis index (p <0.01, r = 0.6; p <0.01, r = 0.583, respectively).

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is the most common chronic liver disease, affecting approximately one third of the global adult population. Patients with type 2 diabetes (T2D) constitute a risk group for presence and severity of NAFLD. Yet, there are few published examples of collaborations between endocrinologists and hepatologists in caring for patients with T2D and NAFLD. Here, we describe preliminary results and patient characteristics from a novel pathway for screening of liver fibrosis in routine specialist diabetes care at a tertiary care hospital.

Method: Patients with T2D seen at the Endocrinology department at Karolinska University Hospital, Stockholm, Sweden, during a structured intervention for T2D between October 2016 and December 2022 were eligible for inclusion. These patients were compared with T2D referred for a comprehensive assessment. Subjects with excessive alcohol consumption, viral hepatitis or other chronic liver diseases were excluded. Liver stiffness measurement (LSM) and Controlled attenuation parameter (CAP) was obtained utilizing vibration-controlled transient elastography (VCTE). A LSM cut-off to exclude advanced fibrosis was set to 8 kPa. LSM cut-off to exclude advanced fibrosis was set to 8 kPa.

Results: A total of 167 patients with a valid LSM were included. The median age was 59 years and 39% were women. The mean LSM was 8.3 (SD 6.4) kPa, and the median CAP was 317 dB/m. In total, 32% had LSM ≥ 8 kPa; 19% had LSM ≥ 10 kPa; and 11% had LSM ≥ 15 kPa. NAFLD defined as CAP ≥ 280 dB/m was present in 94 (66%) patients. Baseline characteristics stratified on a LSM measurement of 8 kPa are presented in Table 1.

Conclusion: NAFLD was detected more frequently in patients with T2DM than in T1DM. BMI, waist/hip ratio, age, duration of DM and complications of DM were found to be the main factors affecting liver fibrosis in T2DM. Microvascular and macrovascular complications of DM are significantly more common in diabetic patients with NAFLD.

SAT-486
Implementing a clinical care algorithm for screening of liver fibrosis in specialist diabetes care
Muna Tajudin1,2, Johan Hoffstedt 1, Sophia Rössner1, 1Karolinska Institutet, Department of Medicine, Huddinge, Sweden; 2Karolinska University Hospital, Department of Upper GI Diseases, Sweden
Email: muna.tajudin.2@ki.se

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is the most common chronic liver disease, affecting approximately one third of the global adult population. Patients with type 2 diabetes (T2D) constitute a risk group for presence and severity of NAFLD. Yet, there are few published examples of collaborations between endocrinologists and hepatologists in caring for patients with T2D and NAFLD. Here, we describe preliminary results and patient characteristics from a novel pathway for screening of liver fibrosis in routine specialist diabetes care at a tertiary care hospital.

Method: Patients with T2D seen at the Endocrinology department at Karolinska University Hospital, Stockholm, Sweden, during a structured intervention for T2D between October 2016 and December 2022 were eligible for inclusion. These patients were compared with T2D referred for a comprehensive assessment. Subjects with excessive alcohol consumption, viral hepatitis or other chronic liver diseases were excluded. Liver stiffness measurement (LSM) and Controlled attenuation parameter (CAP) was obtained utilizing vibration-controlled transient elastography (VCTE). A LSM cut-off to exclude advanced fibrosis was set to 8 kPa.

Results: A total of 167 patients with a valid LSM were included. The median age was 59 years and 39% were women. The mean LSM was 8.3 (SD 6.4) kPa, and the median CAP was 317 dB/m. In total, 32% had LSM ≥ 8 kPa; 19% had LSM ≥ 10 kPa; and 11% had LSM ≥ 15 kPa. NAFLD defined as CAP ≥ 280 dB/m was present in 94 (66%) patients. Baseline characteristics stratified on a LSM measurement of 8 kPa are presented in Table 1.

Conclusion: NAFLD was detected more frequently in patients with T2DM than in T1DM. BMI, waist/hip ratio, age, duration of DM and complications of DM were found to be the main factors affecting liver fibrosis in T2DM. Microvascular and macrovascular complications of DM are significantly more common in diabetic patients with NAFLD.

SAT-487
The use of non-invasive tests compared with histological fibrosis stage in predicting liver-related events in metabolic dysfunction-associated fatty liver disease
Wah Loong Chan1, Shi-En Chong1, Felicia Chang1, Kee Huat Chua1, Nik Raihan Nik Mustapha2, Sanjiv Mahadeva1, Wah-Kheong Chan1, 1Universiti Malaya, Gastroenterology and Hepatology Unit, Department of Medicine, Faculty of Medicine, Kuala Lumpur, Malaysia; 2Hospital Sultanah Bahiyah, Department of Pathology, Alor Setar, Malaysia
Email: wljack90@gmail.com

Background and aims: To study the use of non-invasive tests (NITs) compared with histological fibrosis stage in predicting liver-related events in adults with metabolic dysfunction-associated fatty liver disease (MAFLD).

Method: This is a single-centre prospective study of a well-characterized cohort of biopsy-proven MAFLD patients who were followed for liver-related events. The patients were followed every 6–12 months for cardiovascular events, liver-related events, malignancy, and mortality. The performance of NITs was evaluated using area under receiver operating characteristic curve (AUROC).

Results: The data for 202 patients were analyzed (median age 55.0 years old, male 47.5%, steatohepatitis 76.7%, advanced liver fibrosis 27.3%). The median follow-up interval was 7 years (range 1–9 years). Seven liver-related events (ascites, n = 1; hepatocellular carcinoma, n = 1; variceal bleeding, n = 1; gastrointestinal varices, n = 4) occurred in 2.5% (5/202) of patients. LSM and histological fibrosis stage were good predictors of liver-related events with AUROC of 0.88 and 0.89, respectively, while NPS was fair with AUROC of 0.78. FIB-4 and APRI performed poorly with AUROC of 0.63 and 0.56, respectively. The optimal cut-off for each of the NITs (based on Youden index), and its sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) for liver-related events are shown in Table 1.
Using the 10 kPa cut-off, the sensitivity, specificity, PPV and NPV of LSM for liver-related events were 100%, 65.5%, 6.7% and 100%, respectively. Using the 15 kPa cut-off, the corresponding values were 60%, 84.3%, 8.8% and 98.8%, respectively.

**Table 1. The optimal cut-off for each of the noninvasive tests (based on Youden index), and its sensitivity, specificity, positive predictive value, and negative predictive value for liver-related events.**

<table>
<thead>
<tr>
<th>Test</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>PPV</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>LSM</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>0.00</td>
</tr>
<tr>
<td>FIB-4</td>
<td>0.69 (0.19-0.99)</td>
<td>0.88 (0.75-0.91)</td>
<td>0.95 (0.72-0.96)</td>
<td>0.57 (0.37-0.76)</td>
</tr>
<tr>
<td>APRI</td>
<td>0.69 (0.19-0.99)</td>
<td>0.88 (0.75-0.91)</td>
<td>0.95 (0.72-0.96)</td>
<td>0.57 (0.37-0.76)</td>
</tr>
<tr>
<td>GP+</td>
<td>0.69 (0.19-0.99)</td>
<td>0.88 (0.75-0.91)</td>
<td>0.95 (0.72-0.96)</td>
<td>0.57 (0.37-0.76)</td>
</tr>
</tbody>
</table>

**Conclusion:** LSM, but not simple blood-based fibrosis scores, appeared to be as good as histological fibrosis stage in predicting liver-related events in MAFLD patients.

**SAT-488**

**LIVERFAS** GP+ (GP+), a non-invasive blood testing for NAFLD staging, improves risk stratification of patients with indeterminate FIB-4 results

Naim Alkhouri1, Anita Kohli1, Phillip Left1, Rida Nadeem1, Mona Munteanu2, 1Arizona Liver Health, United States; 2Fibronostics, United States

**Background and aims:** GP+, an AI-based blood test, was validated against liver biopsy (LB) to identify the presumed NAFLD clinical stages. GP+ clinical variables are: total bilirubin, liver enzymes, glucose and lipid panel. The aim was to assess retrospectively the GP+ performance and concordance rate (CR) as second step after FIB-4 for the assessment of advanced fibrosis (F3-F4) in NAFLD patients.

**Method:** Patients included from a tertiary hepatology clinic had LB-proven NAFLD and concomitant FIB-4, GP+ and liver stiffness measurement (LSM). AUC (SE) and C-statistics were used to assess the accuracy of each no-invasive test (NIT) against LB.

**Results:** 176 patients were included [mean (sd) age 57.2 (8.0) years, BMI 37.7 (6.4)cm2/m2, ALT 52 (35), ALT 52 (35), diabetes 47.4%]. AUC (SE) for F3-F4 for FIB-4, GP+ and LSM, respectively, were 0.76 (0.04), 0.69 (0.04), 0.76 (0.04), all p values = ns. 27 patients had FIB-4 ≥ 2.67; the LB CRs for F3-F4 and all NITs were 68%; LB CRs for F3-F4 with LSM and GP+, respectively, were higher (68% each) than with FIB-4 (58%). In 64 patients FIB-4 ranged 1.30–2.67; LB stage was F1-F2 in 34 and F3-F4 in 26. For F1-F2, LB CR with GP+ was 60%, significantly higher than with LSM (28%), p < 0.001. For F3-F4, LB CRs with LSM and GP+ were similar (43%). 85 patients had FIB-4 < 1.3; LB CR with FIB-4 for ruling out F3-F4 was 17%; LB CR with GP+ for F1-F2 staging was 71%, higher than with LSM (31%).

**Conclusion:** GP+ is readily available and can be used to identify F3-F4 as a second step in patients with indeterminate FIB-4.

**SAT-489**

**Assessing the feasibility of AI-based Hamaguchi score estimation for NAFLD diagnosis using ultrasound images**

Alessia Visintin1, Mauro Giaffra2,3, Francesca Dottor4, Christian Francescut5, Flora Masutti1, Lisa Rebuzzi1, Marco Sartori2, Massimiliano Loddo2, Caterina Zoratti2, Simone Kre sevic4, Silvia Palmisano2,3,5, Saveria Lory Cocco1,2,3,1, Azienda Sanitaria Universitaria Giuliano Isontina (ASUGI), Clinica Patologie del Fegato, Trieste, Italy; 2Università degli Studi di Trieste, Dipartimento di Scienze Mediche, Trieste, Italy; 3Fondazione Italiana Fegato Onlus, Trieste, Italy; 4Prodigys, Trieste, Italy; 5Azienda Sanitaria Universitaria Giuliano Isontina (ASUGI), Clinica Chirurgica, Trieste, Italy

**Email:** gff.mauro@gmail.com

**Background and aims:** NAFLD is a liver disease caused by fat accumulation and ranges from simple steatosis to NASH with increasing liver damage. 25% of the world population has NAFLD and is projected to rise to 33.5% by 2030. Ultrasound B-mode imaging is the preferred diagnostic method but has limitations. This study aims to improve diagnosis using ML and DL algorithms to estimate scores for US images using the Hamaguchi Score and provide a new approach for automatic analysis.

**Method:** The study evaluated 220 patients with NAFLD who underwent US assessment at Trieste University Hospital. The clinical and radiological data were analyzed to create the study dataset, divided into 3 datasets (Hepatorenal, Diaphragm, Vessel) based on the visibility of liver and renal parenchyma, intrahepatic vessels, and the diaphragm. The Hamaguchi score was assigned to each dataset by 4 physicians, and pre-processing was applied to locate the US cone containing the info. The study proposed a framework for automatic estimation of Hamaguchi score based on semiautomatic analysis of US images using 3 sub-score related algorithms. The liver brightness score was calculated using clustering and K-means, while diaphragm and vessel scores were evaluated using 2 CNNs with transfer learning. To prevent overfitting, data augmentation was used to balance the datasets. Ten CNNs were implemented with transfer learning (VGG-16 and VGG-19) and the best performing network was selected. The development was implemented using Python and TensorFlow/Keras libraries.

**Results:** A predictive model for liver brightness contrast score was developed and had a 90.5% classification accuracy using sub-scores labeled by physicians. For misclassified cases, the maximum error was one point. The best models for diaphragm deep attenuation and vessel blurring sub-scores based on their performance on the validation dataset. For diaphragm deep attenuation: accuracy 83.25%, loss 0.48, AUC 0.93, precision 83%. Whereas for vessel blurring: accuracy 84.05%, loss 0.44, AUC 0.89, precision 89%. The algorithm for diaphragm deep attenuation showed an accuracy of 81.8% with misclassified scores under- or over-estimated by one point. The vessel blurring sub-score model had an accuracy of 86.4% on the test dataset, maintaining its performance from training and validation.

**Conclusion:** This study aimed to assess the possibility of estimating Hamaguchi’s score for NAFLD diagnosis using advanced image analysis. The results showed that AI-based methods can estimate the three sub-scores that determine the score with high classification accuracy. These results suggest that such decision support systems could support liver disease diagnosis in the future and reduce intra- and inter-operator assessment error. However, the study had limitations such as a moderate sample size and a retrospective nature that limited the possibility of building a balanced dataset. Further studies with larger samples and clinically balanced datasets are needed to confirm and improve these preliminary results. An automatic tool for ROI selection could also enhance the presented approach.
SAT-490
Metabolic and adipocytokine disorders as a background cause of the progression of non-alcoholic steatohepatitis in obese patients depending on comorbidity with chronic obstructive pulmonary disease
Olha Hryniuk1, Oksana Khukhlina1, Olha Mandryk1, Ivanna Rachynskaja1, 1 Bukovinian State Medical University, Department of Internal Medicine, Clinical Pharmacology and Occupational Diseases, Chernivtsi, Ukraine
Email: olha.hryniuk@bsmu.edu.ua

Background and aims: The aim of the research was to analyze changes in glycemia, blood lipid profile and their endocrine (insulin, leptin, adiponectin) regulation during the isolated and combined course of non-alcoholic steatohepatitis (NASH) and chronic obstructive pulmonary disease (COPD) against the background of obesity.

Method: The study involved 160 patients: 35 patients with NASH and obesity of the 1st stage (1 group), 90 patients with NASH, obesity of the 1st stage and COPD 2–3 B, C, D (group 2) and 35 patients with COPD 2–3 B, C, D (group 3). The control group (CG) consisted of 30 practically healthy persons. The state of carbohydrate metabolism was determined by performing the glucose tolerance test using the glucose oxidase method, fasting insulin (DRG System) by the enzyme-linked immunosorbent assay (ELISA). The degree of insulin resistance (IR) was determined by the body mass index, waist circumference/hip circumference; the HOMA-IR index was calculated using the HOMA Calculator Version 2.2 Diabetes Trials Unit University of Oxford (United Kingdom). Blood lipid spectrum was studied by total lipid content (TL), total cholesterol (TC), triacylglycerols (TG), and high-density lipoprotein (HDL) and low-density (LDL) using diagnostic standard sets of “Simko Ltd” (Ukraine). Hormonal regulation of lipid metabolism was determined by blood leptin, adiponectin (DRG System) by ELISA.

Results: The fasting glycemia index in patients of the 1st and 2nd groups were slightly increased by 10.9% and 14.3% (p1 < 0.05) compared to the CG. Analysis of the postprandial glycemia in patients of the 1st and 2nd groups showed a significant increase glycemia level by 18.6% and 34.4% respectively (p1,2 < 0.05) in comparison to data CG. In patients with an isolated course of COPD improbable changes were (p > 0.05) were observed. The fasting insulin study revealed probable hyperinsulinemia and HOMA IR index increases which were 2.4 and 2.7 times increase in patients of the 1st and 2nd groups comparing to CG (p1,2 < 0.05). In patients of the 3rd group insulin content and HOMA-IR index were higher than the score in CG by 1.6 times (p > 0.05). Blood total lipid concentration in the 3 groups were higher by 29.5%, 39.8% and 14.9% (p1,3 < 0.05) respectively and blood content of TC increases by 36.3%, 45.7% and 14.9% (p1,3 < 0.05) respectively in comparison to CG. A probable increase the TG blood concentration (1.9 and 2.2 times respectively, p1,2 < 0.05) was registered in the 1st and 2nd groups, while in the 3rd group in 1.6 times increase (p < 0.05). A significant increase in the athereogenic index was established in patients of the 1st group by 2.3 times, but in the 2nd group the indicator was lower than in CG by 1.2 times (p1,2 < 0.05), in patients of the 3rd group changes were not improbable (p > 0.05). Serum leptin level in the 1st group exceeded the scale of CG by 4.7 times, and in the 2nd group-by 5.4 times (p1,2 < 0.05). Plasma adiponectin level of patients of the 1st and 2nd groups were 1.7 and 2.4 times lower than the indicator of CG (p1,2 < 0.05). In the 3rd group there were no probable changes in indicators (p > 0.05).

Conclusion: The metabolic prerequisites to the progression of NASH in comorbidities with obesity are deepened under the conditions of COPD, which is an additional powerful inducing factor of the lipid distress syndrome and carbohydrate disorders with a likely higher increase in the blood of TG, TC, LDL-C, HDL-C level, atherogenicity index, the degree of IR accompanied by hyperleptinemia, adiponectin deficiency.

SAT-491
The role of M2BPGi for screening of advanced hepatic fibrosis in elderly patients
Hoon Gil Jo1, Dae Won JUN2, Eileen Yoon2, Mimi Kim2, Hye-Lin Kim3, Eun Young Cho1, Se Yeong Jang4, Young Youn Cho5, Ki Tae yoon6, Yang-Hyun Baek7, Sang Yi Moon7, Ajeong jo7, 1 Wonkwang University College of Medicine and Hospital, Korea. Rep. of South; 2 Hanyang University, College of Medicine, Korea. Rep. of South; 3 Sahmyook University, College of Pharmacy, Korea. Rep. of South; 4 Kyungpook National University, Kyungpook National University Hospital, Daegu, South Korea, Korea. Rep. of South; 5 Chung-Ang University Hospital, Seoul, Korea, Korea. Rep. of South; 6 Pasun National University, Daegu, South Korea, Korea. Rep. of South; 7 Department of Internal Medicine, Dong-A University College of Medicine, Busan, South Korea, Korea, Rep. of South
Email: noshin@hanyang.ac.kr

Background and aims: Non-invasive fibrosis markers such as Fibrosis-4 (FIB-4) or NAFLD Fibrosis Score (NFS) are simple and powerful tools to rule out progressive fibrosis in middle age. However, it is known that FIB-4 and NFS showed very low specificity in the elderly. The purpose of this study is to determine if Mac-2 binding protein glycan isomer (M2BPGi) and non-invasive test (NIT) and their combination could be helpful in diagnosing advanced liver fibrosis in elderly patients aged ≥ 65 years.

Method: Of the 2,177 patients who visited the gastroenterology department of six tertiary general hospitals and performed M2BPGi and transient elastography test (TE), 521 elderly patients aged 65 years or older were finally analyzed. FIB-4 and NFS were calculated for all subjects. Progressive fibrosis was defined as a TE ≥ 8.0 kPa.

Results: A total of 521 elderly patients were included, with an average age of 74.1 ± 5.3 years. Based on the FIB-4 cut-off 2.0, the sensitivity and specificity for screening advanced hepatic fibrosis were 90.4% and 45.2%. When the M2BPGi cut-off was set as 0.8, the sensitivity and specificity in the elderly patients were 83.9% and 38.8%, respectively. The sequential combination of FIB-4 and M2BPGi showed 77.1%, 62.1%, 54.0%, and 82.5% of sensitivity, specificity, positive predictive value, and negative predictive value, respectively. In the case of using the sequential combination of FIB-4 and M2BPGi, the unnecessary referral rate for transient elastography examination in elderly patients was reduced by 24.7% compared to the case of using FIB-4 alone.

Conclusion: The sequential combination of FIB-4 followed by M2BPGi may reduce unnecessary referral rates and decrease consequently further investigations in elderly patients with mild fibrosis.

SAT-492
Development of a novel non-invasive test for prediction of liver fibrosis in patients with clinically severe obesity defined by a BMI over 50 kg/m²
Maximilian Joseph Brol1, Uta Drebber2, Xiaojie Yu2, Robert Schierwagen1, Sabine Klein1, Andreas Plamper3, Margarete Odenath2, Wenyi Gu1, Frank Erhard Uschner1, Karl-Peter Rheinwald2, Josef Treibika1, 1 University Hospital Münster, Department of Internal Medicine B, Münster, Germany; 2 University Hospital of Cologne, Department of Pathology, Cologne, Germany; 3 St. Franziskus-Hospital, Department of Bariatric, Metabolic, and Plastic Surgery, Cologne, Germany; 4 European Foundation for the Study of Chronic Liver Failure-EF Clif, Barcelona, Spain
Email: maximilian.brol@ukmuenster.de

Background and aims: Liver fibrosis is the major driver in chronic liver disease progression. Especially in non-alcoholic fatty liver disease (NAFLD) awareness of liver fibrosis is key for patient stratification and follow-up planning. Non-invasive tests (NIT) for liver fibrosis perform poor in patients with obesity and to date no NIT was validated in the rapidly growing cohort of patients with clinically severe obesity, namely a body mass index (BMI) over 50 kg/m².
Method: This prospective, single-center cohort study included 95 patients who were referred to bariatric surgery. Liver biopsies were acquired during surgery. Liver fibrosis was histopathologically determined according to Kleiner. AST-to-platelet ratio index (APRI), Fibrosis-4 score (FIB-4), NAFLD fibrosis score (NFS) and BMI, AST/ALT-ratio and diabetes score (BARD) with classic and optimized thresholds, determined by maximal Youden-Index were performed. Accuracy, sensitivity, specificity, negative predictive value (NPV) and positive predictive value (PPV) were calculated for each NIT. Multiple regression analysis of clinical variables were used to identify predictive factors in our cohort.

Results: Commonly used NITs showed poor prediction of liver fibrosis in our cohort, with maximum AUROC of 0.70. Multiple linear regression and ANOVA analyses identified five variables (presence of dyslipidemia, presence of diabetes, serum levels of ALT, AST and creatinine) significantly predicting fibrosis. This resulted in the Severely-Obese-Score (SOS) with an AUROC of 0.79. Sensitivity was 0.4 for APRI, 0.49 for FIB-4, 0.73 for NFS, 0.64 for BARD and 0.74 for SOS. Specificity was 0.93 for APRI, 0.71 for FIB-4, 0.57 for NFS, 0.43 for BARD and 0.79 for SOS. Accuracy in predicting fibrosis for commonly used NITs ranged between 48–71%. Our score had the best accuracy (75% correctly classified patients) and best NPV for prediction of any degree of fibrosis.

Conclusion: Performance of established NITs is weak in patients with clinically severe obesity and a BMI over 50 kg/m². The here presented score is a useful tool this setting. Prospective evaluation of our score should be performed in further studies.

SAT-493
Detecting early improvements in a NAFLD patient population during diet-induced weight loss
Pietro Torre¹, Luigi Schiavo¹, Mario Masarone¹, Benedetta Maria Motta¹, Federica Belladonna¹, Marco Aquino¹, Marcello Persico¹.¹University of Salerno, Department of Medicine, Surgery and Dentistry, “Scuola Medica Salernitana”, Italy
Email: pietrotorre90@gmail.com

Background and aims: Weight loss is the cornerstone in the treatment of NAFLD and was found associated with a histological improvement proportional to its extent. However, it is a difficult goal to achieve and maintain. Moreover, the precise link between weight changes and NAFLD is not fully understood. The aim of this study is to describe the possible positive influences of a nutritionist-guided low-glycemic index diet on anthropometric parameters, Transient Elastography (TE), Controlled Attenuation Parameter (CAP, with the SmartExam software), and blood chemistry in overweight or obese NAFLD patients. The genetic correlation with TE/CAP measurements was also taken into account.

Method: 69/106 patients who were attending our Hepatology Unit, with NAFLD, aged ≥18, and with a BMI ≥25 accepted to start the nutritionist-guided diet. Baseline anthropometric data, TE/CAP, and blood test results were recorded. Single nucleotide polymorphisms in NAFLD risk genes were analyzed and genetic risk score (GRS) was calculated. Control visits were scheduled after 1 and 3 months. TE/CAP was performed during each visit, and after 3 months blood tests were repeated.

Results: 57/69 patients (82.61%) attended at least one of the control visits. A significant difference from baseline was observed at both 1-month and 3-month visit in weight (−4.26 kg [−4.78%] < 0.0001, and −7.67 kg [−8.43%] < 0.0001), BMI (−1.55 Kg/m², p < 0.0001, and −2.75 Kg/m², p < 0.0001), and CAP (−27.67 db/m, p = 0.0062, and −42 db/m, p = 0.0182). Changes in CAP were proportional to the extent of weight loss, whereas mean liver stiffness remained almost unchanged. Baseline CAP was proportional to GRS; high GRS patients presented a higher decrease in TE/CAP values after 3 months of diet. After 3 months of diet, significant differences in glycemia and triglycerides were observed; AST, ALT, total cholesterol and HDL cholesterol also improved.

SAT-494
Echocardiography-based markers for subclinical cardiac dysfunction in patients with non-alcoholic fatty liver disease and significant fibrosis with preserved ejection fraction: preliminary data from a prospective monocentric Italian cohort
Angelo Armandi¹,², Daphne D’Amato³, Alessandro Andreis³, Matteo Bellettini³, Gian Paolo Caviglia³, Gabriele Castelnuovo¹, Irene Poggiolini¹, Chiara Rosso¹, Nuria Pérez Diaz del Campo³, Amina Abdul³, Kamela Gjini¹, Davide Ribaldone¹, Gaetano De Ferrari³, Giorgio Maria Saracco¹, Davide Castagno³, Elisabetta Bugianesi¹.¹Division of Gastroenterology and Hepatology, Department of Medical Sciences, University of Turin, Turin, Italy; ³Metabolic Liver Disease Research Program, I. Department of Internal Medicine, University Medical Center of the Johannes Gutenberg University of Mainz, Mainz, Germany, Germany; ²Division of Cardiology,

Figure: Conclusion: In our NAFLD population, after diet-induced weight loss, an improvement in metabolic parameters was observed. The early reduction of CAP could increase patient awareness of the ongoing improvements. Genetics could influence the reduction of steatosis during weight loss.

SAT-493
Detecting early improvements in a NAFLD patient population during diet-induced weight loss
Pietro Torre¹, Luigi Schiavo¹, Mario Masarone¹, Benedetta Maria Motta¹, Federica Belladonna¹, Marco Aquino¹, Marcello Persico¹.¹University of Salerno, Department of Medicine, Surgery and Dentistry, “Scuola Medica Salernitana”, Italy
Email: pietrotorre90@gmail.com

Background and aims: Weight loss is the cornerstone in the treatment of NAFLD and was found associated with a histological improvement proportional to its extent. However, it is a difficult goal to achieve and maintain. Moreover, the precise link between weight changes and NAFLD is not fully understood. The aim of this study is to describe the possible positive influences of a nutritionist-guided low-glycemic index diet on anthropometric parameters, Transient Elastography (TE), Controlled Attenuation Parameter (CAP, with the SmartExam software), and blood chemistry in overweight or obese NAFLD patients. The genetic correlation with TE/CAP measurements was also taken into account.

Method: 69/106 patients who were attending our Hepatology Unit, with NAFLD, aged ≥18, and with a BMI ≥25 accepted to start the nutritionist-guided diet. Baseline anthropometric data, TE/CAP, and blood test results were recorded. Single nucleotide polymorphisms in NAFLD risk genes were analyzed and genetic risk score (GRS) was calculated. Control visits were scheduled after 1 and 3 months. TE/CAP was performed during each visit, and after 3 months blood tests were repeated.

Results: 57/69 patients (82.61%) attended at least one of the control visits. A significant difference from baseline was observed at both 1-month and 3-month visit in weight (−4.26 kg [−4.78%] < 0.0001, and −7.67 kg [−8.43%] < 0.0001), BMI (−1.55 Kg/m², p < 0.0001, and −2.75 Kg/m², p < 0.0001), and CAP (−27.67 db/m, p = 0.0062, and −42 db/m, p = 0.0182). Changes in CAP were proportional to the extent of weight loss, whereas mean liver stiffness remained almost unchanged. Baseline CAP was proportional to GRS; high GRS patients presented a higher decrease in TE/CAP values after 3 months of diet. After 3 months of diet, significant differences in glycemia and triglycerides were observed; AST, ALT, total cholesterol and HDL cholesterol also improved.

SAT-494
Echocardiography-based markers for subclinical cardiac dysfunction in patients with non-alcoholic fatty liver disease and significant fibrosis with preserved ejection fraction: preliminary data from a prospective monocentric Italian cohort
Angelo Armandi¹,², Daphne D’Amato³, Alessandro Andreis³, Matteo Bellettini³, Gian Paolo Caviglia³, Gabriele Castelnuovo¹, Irene Poggiolini¹, Chiara Rosso¹, Nuria Pérez Diaz del Campo³, Amina Abdul³, Kamela Gjini¹, Davide Ribaldone¹, Gaetano De Ferrari³, Giorgio Maria Saracco¹, Davide Castagno³, Elisabetta Bugianesi¹.¹Division of Gastroenterology and Hepatology, Department of Medical Sciences, University of Turin, Turin, Italy; ³Metabolic Liver Disease Research Program, I. Department of Internal Medicine, University Medical Center of the Johannes Gutenberg University of Mainz, Mainz, Germany, Germany; ²Division of Cardiology,
Background and aims: Individuals with Non-Alcoholic Fatty Liver Disease (NAFLD) have abnormal myocardial energy metabolism and reduced coronary functional capacity, even in the absence of risk factors for cardiovascular disease (CVD), potentially associated with cardiac fibrosis and heart failure (HF). We aimed to evaluate diastolic and systolic function in NAFLD patients and significant fibrosis with preserved ejection fraction (EF).

Method: We prospectively included patients with ultrasound-diagnosed NAFLD undergoing screening echocardiography per protocol, in the absence of overt CVD or HF. Echocardiography was performed according to European Society of Cardiovascular Imaging guidelines, including speckle tracking analysis with left ventricular global longitudinal strain (GLS) measurement for accurate quantification of systolic function (Philips, Andover, US). Diastolic dysfunction with increased filling pressures was defined as a mitral E/E′ ratio >9. Liver fibrosis was assessed by non-invasive tests and transient elastography (TE, Fibroscan F530); significant liver fibrosis (SLF) was defined as either FIB-4 score >1.3 or liver stiffness (LS) >7 kPa. Clinical and biochemical parameters, as well as TE and echocardiography, were collected within one month from NAFLD diagnosis.

Results: A total of 95 patients were included. Median age was 53.0 [IQR 44.5–62.5] years and 44.6% was male. Type 2 diabetes mellitus (T2DM) and obesity were present in 21.1% and 43.3% of the cohort, while 46.2% had arterial hypertension. Median Fib-4 was 0.97 [IQR 0.67–12.4]. SLF, diastolic and systolic dysfunction were found in 20%, 17% and 18.3% of the total. Higher FIB-4 levels were found in both diastolic and systolic dysfunction (p = 0.003 and p = 0.001). SLF was associated with diastolic dysfunction (OR 6.8 [95%CI 1.8–25.5], p = 0.004), showing an Area Under the Curve of 0.76 (Se 76.9%, Sp 72.2%, PPV 33.3%, NPV 94.5%) (Figure 1). In a multiple stepwise logistic regression model including T2D, obesity, arterial hypertension, dyslipidemia, male sex and SLF, both SLF and T2D were significantly and independently associated with diastolic dysfunction (aOR of SLF 6.2 [95%CI 1.5–25.1], p = 0.011). In the same regression model for systolic dysfunction, only T2D showed a significant association (aOR 4.6 [95%CI 1.3–16.8], p = 0.021).

Conclusion: In NAFLD patients with preserved EF, significant liver fibrosis by FIB-4 and TE correlate with markers of diastolic dysfunction and lower GLS systolic values. T2DM is the strongest factor associated with diastolic dysfunction in this population. Screening echocardiography may be recommended in this population. The research has been supported by the Italian Ministry for Education, University and Research (MIUR) under the programme “Dipartimenti di Eccellenza 2018–2022” Project code D15DI8000410001.

SAT-495 Comparison of performance of non-invasive indices in assessing degree of steatosis in non-alcoholic fatty liver disease

En Ying Tan1, Sin Hui Melissa Chua1, Eunice Tan1, Daniel Huang1, Jonathan Lee1, Margaret Teng1, Nur Halisah Binte Jumat1, Yock Young Dan1, Mark Muthiah1. 1 National University Hospital (NUH)-Singapore, Department of Gastroenterology and Hepatology, Singapore, Singapore

Email: tanenyi@hotmail.com

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is the most prevalent chronic liver disease worldwide, of which the earliest manifestation is simple hepatic steatosis. Most of the patients with NAFLD have hepatic steatosis, without the presence of steatohepatitis or fibrosis. Liver biopsy is the gold standard for assessment of steatosis, but is associated with significant cost, risks and limited availability, and is not feasible in a disease for which identification in large swaths of the population is key. To identify NAFLD in population cohorts, it is essential to evaluate non-invasive tests (NITs) that are easily performed in primary care. We aim to evaluate the performance of various NITs in predicting presence and severity of hepatic steatosis, comparing to histology as the reference standard.

Method: Patients with biopsy-proven NAFLD were enrolled from National University Health System, Singapore to undergo various non-invasive tests. Patients who also had other causes for liver disease were excluded. Hepatic steatosis index (HSI), visceral adiposity index (VAI), NAFLD liver fat score (NLFS), triglyceride-glucose ratio (TGI), fatty liver index (FLI) and FibroScan Controlled Attenuation Parameter (CAP) were evaluated for performance in assessment for steatosis.

Results: 399 multi-ethnic Asian patients with biopsy-proven NAFLD were recruited from 2014 to 2021. AUC values for identifying steatosis (S1–3) for HIS, FLI, NLFS, TGI, VAI and FibroScan CAP were 0.792, 0.720, 0.905, 0.714, 0.823 and 0.957 respectively. Optimal cut offs for diagnosis of hepatic steatosis were HSI 38.2, FLI 124.8, NLFS –0.818, TGI 8.45, VAI 1.33 and CAP 254 kPa. Respective AUC values for identifying S2–3 steatosis for the above-mentioned tests were 0.647, 0.592, 0.736, 0.664, 0.671 and 0.677. Respective AUC values for identifying S3 steatosis were 0.581, 0.585, 0.703, 0.613, 0.668 and 0.616. All indices performed better at identifying steatosis than at distinguishing severity of steatosis. In particular, Fibroscan CAP was excellent in identifying steatosis. NLFS had significantly better performance than several other composite scores, especially in diagnosing steatosis.

Conclusion: Our findings suggest NLFS to be a potential NIT for identifying steatosis in population cohorts, given its favourable performance as well as cost and accessibility. As with other NITs, it may be less robust in distinguishing severity of steatosis. FibroScan CAP remains a good option, particularly in places with access to them at the primary care level.
SAT-496
Evaluation of the performance of a novel single-nuclei digital pathology method for the continuous quantification of steatosis and inflammation in liver biopsies and its correlation with NASH-CRN scores in patients with NASH
Louis Petitjean¹, Li Chen¹, Dmitri Fedorov², Aras Mattis³, Mojgan Hosseini⁴, Mathieu Petitjean¹, Arun Sanyal⁵, Cynthia Behling⁴.
¹PharmaNest, Inc, Princeton, United States; ²ViQi Inc, Santa Barbara, United States; ³University of California San Francisco, San Francisco, United States; ⁴University of California San Diego, La Jolla, United States; ⁵Virginia Commonwealth University, Division of Gastroenterology, Hepatology and Nutrition, Richmond, United States
Email: mathieu.petitjean@pharmanest.com

Background and aims: The quantification of HAMD liver biopsy with Digital Pathology methods based on annotation provided by pathologists (steatosis, inflammation) result in continuous scores of

Figure: (abstract: SAT-495).
Figure: (abstract: SAT-496).

SAT-497
Development of ultra-sensitivity enzyme linked immunosorbent assay for hepatitis delta virus antibody detection
Nomin Artingerel1,2, Uzligerel Yanjinlkham1, Saruch Enkhjargal 1,2, Naranjargal Dashdorj1, Odgerel Oidovsambuu1,3, School of engineering and applied sciences, Department of chemical and biological engineering, Ulaanbaatar, Mongolia; 2Liver center, Ulaanbaatar, Mongolia; 3National University of Mongolia, Department of Chemical and Biological Engineering, Ulaanbaatar, Mongolia; Email: a.nomin@onomfoundation.org

Background and aims: The prevalence of hepatitis delta virus (HDV) is unequally distributed in the world. In most countries, the infection rate is very low, but some countries, especially Mongolia has a disproportionately high prevalence of HDV infection. Therefore, the introduction of sophisticated diagnostic assays for detection of HDV infection is less attractive for most companies, and diversity of commercially available kits are very limited. Also, we have found that most ELISA diagnostic kits for anti-HDV IgG detection have single origin in China and their quality issues should be accounted. In this study, we have developed an ultra-sensitive ELISA assay using self-assembled monolayer method, which applies covalent attachment of sHDAg on the plate surface in more organized manner that produces much better results than the conventional physical absorption method in terms of sensitivity and specificity.

Method: Recombinant His-tagged sHDAg protein (23 kDa) was produced in E. Coli and purified by Ni-NTA metal-affinity chromatography. First, the surface of the polystyrene plate was functionalized by treating with 1% sodium hydroxide for binding of 2% 3-(aminopropyl)triethoxysilane (APTES). Then 10 μg/ml HDV-Ag proteins were cross-linked with N-ethyl-N’-3-dimethylaminopropyl) carbodiimide/N-hydroxysuccinimide (EDC/NHS) agents. Then 100 ul of activated proteins were immobilized on the functionalized surface via the crosslinking agents in a self-assembled monolayer. Finally, 100 ul of 5% BSA (bovine serum albumin), healthy human serum and 3% skim milk were used by blocking plates and prevent unspecific binding. For the analysis of sensitivity and specificity, 2 groups (positive and negative) of a total of 131 samples were used. The positive group consisted of samples from 46 patients, who were previously identified as healthy by showing HBsAg negative and anti-HCV negative. The optimal conditions for the new ELISA tests were established using checkerboard dilutions of the secondary antibody and serum. Main parameters of the optimal ELISA assay were found as follows: Serum dilution scale 1:100, Secondary Ab dilution scale 1:80000, incubation time 15 min at 370C, color development time 3 min, and total test duration 30 min. For comparison analysis of sensitivity, the commercially available Wantai anti-HDV IgG kit was used.

Results: Our results showed that our in-house developed ELISA assay has a specificity of 98.8%, a sensitivity of 100%, and an agreement of moderate performances. Here, we report results of a new AI-assisted single-nuclei quantification approach that benefits from (a) training received from pathologists on highly consensual features (cell types) and (b) generates mathematically defined outcomes. This approach address limitations of current histological current nomenclatures and methods (doi:10.1002/hep.32475)

Method: This retrospective cohort included 87 patients with NASH diagnosed by histologic assessment of liver biopsy with lobular inflammation grades of 0 (N = 7), 1 (68), and 2 (12), and steatosis grades of 0 (N = 2), 1 (40), 2 (30) and 3 (14). Quantitative image analysis of 20X Digital pathology images of HandE stained sections was performed to identify cell nuclei (>20 k per biopsy) and quantify their morphometric and local surroundings in 86 parameters. A subset of 13 images (~260 K nuclei) was used to develop a machine learning (ML) model using 3.0 K annotations (respectively 3.0 K, 3.3 K, 3.7 K, 3.7 K, 3.0 K) for steatotic hepatocytes, normal hepatocytes, inflammatory cells (all kinds), liver specialized cells (all kinds), and "debris" (cells in apoptosis or distorted). Once classified, a cell tissue panel was calculated to account for cell densities (count/mm2) and relative cell count %. Macro-steatosis Area Ratio was calculated. Clusters of inflammatory cells were identified using "closest neighbor" method and the morphometric features of these clusters was used to classify them into small (<5000 μm2), medium and large clusters which are then quantified by several continuous and normalized parameters (biopsy area ratio, count per mm2 or 200XFOV).

Results: The cell classification accuracy (error) of the ML model ranged from 14.6% (24.3%) for specialized cells to 77.7% (26.9%) for inflammatory cells. The steatotic hepatocytes count ratio (Fig. A, 0.008±p values=0.38) exhibited similar trends reported previously using ML from pathologists' annotations and correlates well with Area Ratio (Fig. B, R2 = 0.5226). The count of small inflammation clusters (Fig. C, 0.107±p values=0.034) moderately corresponds to the histological grades, which is attributed to the histological definition of inflammatory clusters and their assessment. The inflammatory cell density detects the presence of inflammation with good performance (Fig. D).

Conclusion: Quantitative digital pathology can automatically generate tissues panels from HandE stained sections. While the scores extracted from these tissues panels moderately correspond to NASH-CRN histological stages, they present the benefit of being quantitative and translational, and not sensitive to liver tissue variation due to swelling, fat invasion, or various artifacts.
99.2% respectively. Ultra-sensitivity of the assay was confirmed by the detection of 1:1000000 times diluted serum while the commercially available kit was only able to detect up to 1:50 000 times diluted serum. The total testing process could be done in 30 min, which is 3 times shorter than the commercial testing kit. All these superior results indicate that the self-assembled monolayer method has principally advantageous in terms of design and method.

Conclusion: The ELISA assay developed by self-assembled monolayer method has very high sensitivity and this technology should be introduced to the HDV-diagnostic field.

SAT-498
Biomarkers of hepatocyte basement membrane turnover reflect disease activity in patients with early-stage non-alcoholic fatty liver disease
Ida Lønsmann1,2, Jane I. Groen3,4,5, Asma Haider6, Philip Kaye6, Morten Karsdal2, Diana Leeming6, Guruprasad Aithal3,4,5. 1University of Southern Denmark, Department of Clinical Research, Odense, Denmark; 2Nordic Bioscience, Hepatic Research, Herlev, Denmark; 3University of Nottingham, MRC/EPSRC Nottingham Molecular Pathology Node, Nottingham, United Kingdom; 4Nottingham University Hospitals NHS trust and University of Nottingham, NIHR Nottingham Biomedical Research Centre, Nottingham, United Kingdom; 5University of Nottingham, Nottingham Digestive Diseases Centre, Translational Medical Sciences, School of Medicine, Nottingham, United Kingdom; 6Nottingham University Hospitals NHS Trust, Department of Pathology, Nottingham, United Kingdom
Email: ilc@nordicbio.com

Background and aims: Halting progressive liver disease necessitate novel non-invasive methods to identify and monitor patients in need of early intervention. Investigating the pathophysiology of early liver injury might help to identify unique biomarkers. Early liver injury is characterized by recomposition of the hepatocyte basement membrane (BM) of the extracellular matrix. Thus, we quantified biomarkers targeting two distinct neo-epitopes of the major BM collagen, type IV collagen (PRO-C4 and C4M), in patients spanning the non-alcoholic fatty liver disease (NAFLD) spectrum.

Method: We evaluated BM biomarkers in a cross-sectional study with 97 patients with NAFLD confirmed on histology. Serological levels of PRO-C4 and C4M were quantified using validated competitive enzyme-linked immunosorbent assays (ELISAs). Using the fatty liver inhibition of progression (FLIP) algorithm, we stratified data into two groups: non-alcoholic fatty liver (NAFL) and non-alcoholic steatohepatitis (NASH). Biomarker levels in the two groups were stratified by the NAFLD activity score (NAS). In both groups, biomarker measurements were analyzed in relation to histological scorings of steatosis, inflammation, ballooning, and fibrosis.

Results: The included patients had a body mass index (BMI) of 30.9 ± 5.6 kg/m², age of 53 ± 13 years and a NAS range of 1–8. Upon stratification by FLIP, the NASH patients had higher platelets, ALT, and AST levels than the NAFL group. Both PRO-C4 (p = 0.0125) and C4M (p = 0.003) increased with increasing NAS solely within the NAFL group. Furthermore, both markers were significantly associated with lobular inflammation (p = 0.020 and p = 0.048) and steatosis (p = 0.004 and p = 0.015) in patients with NAFL.

Conclusion: This study found that BM turnover is associated with liver injury in patients with NAFL but not those with NASH. These findings support BM turnover as a clinical feature in early disease development.
Development of loop-mediated isothermal amplification assay for detection of hepatitis delta virus

Saruul Enkhjargal1, Nomin Ariungerel1, Naranjargal Dashdorj2, Naranbaatar Dashdorj3, Odgerel Oidovsambuu4. 1 National University of Mongolia, Department of Chemical and Biological Engineering, School of Engineering and Applied Sciences, Ulaanbaatar, Mongolia; 2 Liver center, Ulaanbaatar, Mongolia; 3 Onom foundation, Ulaanbaatar, Mongolia; 4 National University of Mongolia, Department of Chemical and Biological Engineering, Ulaanbaatar, Mongolia. Email: srl@onomfoundation.org

Background and aims: Infection of hepatitis delta virus (HDV) is one of the leading factors for liver disease-related mortality in some countries. For these countries, it is crucial to implement a suitable strategy to eliminate the endemicity of HDV using sophisticated technologies. Correct diagnostic approaches and management, which enable early detection of HDV infection play a key role in effective elimination. However, HDV-infected people know their infection at a very late time when cirrhosis already developed to a serious stage. Therefore, some countries including Mongolia have initiated a mass screening campaign for the detection of hepatitis viral infection in the entire population, and currently, some apparent improvements were observed in the national viral hepatitis status. Loop-mediated isothermal amplification (LAMP) could be one of the possible options for the detection of active HDV infection in Mongolia, especially since this method might be very useful outside of big cities. LAMP-PCR does not require special equipment like an expensive real-time PCR cycler, and its simple, fast-processing characteristic is very attractive.

The aim of this study was to develop and characterize a LAMP-PCR assay for the detection of HDV-RNA (HDV-LAMP assay).

Method: Different primer sets were designed using NEB-online tools on a high homology region of HDV genomic sequence. In this study, commercially available WarmStart Colorimetric and Fluorescent LAMP 2X Master Mix (DNA and RNA) kits from NEB were used. For RNA extraction, Viral RNA isolation kit from Bioactiva Diagnostica was used. Serum samples from 13 HDV-infected patients and 15 healthy people (a total of 28 people) were used for this study. Serially diluted recombinant construct containing HDV genomic sequence were used for the analysis of the limit of detection (LOD). Both colorimetric and fluorescent assays were done for all 23 samples in different protocols to adjust the optimal condition. The amplified products were confirmed by gel electrophoresis and dissociation curve analysis. The overall HDV-LAMP assay was characterized by its sensitivity, specificity, optimal reaction temperature, and time-point of detection.

Results: We tested 5 different primer sets and the best primer set was identified by judging the rate of false positive results. The optimal reaction temperature for the best setting was found as 68°C. Our result indicated that LOD of HDV-LAMP assay is 4.5 copies/reaction, which can be considered a very sensitive assay. The optimal time-point of detection was 50–60 min for colorimetric and 40–50 min for fluorescent assays. Exceeded incubation time increases the probability of false positive results. Our pilot results showed that HDV-LAMP assay has a sensitivity of 100% and a specificity of 94.4%.

Conclusion: Our study concludes that the currently developed HDV-LAMP assay is a rapid, easy-to-use, and highly sensitive diagnostic assay for detecting HDV-RNA in blood samples. The assay can be
broadly utilized in places without real-time PCR equipment and the testing cost will be cheaper. In further, analytical sensitivity and specificity should be determined using a bigger number of patient samples.

SAT-500
Incorporating artificial intelligence in portable infrared thermal imaging for the diagnosis and staging of non-alcoholic fatty liver disease
Yana Davidov1, Rafael Brzezinski2, Monika Kaufmann3, Mariya Likhter1, Oranit Cohen-ezra1, Yair Zimmer4, Orit Pappo3, Jonathan Leor5,6, Ziv Ben-Ari1,2, Oshrit Hoffer4. 1Sheba Medical Center, Liver Diseases Center, Israel; 2Tel Aviv University, Sackler School of Medicine, Israel; 3Sheba Medical Center, Institute of Pathology, Israel; 4School of Electrical Engineering, Afeka Tel Aviv Academic College of Engineering, Tel Aviv, Israel; 5Sheba Medical Center, Tamman Cardiovascular Research Institute, Leviev Heart Center, Israel; 6Tel Aviv University, Neufeld Cardiac Research Institute, Israel
Email: y.davidov@gmail.com

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is the most prevalent chronic liver disease worldwide. NAFLD comprises a spectrum of progressive liver pathologies, ranging from simple steatosis to non-alcoholic steatohepatitis (NASH). NASH can progress to advanced liver fibrosis stage, liver failure and liver cancer. Liver biopsy is currently the gold standard for staging NAFLD. In our NAFLD mouse model, thermal imaging combined with advanced image processing and machine learning analysis, the derived algorithm demonstrated a 100% detection rate and classified all mice correctly according to their disease status.

Method: This is a prospective study of 46 patients; all underwent a liver biopsy. Liver thermal imaging using a commercially available portable infrared camera was obtained on the same day the liver biopsy was scheduled. We developed an image processing algorithm that measures relative spatial thermal variation across the skin covering the liver. Thermal parameters including temperature variance, homogeneity levels and other textural features were fed as input to a t-SNE dimensionality reduction algorithm followed by k-means clustering. Patients were diagnosed with NAFLD and stratified according to the NAFLD activity score (NAS) and the fibrosis stage using the Metavir score.

Results: Twenty-one out of 46 patients (median age 54 years (ranges, 19–75); 61% males) were diagnosed with NAFLD, of them NAS >4 was detected in 7 (33%). Using thermal imaging processing, the accuracy to detect patients with NAS >4 was AUC = 0.74, (specificity and sensitivity 56% and 81%). For differentiating advanced fibrosis (F3–4) from early fibrosis stage F0–F2, thermal imaging accuracy was AUC = 0.87, with specificity and sensitivity 77% and 88%, respectively.

Conclusion: Non-invasive thermal advanced imaging combined with machine learning-based analysis may improve our ability to diagnose and classify patients with NAFLD.

SAT-501
Metabolic profile reflects stages of fibrosis in patients with non-alcoholic fatty liver disease
Roberta Forlano1, Nila Jambulingam1, Benjamin Preston1, Benjamin H. Mullish1, Greta Portone1, Yama Baheer1, Michael Yee2, Robert D. Goldin2, Mark Thursz1, Pinelopi Manousou1. 1Imperial college london, Liver unit/Division of Digestive Diseases, Department of Metabolism, Digestion and Reproduction, United Kingdom; 2Imperial college NHS Trust, Section of Endocrinology and Metabolic Medicine, United Kingdom; 3Imperial college london, Department of Cellular Pathology, United Kingdom
Email: r.forlano@imperial.ac.uk

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is a leading cause of chronic liver disease worldwide, with fibrosis stage being the main predictor for clinical outcomes. Here, we present the metabolic profile of NAFLD patients with regards to fibrosis progression.

Method: We included all consecutive new referrals for NAFLD services between 2011 and 2019. Demographic, anthropometric, clinical features and non-invasive markers of fibrosis were recorded at baseline and at follow-up. Significant and advanced fibrosis were defined using Liver Stiffness Measurement (LSM) as LSM \(\geq 8.1\) kPa and LSM \(\geq 12.1\) kPa respectively. Cirrhosis was diagnosed either histologically or clinically. Fast progressors of fibrosis were defined as those with delta stiffness \(\geq 1.03\) kPa/year (25% upper quartile of delta stiffness distribution). Targeted and untargeted metabolic profiles were analysed on fasting serum samples using Proton nuclear magnetic resonance (1H NMR).

Figure: (abstract: SAT-500).
Results: 189 patients were included in the study, 111 (58.7%) underwent liver biopsy. Overall, 11.1% patients were diagnosed with cirrhosis, while 23.8% were classified as fast progressors. A combination of metabolites and lipoproteins (formula in Figure 1) could identify the fast fibrosis progressors (AUROC 0.788, 95% CI: 0.703–0.874, p < 0.001) and performed better than non-invasive markers: ALT (AUROC 0.59, 95%CI: 0.48–0.71, p = 0.08), AST (AUROC 0.65, 95% CI: 0.52–0.76, p = 0.006), FIB-4 (AUROC 0.5, 95%CI: 0.39–0.61, p = 0.9), NAFLD fibrosis score (AUROC 0.56, 95%CI: 0.44–0.67, p = 0.26) and LSM at baseline (AUROC 0.43, 95% CI: 0.31–0.55, p = 0.2) (Figure 1).

Conclusion: Specific metabolic profile predicts fibrosis progression in patients with non-alcoholic fatty liver disease. Algorithms combining metabolites and lipids could be integrated in the risk-stratification of these patients.

SAT-502
Diagnostic performance of magnetic resonance imaging, vibration-controlled transient elastography and controlled attenuation parameter in predicting steatohepatitis in NAFLD patients
Sun Young Yim1, Hyung Sun Yim1, Jong Su Kim1, Yeon Seok Seo1.
1Korea University Hospital, Korea, Rep. of South
Email: drseo@korea.ac.kr

Background and aims: Non-alcoholic fatty liver disease (NAFLD) ranges from benign non-alcoholic fatty liver to non-alcoholic steatohepatitis (NASH) where NASH includes progressive fibrosis. Liver biopsy is the gold standard method for the diagnosis of NASH and although there are no reliable non-invasive means of differentiating NAFLD from NASH, non-invasive models that correlate with individual histologic parameters have been developed. The aim of the current study was to examine the diagnostic accuracy of magnetic resonance imaging (MRI) and transient elastography (TE) in classifying fibrosis while MRI-derived proton density fat fraction (PDFF) and controlled attenuation parameter (CAP) in classifying degree of steatosis.

Method: We retrospectively reviewed database of 213 patients who had undergone liver MRI and TE from November 2018 to February 2022 and cross-sectional analysis was performed in 113 patients who had underwent both imaging study and liver biopsy. A systematic NAFLD activity score (NAS) was scored using NASH Clinical Research Network. The Area Under the Receiver Operating Characteristics (AUROCs), sensitivity, and specificity of MRI and TE were analyzed according to degree of steatosis and fibrosis. Further analysis was performed to observe if combination of imaging analysis could detect presence of NASH using linear regression analysis.

Results: Out of 113 patients, 78 patients (69%) were male and mean body mass index was 29.3 ± 4.8 kg/m². The proportion of patients with probable NASH (NAS 3, 4) and definite NASH (NAS ≥5) were 40.7% and 23%, respectively. The correlation between MRI-PDFF and CAP was moderate (r = 0.57, P < 0.001). The AUROCs of MRI-PDFF and CAP were 0.905 (CI 0.856–0.964, P < 0.001) and 0.739 (CI 0.644–0.835, P < 0.001), respectively in detecting advanced steatosis (score≥3, steatosis>33%). MRI-PDFF provided significantly more reliable fat content measurement than did CAP for every degree of steatosis. The AUROC values for MRI-PDFF and TE were 0.936 vs 0.563 for steatosis grade ≥1 and 0.922 vs 0.92 for steatosis grade ≥2 (P = 0.005 and P < 0.001, respectively). In predicting degree of liver fibrosis, the correlation between MRE and TE was also moderate (r...
The predictive efficacy between MRE and TE did not differ in predicting any degree of liver fibrosis. Since there is no imaging modality that can exactly predict degree of NASH, next we analyzed whether the diagnostic ability of combined modalities improved. The predictive efficacy significantly increased when MRE-PDF was added to MRE alone (AUROC; 0.869 vs 0.619, P < 0.001) in identifying both definite NASH (NAS ≥5) and probable NASH (NAS 3–4) (AUROC; 0.823 vs 0.602, P < 0.001) but not for the combination of TE and CAP. In multivariate analysis, there was significant correlation between MRE and degree of hepatocyte ballooning in addition to degree of fibrosis (both, P < 0.001).

**Diagnostic efficacy of combination of MRE & PDFF in detecting degree of NASH and Definite NASH**

![Figure: Diagnostic efficacy of combination of MRE & PDFF in detecting degree of NASH and Definite NASH](image)

**Conclusion:** MRI-PDFF have higher diagnostic performance in non-invasive detection of liver steatosis than TE but no significant difference was observed in identifying degree of liver fibrosis. Combination of MRE and MRI-PDFF enabled detection of NASH in NAFLD patients with high diagnostic efficacy. Our result presents the possibility of non-invasive method in predicting NASH and could possibly reduce the need for liver biopsy following further validation in a larger cohort.

**SAT-503**

SAFE score yielded a better performance than FIB-4 and NFS in predicting significant fibrosis among Asian NAFLD patients.

**Background and aims:** In patients with non-alcoholic fatty liver disease (NAFLD), having fibrosis stage 2 or higher (significant fibrosis; SF) is independently associated with an increased overall mortality. Recently, the Steatosis-Associated Fibrosis Estimator (SAFE) score has been developed as a non-invasive tool to screen for SF among NAFLD patients in primary care (Hepatology 2022, DOI: 10.1002/hep.32545). We aimed to externally validate and compare SAFE with FIB-4 and NFS in Asian population with NAFLD.

**Method:** Biopsy-proven NAFLD patients' data from 6 centres in 3 Southeast Asian countries (Thailand, Malaysia, and Singapore) were collected (N = 889). Using liver biopsy as the gold standard, liver fibrosis stage was graded using NASH CRN criteria. Patients with incomplete data on variables used to calculate SAFE, FIB-4, and NFS were excluded. The performance of SAFE, FIB-4, and NFS were evaluated using areas under the receiver operating characteristics curve (AUROC), sensitivities (Sn) and specificities (Sp) in diagnosing F≥2.

**Results:** A total of 640 patients were included in the analysis, SF was presented in 176 patients (27.5%). As expected, the median age, aspartate and alanine aminotransferase, alkaline phosphatase, serum globulin levels were higher in patients with SF than in those without SF, whereas the serum albumin and platelet levels were lower. Among 3 non-invasive biomarkers, SAFE, FIB-4, and NFS yielded AUROCs (95%CI) of 0.744 (0.700–0.788), 0.731 (0.687–0.775), 0.658 (0.612–0.704), respectively (p = 0.31 for SAFE vs FIB-4, and p < 0.001 for SAFE vs NFS). At the given low cutoffs for detecting SF (SAFE<0, FIB-4<0.81, NFS<0.25), SAFE showed the highest Sn of 89.77%, significantly better than FIB-4 (Sn 80.11%, p < 0.001) and NFS (Sn 80.11%, p = 0.001). At the high cutoffs (SAFE≥100, FIB-4≥1.81, NFS≥0.03), the SF of SAFE, FIB-4, and NFS for detecting SF were 71.77%, 89.22%, and 89.44%, respectively. The proportion of patients categorized by low and high cutoffs of each score are shown in the Figure.

**SAT-504**

**Background and aims:** Liver-related morbidity remains high among people living with HIV (PLWH) despite advances in the management of viral hepatitides. Fatty liver disease (FLD) will likely become the leading cause of liver disease in PLWH, who are impacted disproportionately by comorbidities that contribute to the metabolic syndrome (MetS)-obesity, dyslipidaemia, hypertension and insulin resistance. The utility of transient elastography (TE) in PLWH with viral hepatitis co-infection is established, but its use in assessing FLD in PLWH is not well described. To better understand the burden of FLD in PLWH we reviewed results of TE with Controlled Attenuation Parameter (CAP) scores in PLWH with unexplained transaminis.

**Methods:** We undertook a retrospective review of all PLWH mono-infection with unexplained transaminis (alanine transaminase (ALT) above 35 IU/L for men and 25 IU/L for women) who had a TE/CAP (by FibroScan®) at our central London clinic between 1/2017–3/
2022. FLD and fibrosis were defined as a CAP score >238 dB/m and a liver stiffness measurement of >7.1 kPa respectively. Logistic regression analyses and $\chi^2$ test for trends were performed to assess factors associated with FLD including demographics, HIV-specific variables (antiretroviral medications, CD4+ T-cell count, HIV viral load (VL)), alcohol use, and MetS comorbidities. The definition for MetS included use of diagnostic parameters collected as part of routine care for PWLH (HBA1c, lipids, blood pressure, Body Mass Index (BMI)); or medication history for treatment for any of the above.

**Results:** 408 PWLH were included: median age 51 years (IQR 45–57), 87% male, 68% of White ethnicity, 99% on ART, 93% undetectable HIV VL and median CD4+ T-cell count 610 cells/mm$^3$. 70% (263/379) had a BMI $>25$ Kg/m$^2$ and 45% had $\geq2$ metabolic comorbidities. Median ALT was 54 IU/L (IQR 37–75). A valid CAP score was available for 385/408 (94%). 65% (249/385) had FLD, of whom 80% (201/249) were moderate-to-severe (S2/S3, C$\alpha$P $>260$ dB/m). Fibrosis was identified in 14% (57/408). There was no association between HIV-specific variables and FLD. Male gender, dyslipidaemia, type 2 diabetes mellitus and BMI were significantly associated with FLD (all $p < 0.05$). An increasing number of metabolic comorbidities was associated with increasing odds of FLD ($p < 0.001$) and fibrosis ($p < 0.001$) compared with individuals with no MetS comorbidities. In a multivariable model including age, gender and significant MetS comorbidities, BMI $>25$ Kg/m$^2$ (aOR 6.2 95% CI 3.6–12.8), dyslipidaemia (aOR 2.4 95% CI 1.4–4.2) and 4 metabolic comorbidities (aOR 6.2 95% CI 3.6–12.8) remained significantly associated with FLD.

**Conclusion:** We identified a high prevalence of FLD in our cohort of PWLH with well controlled HIV and low grade transaminitis using TE with CAP. TE/CAP should be more widely applied in screening guidelines to identify FLD in PWLH, especially those with markers of metabolic syndrome and identified as overweight or obese.

**SAT-505**

**Liver stiffness measurements with a new point-of-care device, Hepatoscope, using two-dimensional transient elastography showed both very good reproducibility and correlation to fibroscan**

Víctor de Lédinghen$^{1,2}$, Dan Dutartre$^2$, Françoise Manon$^2$, Joëlle Abiven$^2$, Anne-Laure de Araujo$^2$, Rhizlane Houmadi$^2$, Julie Dupuy$^2$, Juliette Fouche$^2$, Joel Gay$^4$, Claude Cohen-Bacrie$^4$. 1INSERM U1312, BRIC, Bordeaux University, Bordeaux, France; 2Bordeaux University Hospital, Hepatology unit, Pessac, France; 3Inria Bordeaux Sud-Ouest, Bordeaux, France; 4E-Scopics, Saint-Cannat, France.

**Email:** joel.gay@e-scopics.com

**Background and aims:** Liver stiffness measurement (LSM) by ultrasound-based transient elastography (TE) is recommended in risk stratification algorithms for patients with or at risk of non-alcoholic fatty liver disease (NAFLD). Fibroscan® (FS) is widely used today in hepatology practice and provides a 1D-measurement of shear wave speed. Large-scale screening of NAFLD-NASH could benefit from an available and affordable tool in primary care that would provide point-of-care reproducible and reliable LSM. Our goal was to assess the reproducibility of LSM on a new ultrasound point-of-care device, Hepatoscope™ with TE using 2D-measurements of shear wave speed (2DTE) under ultrasound guidance, and to compare 2DTE LSM with FS and blood tests.

**Method:** 96 adult patients referred to routine outpatient hepatology consultation for CLD, including LSM with FS, were enrolled in this prospective single centre study (NCT04782050). Four Hepatoscope liver exams were performed by 1 expert and 1 novice operator, to assess the intra-operator and inter-operator reproducibility of LSM. Stiffness values were computed in real time within a region of interest positioned within the liver image. Each exam consisted of a prospective record of 15 consecutive stiffness values with their quality indicator (QI) above 85%. Operators were blinded to any median value for each series of 15 values. LSM was estimated using the median of an incremented number of several stiffness values selected using different QI thresholds. Data were analysed with R to determine the Hepatoscope LSM, reproducibility intraoperator correlation coefficients (ICC) and the $r^2$ correlation of LSM by experts with other non-invasive tests.

**Results:** Intra-operator reproducibility of the median of 15 values ($LSM_{Med15}$) was very good ($ICC = 0.85; 95\% CI [0.77–0.89]$), excellent for experts ($ICC = 0.90; 95\% CI [0.85–0.93]$), and good for novices ($ICC = 0.76; 95\% CI [0.66–0.83]$). Inter-operator reproducibility was very good ($ICC = 0.83; 95\% CI [0.78–0.88]$). With stiffness values having a QI $\geq90\%$, very good intra- and inter-operator reproducibility could be achieved from only 4 values ($LSM_{Med4}$) ($ICC = 0.86; 95\% CI [0.78–0.9]$, and ICC = 0.85; 95\% CI [0.80–0.89], respectively). Intra-operator reproducibility for experts and novices was very good ($ICC = 0.89; 95\% CI [0.85–0.93]$ and ICC = 0.81; 95\% CI [0.73–0.87], respectively). When considering Hepatoscope LSM exams with an IQR/Median <30% (similar to FS routine use), the correlation between LSM performed with Hepatoscope and FS devices was good: $r^2 = 0.79$ with $LSM_{Med4}$, $r^2 = 0.79$ with $LSM_{Med15}$. Correlation coefficients ($r^2$) between LSM from Hepatoscope and FS to conventional liver fibrosis blood tests is presented in Table 1.

**Table 1:**

<table>
<thead>
<tr>
<th>Score</th>
<th>FIB-4</th>
<th>APRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS LSM</td>
<td>0.12</td>
<td>0.27</td>
</tr>
<tr>
<td>$LSM_{Med4}$</td>
<td>0.19</td>
<td>0.63</td>
</tr>
<tr>
<td>$LSM_{Med15}$</td>
<td>0.22</td>
<td>0.61</td>
</tr>
</tbody>
</table>

**Conclusion:** LSM can be performed with the new point-of-care device Hepatoscope and 2DTE modality by experts and novices. Using a QI of at least 90%, Hepatoscope LSM could be defined as the median of only 4 values, possibly leading to exam time savings. LSM measured with Hepatoscope showed good correlation with FS. These results are very encouraging regarding the use of 2DTE LSM at the point of care for large scale screening purposes. Future comparative studies against liver histology should allow the validation of existing LSM cutoff values for a specific screening and triage of patients at risk of fibrotic NASH.

**SAT-506**

**Are non-invasive tests of fibrosis effective in patients with metabolic associated fatty liver disease? Comparative study between liver biopsy and non-invasive scores or fibroscan**

Annalisa Cespiati$^{1,2}$, Rosa Lombardi$^{1,2}$, Sofia Carvalhana$^3$, Daniel Smith$^4$, Cristina Bertelli$^1$, Giuseppe Pisan$^1$, Helena Cortez-Pinto$^5$, Anna Ludovica Fracanzani$^{1,2}$. 1Unit of Medicine and Metabolic Disease, Fondazione IRCCS Cà Grande Ospedale Maggiore Policlinico, Milan, Italy; 2Department of Pathophysiology and Transplantation, University of Milan, Italy; 3Departamento de Gastroenterología, Centro Hospitalar Universitário Lisboa Norte, Departamento de Dietética e Nutrição, Lisbon, Centro Hospitalar Universitário Lisboa Norte Portugal, Portugal.

**Email:** annalisa.cespiati@unimi.it

**Background and aims:** Metabolic dysfunction-associated fatty liver disease (MAFLD) is characterized by liver steatosis and at least one metabolic comorbidity. Due to limitations of liver biopsy, non-invasive tests of fibrosis (NITs) (FIB4 and NFS) and liver stiffness measurement (LSM) by Fibroscan are used to diagnose fibrosis. Aims 1) to evaluate the diagnostic accuracy of NITs and LSM in MAFLD 2) to evaluate their performance specifically in diabetic and obese subjects 3) to identify new thresholds for scores NITs and LSM in MAFLD.

**Method:** We enrolled 164 biopsy-proven MAFLD (mean age 56 ± 12 ys, 62% males) in Milan and Lisbon. Clinical, laboratory and Fibroscan data were collected within 6 months from biopsy. FIB-4 < 1.3, NFS-
Background and aims: NAFLD is the most common chronic liver disease with a worldwide prevalence of 25%. It encompasses a wide variety of inflammatory conditions. The aim of this study is to evaluate the potential role of FLC as biomarker of inflammation and fibrosis in NAFLD/NASH patients.

Method: We enrolled 254 patients with metabolic liver disease at Liver Outpatient clinic at Policlinico A. Gemelli: 89 with NAFLD, 88 with NASH and 77 with compensated liver cirrhosis. Diagnosis of NASH was histologically assessed. Medical and pharmacological anamnesis, anthropometric measurements and laboratory tests (including FLC, and three serum markers of inflammation and fibrosis) were evaluated by all authors.

Results: 74% of the included 70 patients were females and mean age and mean BMI were 44 years and 42 kg/m², respectively. Patients had a median NAFLD activity score of 3 and mild-to-moderate fibrosis F0 (3%), F1 (86%), and F2 (11%). In general, CTTX-III increased in patients after bariatric surgery (p < 0.0001). The most significant rise was observed from baseline to three-months follow-up (p < 0.001).

Figure: Conclusion: This study indicates that CTTX-III may be a biomarker of fibrosis resolution in patients with NAFLD undergoing bariatric surgery.
31.423 vs 32.134 mg/L (p = 0.2). Among patients who undergone biopsy, FLCs tended to increase gradually with lobular inflammation severity (p = 0.03). Both k and FLCs increased proportionally with fibrosis stages (p < 0.01). Finally, total FLCs were significantly higher in patients with a diagnosis of compensated cirrhosis compared with patients with advanced fibrosis (F3-F4) and no fibrosis (p < 0.01).

Conclusion: We assessed that FLCs serum levels are significantly higher in patients with advanced fibrosis and cirrhosis being strictly related to the severity of the inflammatory process. FLCs might be considered useful tools in monitoring the inflammatory status of patients with NAFLD.

SAT-509
Non-alcoholic fatty liver disease made easy for diabetologists: the automated FIB-4 index
Mona Ismail1,2, Lameya Alsheekh2, Murtaga Makki2, Jaber Alelyani2, Zahra Hassan2, Zahra Alhadhiah2, Hind Al-Faddagh2, Nazih Alkhatam2, Reem Alarjan1,3, Yasir Elamin1,3, Alonoud Alanazi1,3, 1Imam Abdulrahman Bin Faisal University, College of Medicine, Dammam, Saudi Arabia; 2King Fahad Hospital of the University, Division of Gastroentrology, Department of Internal Medicine, Al Khobar, Saudi Arabia; 3King Fahad University Hospital, Endocrinology Division, Internal Medicine, Al Khobar, Saudi Arabia.
Email: monai4@hotmail.com

Background and aim: Non-alcoholic fatty liver disease (NAFLD) commonly causes chronic liver disease (CLD), has a global prevalence of 24%, and can progress to cirrhosis and hepatocellular carcinoma. Patients with type 2 diabetes mellitus have a high prevalence of NAFLD (55%), and diabetes is a strong predictor for developing non-alcoholic steatohepatitis (NASH), the severe form of NAFLD, and progressing to bridging fibrosis and cirrhosis in these patients. Recently, the American Diabetes Association recommended screening patients with type 2 diabetes for NASH and advanced fibrosis. Thus, this study aims to evaluate the role of automated FIB-4 (FIB-4) Index calculations in electronic medical records (EMR) in assisting diabetologists in identifying advanced fibrosis in diabetic patients.

Method: In this prospective study, patients with type 2 diabetes attending the diabetes clinic at a tertiary university hospital and unaware of having NAFLD were recruited. We incorporated automated FIB-4 calculations into the EMRs (QuadraMed®, TX, USA). Clinical and demographical data collected were age, sex, body mass index, complete blood count, liver and renal function, body mass index, insulin resistance, presence of comorbidities, dyslipidemia, ischemic heart disease, and medications used. We used logistic regression to identify predictors of advanced fibrosis. Patients with a high FIB-4 index of ≥1.3 and ≤65 years or ≥2.0 and ≥65 years were considered advanced fibrosis and referred to the Hepatology clinic. Patients with a FIB-4 index of <1.3 and <65 years or <2.0 and <65 years will continue to follow-up with their diabetologist and have a repeat FIB-4 calculation after 3–5 years.

Results: A total of 318 patients were included, and advanced fibrosis was seen in 9.7% of patients with type 2 diabetes. The mean age was 54.8 ± 13.3 years. The majority were females (54.7%), obese (57.2%), and with HbA1C 54.8 ± 13.3 years. The majority were females (54.7%), Saudi nationals (89.9%), obese (57.2%), and with HbA1C ≥7 (67.6%). On univariate analysis, advanced fibrosis by FIB-4 index was significantly associated with older age (OR = 1.07, 95% CI 1.02–1.11, p = 0.002), elevated bilirubin (OR = 3.19, 95% CI 1.62–6.30, p = 0.001), elevated GGT (OR = 2.48, 95% CI 1.60–3.84, p < 0.001), and elevated INR (OR = 9.43, 95% CI 1.76–50.39, p = 0.009).

Conclusion: Advanced fibrosis is a significant health issue in diabetic patients with NAFLD. Advanced fibrosis diagnosed by FIB-4 is associated with older age and a worse laboratory profile. Incorporating automated FIB-4 calculation into EMRs created an easy-to-follow clinical care pathway for diabetologists to quickly identify patients with advanced fibrosis as recommended by the American Diabetes Association and facilitate their early referral to specialists for further management.

SAT-510
Establishment and validation of a diagnostic model for liver inflammation in chronic hepatitis B (CHB) patients concurrent with non-alcoholic fatty liver disease (NAFLD) based on machine learning (ML)
Jie Li1, Qi Xue2, Fajuan Rui1, Xiaorong Tian1, Yayun Xu4, Qi Zheng5, Qing-Lei Zeng6, Zebao He7, Jian Wang1, Weimao Ding8, Chuanwu Zhu9, Yuanwang Qiu10, Yunliang Chen9, Junqing Fan3, Junping Shi11, Chao Wu1. 1Department of Infectious Diseases, Nanjing Drum Tower Hospital, The Affiliated Hospital of Nanjing University Medical School, China; 2Department of Infectious Disease, Shandong Provincial Hospital Affiliated to Shandong Frist Medical University, China; 3School of Computer Science, China University of Geosciences, China; 4Shandong Provincial Hospital, Shandong University, China; 5Hepatology Research Institute, The First Affiliated Hospital of Fujian Medical University, China; 6The First Affiliated Hospital of Zhengzhou University, China; 7Department of Infectious Diseases, Taizhou Hospital of Zhejiang Province affiliated to Wenzhou Medical University, China; 8Department of Hepatology, Huai’an No. 4 People’s Hospital, China; 9Department of Infectious Diseases, The Affiliated Infectious Diseases Hospital of Soochow University, China; 10Department of Infectious Diseases, The Fifth People’s Hospital of Wuxi, China; 11Department of Infectious Diseases, The Affiliated Hospital of Hangzhou Normal University, China.
Email: lijier@sina.com

Background and aims: Chronic hepatitis B (CHB) patients concurrent with non-alcoholic fatty liver disease (NAFLD) are common, but there are still lack of non-invasive models to evaluate liver inflammation. We aimed to build a diagnosis model for liver inflammation in those patients.

Method: This study consecutive enrolled CHB patients concurrent with NAFLD underwent liver biopsy and laboratory examination from eight medical centers of China between April 2004 and October 2020 as training cohort and patients from Tianjin Municipal Infectious Disease Hospital between January 2016 and September 2021 as independent external validation cohort. Inflammation grade 3–4 were predicted using ML models (logistic regression (LR), random forest (RF), decision tree classifier (DCT), gaussian naive bayes (GNB), and K nearest neighbor (KNN)). Features with Pearson correlation coefficients >0.2 were included in the diagnostic model. To avoid overfitting, 5-fold cross validations were used in the ML models building process.

Results: A total of 1340 CHB patients with NAFLD underwent liver biopsy included in the final analysis, with an average age of 38 (32–47 years (1032 males and 308 females). 216 cases (16.12%) were inflammation grade 3–4. Prothrombin time (PT), Aspartate transaminase (AST), alanine transaminase (ALT) were positively associated with inflammation grade 3–4, and albumin (ALB), platelet (PLT) were negatively associated with inflammation grade 3–4. LR model had the best performance, and its AUC for the diagnosis of inflammation grade 3–4 were 0.863 (0.810–0.916) in training cohort, and 0.890 (0.864–0.917) in validation cohort.

Conclusion: LR model performed the best overall performance in predicting inflammation. ML could be an effective tool for identifying clinically liver inflammation in CHB patients concurrent with NAFLD.
Figure: (abstract: SAT-510).
SAT-511
Economic modelling of clinical management options of unexplained hyperferritinaemia in the adult general population: a proposed new model of care
John Olynyk1,2,3, Mukesh Nasa1, Khurshid Alam4,1 Fiona Stanley Hospital, Murdoch, Australia; 2Edith Cowan University Joondalup Campus, Joondalup, Australia; 3Curtin University, Medicine, Bentley, Australia; 4Murdoch University, Murdoch, Australia
Email: john.olynyk@health.wa.gov.au

Background and aims: Unexplained hyperferritinaemia in the absence of iron overload or HFE haemochromatosis is common, especially in association with non-alcoholic fatty liver disease, and of no direct clinical significance. We modelled the discharge of unexplained hyperferritinaemia individuals from care either following diagnosis or after magnetic resonance FerriSmart (MR) measurement of hepatic iron concentration to exclude iron overload (Intervention MR model) compared to the standard of care, involving varying degrees of clinician review, ferritin testing and phlebotomy therapy which all become more likely as ferritin levels rise (comparator model). We hypothesise that the intervention model is more cost-efficient than the comparator model.

Method: A cost-minimization analysis was undertaken from the Australian health system perspective using Medicare and industry-provided costs. Costs of the intervention and comparator models were determined over a 5-year period for unexplained hyperferritinaemia individuals with elevated serum ferritin levels of ≥620 mg/L. Costs of the intervention and comparator models were based on algorithms described in methods and assuming a 10% loss varying degrees of clinician review, ferritin testing and phlebotomy. Modelling based on algorithms described in methods and assuming a 10% loss over 5 years.

Results: For the intervention model, the year 1 and 5-year average costs per individual for the 620–999 ug/L and ≥1000 ug/L groups were AUS464.83 and AUS92.97 and AUS784.70 and AUS156.94, respectively. For the comparator model, the year 1 and 5-year average costs per individual for the 620–999 ug/L and ≥1000 ug/L groups were AUS298.74 and AUS312.38 and AUS745.84 and AUS560.89, respectively. The intervention model was most cost-efficient after the first year.

Conclusion: It is more cost-efficient to discharge unexplained hyperferritinaemia individuals, with or without MR measurement, compared with the standard of care.

SAT-512
A systematic review and meta-analysis of the prevalence and cross-sectional severity of South Asian patients with non-alcoholic fatty liver disease
Michael James1, Naheeda Rahman1, Melanie Smuk1, Georgia Black2, William Alazawi1,1 Bizzard Institute, Centre for Immunobiology, United Kingdom; 2Wolfson Institute of Population Health, United Kingdom
Email: mikejames5289@gmail.com

Background and aims: Patients of South Asian (SA) ethnicity represent a distinct cohort in non-alcoholic fatty liver disease (NAFLD), with an aggressive phenotype, embodying a growing proportion of the patients referred to hepatology services. We performed a systematic review and meta-analysis to assess overall prevalence and cross-sectional severity of NAFLD in SA patients.

Method: PubMed, Embase, Ovid and Cochrane databases were searched from January 2002-November 2022. We included observational/cross-sectional studies and clinical trials, in English, involving adults (age ≥18 years) of SA ethnicity (defined as Indian, Pakistani, Bangladeshi, Sri Lankan). All contained data on prevalence of NAFLD in the general or diabetic population, diagnosed by ultrasound (US) or biopsy. Data on severity were collected, measured by AST:ALT ratio, fibrosis score F0-F4 on biopsy or steatosis grade S1-S3 on US. Abstracts were screened for relevance and then full-text review undertaken by two reviewers. Random effects meta-analyses were performed. Quality of included studies was assessed using The National Institutes of Health quality assessment tool.

Results: We identified 3175 articles from the literature search and included 43 eligible studies with a total of 24419 individuals, average mean age of 47 (95% confidence interval (CI) 43.9–50.1). 32 studies were based on Indian populations, 6 Sri Lankan, 3 Pakistani and 2 Bangladeshi. 33 studies had data on prevalence of NAFLD in general and in diabetic populations, with 22 using US as the sole method of diagnosis. AST:ALT ratio, FIB4 and vibration-controlled transient elastography were utilized in 4 studies. The pooled prevalence of NAFLD in the general population was 47% (CI 34–60%). In people with diabetes, this increased to 66% (CI 55–77%). 34 studies reported on severity, 17 with biopsy, with 12 having a breakdown of fibrosis scores. Of these, 216/1278 had clinically significant fibrosis (≥F3). The pooled proportion of patients who had ≥F3 on biopsy was 12.67% (CI 6.74–18.6) (figure). In terms of risk stratification, only 8/17 liver histology studies reported non-invasive assessment prior to biopsy (all US) and none reported on the use of a formal diagnostic assessment pathway. The proportion of patients biopsied with clinically significant fibrosis is higher than reports from multiethnic cohorts in Britain (7.7%, 1) and in the United States (4.28%, 2).

Figure:
Conclusion: The pooled prevalence of NAFLD in general and diabetic South Asian populations is higher than reported in previous systematic reviews. More work is needed to understand the epidemiology and natural history of NAFLD and the mechanisms that underlie the more aggressive disease phenotype in South Asian populations.

References

SAT-513
Serum glycochenodeoxycholic acid-3-sulfate can discriminate non-alcoholic steatohepatitis from steatosis
Barbora Nováková1,2, Kateřina Žížalová2, Vaclav Smid1, Karel Dvorák1,4, Ales Kuběná2, Libor Vitek2,3, Martin Lenicek5, Radan Bruha4. 1First Faculty of Medicine, Charles University and General University Hospital in Prague, 4th Department of Internal Medicine-Department of Hepatogastroenterology, Prague 2, Czech Republic; 2First Faculty of Medicine, Charles University and General University Hospital in Prague, 4th Department of Internal Medicine-Department of Hepatogastroenterology, Prague 2, Czech Republic; 3First Faculty of Medicine, Charles University and General University Hospital in Prague, 4th Department of Internal Medicine-Department of Hepatogastroenterology, Prague 2, Czech Republic; 4Regional Hospital Liberec, Liberec, Czech Republic; 5First Faculty of Medicine, Charles University and General University Hospital in Prague, Institute of Medical Biochemistry and Laboratory Diagnostics, Prague 2, Czech Republic.

Background and aims: Currently, liver biopsy is the only way to differentiate between non-alcoholic steatohepatitis (NASH) and steatosis (NAFL). Although the role of bile acids (BA) as a potential surrogate marker of NASH has already been investigated, the role of sulfated BA has not been tested yet. Therefore, our objective was to determine whether BA, including their 3-sulfates, can distinguish NASH from NAFL.

Method: We compared fasting serum concentrations of 22 individual BA and 23 BA 3-sulfates between the groups in an exploratory patient cohort (NASH n = 24, NAFL n = 18, healthy controls (CTRL) n = 15). The Kruskal-Wallis ANOVA with the appropriate post hoc test was used to compare BA concentrations between the groups. Two potential markers, glycochenodeoxycholic acid-3-sulfate (GCDCA-3S) and glycurseodeoxycholic acid-3-sulfate (GUDCA-3S) were further analysed in the biopsy-proven validation cohort (NASH n = 43, NAFL n = 21). Furthermore, we tested their ability to discriminate NASH using the ROC curve and a general linear model that contained potential confounders (liver fibrosis or cirrhosis, age, sex, BMI).

Results: Patients with NASH had significantly higher concentrations of GCDCA-3S compared to NAFL and CTRL (medians [μmol/L]: exploratory cohort NASH 0.306, NAFL 0.127, CTRL 0.105, p (NASH×NAFL) = 0.030, p (NASH×CTRL) = 0.008; validation cohort NASH 0.200, NAFL 0.049, p <0.0001). Furthermore, in the validation cohort, GCDCA-3S could distinguish NASH with 90% specificity and 60% sensitivity (AUROC = 0.785). The ability of GCDCA-3S to
discriminate between NASH/NAFL remained significant in the linear model that contained the presence of moderate to severe fibrosis or cirrhosis ($p = 0.0066$). Fibrosis/cirrhosis was the only significant confounder in the model ($p = 0.028$). Concentrations of another candidate, GUDCA-3S, were significantly elevated in NASH in the exploratory cohort; however, this was not confirmed in the validation cohort.

**Conclusion:** Serum GCDC-3S concentration appears to distinguish NASH from NAFL.

**SAT-514**

**ALT/AST ratio: the useful predictive marker for insulin resistance**

**Han Seul Kim**, **Moon Young Kim**, **Taesik Lee**, **Yonsei University Wonju College of Medicine, Department of Internal Medicine, Division of Gastroenterology and Hepatology, Wonju-si, Korea, Rep. of South;** **Wonju Severance Christian Hospital, Regenerative Medicine Research Center, Wonju-si, Korea, Rep. of South;** **Yonsei University Wonju College of Medicine, Division of Data Mining and Computational Biology, Wonju-si, Korea, Rep. of South;** **Yonsei University Wonju College of Medicine, Department of Family medicine, Wonju-si, Korea, Rep. of South**

**Email:** drkimmy@yonsei.ac.kr

**Background and aims:** Insulin resistance (IR) is common pathophysiology in type 2 diabetes mellitus, cardiovascular disease, and non-alcoholic fatty liver disease. As increased to the prevalence of these diseases, screening the risk for IR becomes important to prevent disease progression. To predict insulin resistance in the general population, regardless of comorbidity, we analyzed the health examination data using ALT/AST ratio for analysis.

**Method:** 2015, 2019, and 2020 Korea National Health and Nutrition Examination Survey (KNHANES) were analyzed to validate our hypothesis. For the evaluation of insulin resistance, the following four indices were implemented: fasting serum glucose (Glc) and insulin; Homeostatic Model Assessment for Insulin Resistance (HOMA-IR) and $\beta$ cell function (HOMA- $\beta$). Pearson correlation coefficient (PCC) was implemented to evaluate the degree of association of liver profiles with indices for IR. Linear or logistic regression (LR or LR) was implemented to identify the association of liver profiles with indices for IR. Linear or logistic regression (LiR or LR) was implemented to identify the association of liver profiles with IR value or status, respectively. Classification performance was evaluated based on the area under curve of Receiver Operating Characteristic (AUC).

**Results:** Based on PCC, serum ALT in Korean men and women was better predictive performance for Glc and HOMA-IR, compared to the sole ALT level, respectively. Classification performance was evaluated based on the area under curve of Receiver Operating Characteristic (AUC).

**Conclusion:** In the analysis that includes a large community-based population, ALT/AST ratio is a useful predictive marker compared with HOMA-IR. A simple, precise marker that is represented to ALT/AST could be a practical method to screen insulin resistance in the general population regardless of DM, alcohol intake, and gender.

**SAT-515**

**Validation of Baveno VII criteria in NAFLD patients according to body mass index**

**María Del Barrio Azaceta**, **Carmen Lara Romero**, **Paula Izurubieta**, **Andrea Cornejo**, **María del Carmen Rico**, **María Teresa Arias Loste**, **Javier Crespo**, **Manuel Romero Gomez**, **Gastroenterology and Hepatology Department, Clinical and Translational Research in Digestive Diseases, Valdecilla Research Institute (IDIVAL), Marqués de Valdecilla University Hospital, Santander, Spain;** **Digestive Diseases Unit, Hospital Universitario Virgen del Rocío, SeLiveR Group, Institute of Biomedicine of Sevilla (HUVR/CSIC/US), Department of Medicine, University of Seville, Seville, Spain;** **Centro de Investigación Biomédica en Red de Enfermedades Hepáticas y Digestivas (CIBEREH), Madrid, Spain**

**Email:** mromerogomez@us.es

**Background and aims:** In Baveno VII consensus, new criteria have been defined to try to identify the presence of clinically significant portal hypertension (CSPH). “The rule of 5 (R5)” establishes liver stiffness values in combination with the platelet count, to predict the presence of CSPH. However, in obese patients with Metabolic associated fatty liver disease (MAFLD) these criteria have not been validated.

**Method:** Bicentric cross-sectional study of 131 patients with MAFLD diagnosed by biopsy ($n = 41$; $31.3$%) or clinical criteria ($n = 90$; 68.7$%$) and who had a transient elastography (TE) with significant fibrosis ($\geq 8$ kPa). CSPH was defined as the presence of esophageal varices or gastropathy, hepatic decompensation, collaterals, or ascites. The R5 Baveno VII inclusion criteria were used: A) ET $> 25$ kPa; B) 20 kPa $<$ ET $< 25$ kPa and $< 150,000$ platelets; C) 15 kPa $<$ ET $< 20$ kPa and $< 110,000$ platelets; exclusion criteria: ET $< 10$ kPa or 10 kPa $<$ ET $< 20$kPa and $> 150,000$ platelets.

**Results:** Ninety-one patients had obesity (BMI $> 30$). In patients with MAFLD, the R5 had an overall sensitivity (Sen) of 68.08%, specificity (Spe) 51.19%, PPV 58.18% and NPV 90.38%. Sensitivity and PPV were lower in obese MAFLD patients (BMI $> 30$ kg/m$^2$): (S: 63.3% E: 55.7%; PPV 51.4%; NPV: 90.3%); compared to those with BMI $\leq 30$ (S: 76.5% E: 56.52% and PPV: 72.2%; NPV: 86.7%); $p < 0.05$. The probability of classification in the grey area was 17/91 (18.7%) in obese patients compared to 7/40 (17.5%) in BMI $< 30$ kg/m$^2$ ($p = ns$); presenting CSPH 10/24 (41.6%) and being absent in 14/24 (58.83%). Figure. In the univariate and multivariate (LR) analysis, the only independent predictor variable to predict the failure was age with Exp = 5.050 $\times$ 0.76 $\times$ Age (year).

**Conclusion:** Predictive criteria proposed by Baveno VII for CSPH are less accurate in obese patients with MAFLD and should be corrected for age.

**Figure:**

**Conclusion:** Predictive criteria proposed by Baveno VII for CSPH are less accurate in obese patients with MAFLD and should be corrected for age.
SAT-516
A real world experience utilising the FAST score to identify patients with NASH fibrosis
Gres Karim1, Dewan Giri1, Brooke Wyatt2, Ilan Weisberg3, Amreen Dinani2,4, Mount Sinai Beth Israel, United States; 2Icahn School of Medicine at Mount Sinai, United States; 3New York Presbyterian-Brooklyn Methodist Hospital, United States; 4Duke Health, Gastroenterology and Hepatology, United States
Email: gres.karim@mountsinai.org

Background and aims: The need to develop simple and non-invasive methods to diagnose non-alcoholic steatohepatitis (NASH) and fibrosis is one of the tasks the NAFLD community recognizes as important and necessary. Several non-invasive tests (NITs) have been studied and validated with moderate predictive capability to accurately rule out advanced fibrosis. The FibroScan-AST (FAST) score is a NIT that uses a combination of the liver stiffness measurement (LSM) and controlled attenuation parameter (CAP) from vibration controlled transient elastography (VCTE), and aspartate aminotransferase (AST) to identify patients with ‘fibrotic NASH’, defined as NASH with significant liver fibrosis (stage 2 fibrosis or higher [F2]). The aim of this study was to test the performance of the FAST score to accurately identify NASH + >F2 in a cohort of patients with a histological diagnosis of NASH, using a cutoff of >0.35 as a rule in factor. The cut off of 0.65 was not tested in this study as it has been proposed to identify those with >F3 fibrosis (advanced fibrosis). We compared the performance of the FAST score to LSM >8kPa and Fibrosis-4 Index (FIB-4) >1.3 (both cut-off for >F2) and attempted to identify risk factors to develop a model for improving diagnostic accuracy.

Method: Patients with a histological diagnosis of NASH were identified from 2020 to 2021. Demographic information, laboratory data, and VCTE data was collected. FAST score and FIB-4 were calculated. Univariate and backwards entry multivariate logistic regression analysis were performed to identify additional risk factors to diagnose NASH + >F2. Discrimination and overall accuracy (c-statistic) was assessed using area under receiver operating characteristic (AUROC) curves.

Results: Using a cutoff in factor of >0.35, the FAST score performed with a sensitivity, specificity, PPV and NPV of 96.4%, 36.8%, 81.8%, 41.6%, respectively. Independent logistic regressions within this sample showed age (OR = 0.06, CI:0.1–0.17, p = 0.05) and a FAST >0.35 (OR = 15.75, CI:2.9–85.48, p = 0.001) to be associated with correctly identifying NASH + >F2 based on histological evidence. Although the FAST score >0.35 performed with the highest accuracy (81.3%), it performed with the lowest c-statistic (0.70, CI: 0.55–0.84) when compared to LSM >8kPa (0.72, CI:0.59–0.85) and FIB-4 >1.3 (0.73, CI:0.59–0.87). Our proposed FAST + Age model outperformed the others with a sensitivity of 94.6%, specificity of 42.1%, PPV of 82.7%, NPV of 96.4% and c-statistic of 0.78 (CI: 0.64–0.92).

SAT-517
The sequential use of liver stiffness measurement and direct biomarkers of fibrosis is able to identify patients with severe non-alcoholic steatohepatitis
Filippo Gabrielli1,2, Simonieta Lugari1, Alessia Cavicchioli1, Amedeo Lonardo1, Cristina Felicani2, Antonia Rudilosso2, Chiara Pacchioni2, Carla Greco2, Chiara Valenti2, Luigi Valerio2, Mario Bondi3, Daniele Santi4, Giorgia Spaggiari5, Stefano Ballestri6, Tommaso Trenti2, Valentina Pecoraro2, Manuela Simon2, Pietro Andreone2, Fabio Nascimbeni2, Università degli studi di Bologna, Medical and surgical sciences, Bologna, Italy; 2University of Modena and Reggio Emilia, Department of Medical and Surgical Sciences Maternal-Child and Adult, Modena, Italy; 3Azienda Ospedaliero-Universitaria di Modena, Internal Medicine, Modena, Italy; 4Azienda Ospedaliero-Universitaria di Modena, Endocrinology, modena, Italy; 5Azienda Ospedaliero-Universitaria di Modena, Corelab, modena, Italy; 6Pavullo Hospital, Internal Medicine, Pavullo Nel Frignano, Italy
Email: judeslash1@gmail.com

Background and aims: The identification of patients with severe non-alcoholic steatohepatitis (NASH), who are at greater risk of progression to cirrhosis, and who most deserve targeted interventions and recruitment in clinical trials, is a major priority. Several non-invasive tests (NITs) have been developed to detect patients at risk of severe NASH and to reduce the use of liver biopsy. We conducted a prospective single-centre study aimed at evaluating the diagnostic performance of different NITs in the identification of biopsy-confirmed severe NASH. Moreover, we explored if the sequential use of NITs was able to improve their diagnostic accuracy.

Method: 56 consecutive patients (73.2% men; age 52 [22–69] years) performed liver biopsy for the suspicion of severe NASH, defined as the presence of NASH, NAFLD activity score ≥4 and fibrosis stage ≥F3. Simple wet NITs [aspartate aminotransferase (AST), alanine aminotransferase (ALT), albumin, platelet count, AST/ALT ratio (AAR) and AST to platelet ratio index (APRI)], complex wet NITs, [BARD score, Fibrosis-4 index (FIB-4), NAFDL fibrosis score (NFS), Forns Index and Hepamet fibrosis score (HFS)], direct biomarkers of fibrosis [collagen IV (CIV), laminin (LM), cholyglycine (CG), hyaluronic acid (HA) and procollagen type III amino-terminal peptide (PiPil)], measurement of liver stiffness (LS) with Fibroscan®, and AGILE 3+ and AGILE 4 scores, were all evaluated at the time of liver biopsy. The area under the receiver-operating characteristic curve (AUROC) for the identification of severe NASH of each single NIT was calculated. Finally, we evaluated the diagnostic accuracy of the sequential use of the NITs yielding the best diagnostic performance at AUROC analysis.

Results: Severe NASH was present in 12 (21.4%) patients. Simple wet NITs were not able to significantly detect severe NASH (AUROCs ranging from 0.46, p = 0.68 for albumin to 0.67, p = 0.08 for GOT, platelet and AAR). Among complex wet NITs, only BARD was able to significantly detect severe NASH (AUROC 0.77, p = 0.004), while FIB-4, NFS, Forns Index and HFS were not (AUROCs ranging from 0.45, p = 0.71 for Forns Index to 0.65, p = 0.12 for NFS). All direct biomarkers of fibrosis significantly detected severe NASH, with PiPil (AUROC 0.81, p = 0.001) and CIV (AUROC 0.80, p = 0.002) showing the best diagnostic performance. NITs based on LS with Fibroscan® also significantly detect severe NASH, however, AGILE >3+ (AUROC 0.71, p = 0.05) and AGILE 4 (AUROC 0.70, p = 0.04) scores did not improve the diagnostic performance of LS alone (AUROC 0.76, p = 0.007). The sequential use of LS (cut-off 8.5 kPa) and PiPil (cut-off 22 ng/ml) or CIV (cut-off 16.5 ng/ml) had a diagnostic accuracy of 85.7% and 91.1%, respectively.

Conclusion: The sequential use of LS and direct biomarkers of fibrosis, such as PiPil and CIV, may be a promising approach to non-invasively identify patients with severe NASH.
SAT-518
The clinical significance of transient elastography and cap in the diagnosis and surveillance of non-alcoholic fatty liver disease
Eleni Gigi1, Despoina Vasileiou1, Theodoros Michailidis1, 1Aristotle’s University of Thessaloniki, Hepatology Dep of 2nd Internal Medicine, Greece
Email: elengigi@auth.gr

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is characterized nowadays as the most common liver disease with a prevalence of 25–30% in the general population. While in most cases it has a benign course, a significant percentage of patients progress to non-alcoholic steatohepatitis (NASH), which is characterized by inflammation of the hepatocytes, and then a percentage of them end up with cirrhosis, with an increased risk of developing HCC. The gold standard method for the diagnosis of NAFLD is liver biopsy, but due to the fact that it is an invasive method accompanied by complications, there has been an attempt in recent years to use new non-invasive diagnostic methods such as transient elastography. The purpose of this thesis is to clarify whether transient elastography is a reliable method for the diagnosis and monitoring of NAFLD.

Method: In this context, a cross sectional study was carried out at the Hepatology Department of General Hospital of Thessaloniki “Ippokrato.” 81 participants with different liver diseases underwent transient elastography, upper abdomen ultrasound and laboratory blood tests.

Results: The results of the study showed that the participants had an average CAP value of 254 dB/m, which corresponds to stage 1 steatosis, but 18, 52% showed a high risk of disease progression based on the FAST score. In addition, it was shown that the results of the transient elastography were strongly related to the results of the ultrasound with a Spearman rank correlation coefficient = 0.589 and a p value <0.001. It was also found that BMI, SGPT, fasting glucose, uric acid and triglycerides were significantly associated with CAP with p values <0.001, 0.004 and 0.002, 0.036 and 0.041 respectively. Regarding severe NAFLD only BMI appeared to have a strong correlation with a p value = 0.006. However, in the multivariate analysis only the first three variables showed a significant correlation and so they were used to form a multivariate model: CAPrev = 27, 249 + 4, 723xBMI + 0, 26x SGPT + 0, 536xFasting glucose.

Conclusion: Transient elastography is a reliable diagnostic tool for the management of NAFLD, however, it has weaknesses in terms of confounding factors that affect its results and reduce its diagnostic accuracy.

NAFLD Experimental and pathophysiology

WEDNESDAY 21 TO SATURDAY 24 JUNE

TOP-084
Caspase 8 reverses progression of NASH after hepatocyte-specific Jnk deletion
Ines Volkert1, Julia Piche1, Christian Trautwein1. 1RWTH Aachen University Hospital, Medical department III, Aachen, Germany
Email: ivolkert@ukaachen.de

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is the most common chronic liver disorder in the Western world. Despite intensive research the mechanisms that may lead to progression towards end-stage cirrhosis and hepatocellular carcinoma (HCC) remain unclear. c-Jun N-terminal kinases (JNKs) are known to play a significant role in liver physiology and disease pathogenesis. In the present study, we aimed to investigate the mechanisms of liver damage after hepatocyte-specific Jnk1 and Jnk2 deletion in an experimental NASH model.

Method: NASH was induced by feeding animals a Western-style diet (WSD) to compare disease development between wild-type (WT) and mice with a hepatocyte-specific deletion of Jnk1 and Jnk2 (JNK1/2Δhepa). After pathway analysis, JNK1/2Δhepa/caspase8Δhepa animals were generated.

Results: WSD of JNK1/2Δhepa mice caused significantly increased transaminases, enhanced fibrogenesis and strongly increased inflammation, as evidenced by infiltration of immune cells and liver cytokines and chemokines, compared to WT mice. A gene set pathway analysis revealed distinct pathways, which are activated among WSD in JNK1/2Δhepa livers. Besides inflammatory signals, we specially found a strong increase of apoptotic pathways, which was further confirmed by TUNEL and Cleaved Caspase 3 staining. Hence, JNK1/2Δhepa/caspase8Δhepa animals were fed with a WSD. Triple ko animals showed significantly decreased liver transaminases and inflammation. Moreover, fibrogenesis and cell death were completely rescued. Interestingly, pathway analysis showed that most genes that were upregulated in JNK1/2Δhepa mice, were reversed after additional caspase 8 knockdown. Thus, an additional knockout of Caspase 8 achieved a complete reversal of the severe phenotype.

Conclusion: Our results demonstrate that hepatocyte-specific deletion of Jnk1 and Jnk2 triggers a strong oxidative stress response leading to increased NASH progression associated with apoptotic cell death. Interestingly additional hepatocyte-specific caspase 8 deletion completely rescued the phenotype. Hence, caspase 8 seems a promising hepatocyte-specific therapeutic target during NASH progression.

TOP-086
Novel role of macrophage Foxo1-mediated YAP-Notch axis in NASH progression
Dongwei Xu1,2, Xiaoye Qu1,2, Tao Yang1, Michael Ke1, Jun Li1, Longfeng Jiang3, Qiang Xia2, Douglas Farmer1, Bibo Ke1. 1The Dumont-UCLA Transplant Center, Division of Liver and Pancreas Transplantation, Surgery, Los Angeles, United States, 2Renji Hospital, Shanghai Jiaotong University School of Medicine, Liver Surgery, Shanghai, China, 3The First Affiliated Hospital, Nanjing Medical University, Infectious Diseases, Nanjing, China
Email: bke@mednet.ucla.edu

Background and aims: Innate immune activation is critical in initiating and amplifying hepatic inflammation in NASH progression. However, the mechanisms of immunoregulatory molecules in recognizing lipogenic, fibrotic, and inflammatory signals remain unclear.

Method: A mouse model of a high-fat diet (HFD)-induced NASH was used in the myeloid-specific Foxo1, YAP, or Notch1 knockout or double knockout mice. Liver injury, lipid accumulation, fibrogenic genes, and immune regulatory molecules were assessed in vivo and in vitro.

Results: HFD-induced oxidative stress activates Foxo1, YAP, and Notch1 signaling in hepatic macrophages. Macrophage Foxo1 deficiency (Foxo1ΔM-R2) ameliorates hepatic inflammation, steatosis, and fibrosis in HFD-challenged livers, accompanied by reduced STING, TBK1, and NF-κB activation in HFD-challenged livers. However, disruption of Foxo1 and YAP double knockout (Foxo1/YAPΔM-R2) or Foxo1 and Notch1 double knockout (Foxo1/Notch1ΔM
deletion) enhances STING function and exacerbates HFD-induced liver injury. Interestingly, Foxo1ΔM-R2 markedly reduces TGF-β1 release from palmitic acid (PA)-stimulated Kupffer cells, and decreases Col1α1, CCL2, and Tim1 but increases MMP1 expression in primary hepatic stellate cells (HSCs) after co-culture with Kupffer cells. Notably, the PA challenge in Kupffer cells augments LIMD1 and LAT51 co-localization and interaction, which induces YAP nuclear translocation. Foxo1ΔM-R2 activates PGC–1α and enhances nuclear YAP activity. Disruption of YAP in Foxo1ΔM-R2 macrophages increases ROS.
production in hepatocytes after co-culture exposed to PA challenge. Moreover, YAP deletion in Foxo1 M-KO macrophages reduces mitochondrial transcription factor A (TFAM) and mitochondrial DNA (mtDNA) expression but augments intracellular lipid levels in PA-stimulated hepatocytes after co-culture. Using chromatin immunoprecipitation (ChIP) coupled with massively parallel sequencing (ChIP-Seq) and in situ RNA hybridization approaches, we find that NICD co-localizes with YAP and targets Mb21d1 (cGAS) and modulates STING function leading to impeding NASH development.

**Conclusion:** Macrophage Foxo1-mediated YAP-Notch1 axis controls NASH progression via regulating cGAS-STING immune activation and mitochondrial biogenesis. YAP is a novel coactivator of NICD, and the YAP-NICD interaction is crucial for inhibiting STING function in NASH progression.

**TOP-089**

NAFLD is a night-time disease driven by nocturnal hepatic, adipose, and skeletal muscle insulin resistance

Thomas Marjot1,2,3, Sarah White1,3, Elspeth Johnson1, Felix Westcott1, Kate Gralton1, Riccardo Pofi1, David Dearlove1, David Ray1,3, Leanne Hodson1,3, Jeremy Tomlinson1,3.

1Oxford Centre for Diabetes, Endocrinology and Metabolism, Churchill Hospital, University of Oxford, Oxford, United Kingdom, 2Oxford Liver Unit, Translational Gastroenterology Unit, Nuffield Department of Medicine, University of Oxford, Oxford, United Kingdom, 3NIHR Oxford Biomedical Research Centre, Oxford University Hospitals NHS Foundation Trust, Oxford, United Kingdom

Email: thomas.marjot@ndm.ox.ac.uk

**Background and aims:** Rodent models show that hepatic lipid and glucose metabolism are under tight circadian control yet there are no clinical studies exploring diurnal patterns in functional processes governing intrahepatic lipid accumulation. We have characterised these metabolic pathways during day and night in patients with NAFLD before and after weight loss as well as matched controls.

**Method:** 11 NAFLD patients and 11 controls underwent detailed metabolic phenotyping during the day (07:00 AM-13:00 PM) and at night (19:00 PM-01:00 AM) under standardised fasting conditions. Investigations included a 2-step hyperinsulinaemic euglycaemic clamp, stable isotope assessments of glucose utilization, and paired biopsies of adipose and skeletal muscle tissue. Identical day and night-time investigations were performed in patients with NAFLD after a 12-week weight loss program.

**Results:** In NAFLD patients, glucose utilization (M/I value) was lower at night compared to day during both low- (12.1 ± 4.8 vs. 23.2 ± 3.7 mg/kg/min per uU/ml; p = 0.046) and high-dose insulin infusions (13.5 ± 2.3 vs. 20.6 ± 3.6 mg/kg/min per uU/ml; p = 0.042) indicative of night-time hepatic and skeletal muscle insulin resistance respectively (Fig. 1A). Isotopically measured glucose disposal (Gd) was also lower at night compared to day (18.6 ± 2.0 vs. 27.3 ± 2.7 μmol/kg/min; p < 0.001) (Fig. 1B) as was total body glucose oxidation assessed by [13C]CO₂ detection in breath (1.57 ± 0.1 vs. 1.72 ± 0.1 mmol/min/kg; p = 0.03). In contrast, control participants had no diurnal differences in M/I values, glucose disposal, or glucose oxidation. Patients with NAFLD also had markedly elevated plasma non-esterified fatty acids (NEFA) at night compared to day during basal (384 ± 58 vs. 299 ± 461 mmol/L; p = 0.001) and low-dose insulin phases of the clamp (234 ± 74 vs. 173 ± 49 mmol/L; p = 0.006) (Fig. 1C). These data are consistent with night-time adipose insulin resistance which positively correlated with degree of hepatic steatosis measured by controlled attenuation parameter (CAP) (r = 0.806; p = 0.005). Self-reported food diaries demonstrated that NAFLD patients consumed 48% of their mean daily calories during a single evening meal which may compound their night-time metabolic dysfunction. 9/11 (81%) NAFLD patients completed the lifestyle intervention achieving 6% weight loss and a 19% CAP reduction. Whilst there were global improvements in insulin sensitivity and adipose function, diurnal differences in M/I values (p = 0.02) and circulating NEFA levels (p = 0.008) persisted with continued metabolic dysfunction at night. Across all groups, there were no significant differences in calory intake, physical activity, and sleep quality in the week preceding day and night-time investigations suggesting that observed metabolic changes were related to time-of-day rather than external lifestyle factors. Proteomic analysis of adipose and skeletal muscle tissue will now help establish a mechanistic basis for this diurnal variability in metabolic phenotype.

**Conclusion:** Night-time metabolic dysfunction may represent a unique risk factor for NAFLD with multiple contributory pathogenic pathways augmented at night compared to day. These findings will help establish the optimal window for energy intake in patients with NAFLD and guide the best time-of-day to deliver medications currently in development.
**TOP-090**

**Single-cell RNA sequencing in DIAMOND mice reveals differentially regulated pathways specifically associated with the transition from simple steatosis towards NASH**

Rocio Gallego-Durán1,2, Douglas Maya1,2, Ignacio Benedicto3, Jose Maria Herranz2,3, Blanca Escudero-López4,5,6, Elena Vázquez-Ogando7, Rocio Montero-Vallejo1,2, MI José Robles-Frias6, Blanca Escudero-López4,5,6, Antonio Cárdenas-García3,6, Ana Quintas9, Elena Blázquez-López2,7, Francisco Javier Cubero2,3, Javier Vaquero2,7, Yulia Nevzorova3, Maite G Fernandez-Barrena7,8, Matias A Avila3,4, Jordi Gracia-Sancho2, Rafael Bañares2,7, José María Herranz2,4, Lucía López-Bermudo5,6, Manuel Romero Gomez1,2, Javier Ampuero1,2,7, ICM Diagnostic Diseases, Hospital Universitario Virgen del Rocío; SeLiver Group, Instituto de Biomedicina de Sevilla (HUVR/CSIC/US), Departamento de Medicina Universidad de Sevilla, Sevilla, Spain, 2CIBEREHD- Centro de Investigación Biomédica en Red de Enfermedades Hepáticas y Digestivas, Spain, 3Departamento de Inmunología, Oftalmología y ORL, Facultad de Medicina, Universidad Complutense de Madrid, Madrid, Spain, 4Program of Hepatology, Centre of Applied Medical Research (CIMA), University of Navarra, Spain, 5Centro Andaluz de Biología Molecular y Medicina Regenerativa-CABIMER, Universidad Pablo de Olavide, Universidad de Sevilla, Consejo Superior de Investigaciones Científicas (CSIC), Spain, 6CIBERDEM-Centro de Investigación Biomédica en Red de Diabetes y Enfermedades Metabólicas Asociadas, Spain, 7HepatoGastro Lab, Servicio de Ap. Digestivo del HGU Gregorio Marañón, Instituto de Investigación Sanitaria Gregorio Marañón, Spain, 8Pathology Department, Hospital Universitario Virgen del Rocío, Spain, 9Centro Nacional de Investigaciones Cardiovasculares (CNIC), Spain

**Email:** jampuero-ibis@us.es

**Background and aims:** DIAMOND™ mice have been validated as a preclinical model mirroring the metabolic and histological features of human NASH without significant fibrosis. The main aim was to employ single-cell RNAseq (scRNAseq) technology in this preclinical model to unveil the differential changes specifically associated with the progression from simple steatosis to NASH.

**Method:** We performed scRNAseq on parenchymal and non-parenchymal cells (NPCs) isolated from 8 DIAMOND™ mice fed high-fat high-fructose diet (HF-HFD) vs. controls at 19 and 32 weeks. For cell isolation purposes, livers were perfused and divided into two different fractions, one for hepatocytes and the other for the evaluation of NPCs. Briefly, hepatic tissue was dissociated, centrifugated, sorted by FACS and prepared to single-cell sequencing analysis using 10x Genomics. Several ingenuity pathway analyses (IPA) tools were used to find altered pathways, upstream regulators and toxic molecules specifically associated to NASH transition (Δz-score >|2|). Mitochondrial gene presence filtering was tested with several cut-offs selecting the most appropriate one for the experiment and validating its effect in clustering and differential expression. Clustering was carried out using the Seurat package in R with different resolutions to find the most adequate one for the experiment and validating the biological existence of the cluster using published markers and human protein atlas. Cell type annotation was generated using celldex package and validated using published and human protein atlas cell type markers to rename liver specific populations. The similarity with human NASH progression was measured using a robust NASH signature from previously published data. Mice livers were stained for haematoxylin-eosin and Masson’s trichrome, SAF Score and fibrosis were calculated by a pathologist blinded to the provenance of samples.

**Results:** Histopathological analysis following SAF Score showed NASH exclusively at 32 w despite significant inflammation at 19w of diet. Mild fibrosis was observed in all animals fed HF-HFD. We obtained a total of 70637 hepatocytes and 151132 NPCs, and identified six clusters of hepatocytes at week 19 and five at week 32 (see figure). NPCs clustering identified 21 clusters at week 19 and 24 at week 32, and 12 out of 21 and 10 out of 24 were assigned as known cell types respectively. Preliminary IPA analysis on hepatocytes reinforced the idea that the presence of NASH is associated with mitochondrial dysfunction (Mitochondrial dysfunction Δz-score = 3.78; Oxidative phosphorylation Δz-score = –5; Sirtuin signalling pathway Δz-score = 5.74). Interestingly, we observed a significant downregulation of several pathways linked to caspase-dependent apoptosis (Apoptosis of hepatocytes Δz-score = –2.178; Cell death of hepatocytes Δz-score = –2.662) despite a much higher presence of ballooned hepatocytes in NASH tissue together with an activation of a pathway related to caspase-independent apoptosis (Granzyme A signalling Δz-score = 3.74).

**Conclusion:** A single-cell model to analyse the transition towards NASH independently of fibrosis stage using DIAMOND™ mice has been established. Preliminary results link mitochondrial dysfunction in hepatocytes to NASH and ballooning, and highlight some noteworthy deregulations in pathways mediating apoptosis.

---

**Figure:** (abstract: TOP-090): UMAP results from parenchymal cells isolated from livers at 19w (a) and 32w (b) of diet.
WEDNESDAY 21 JUNE

WED-393
A functional interaction between hepatic estrogen receptor-α and PNPLA3 p.I148M inherited variant drives fatty liver disease susceptibility in women
Alessandro Cherubini1, Mahnoosh Ostadreza1, Oveis Jamialahmadi2, Serena Pelusi3, Eniada Rrapaj1, Elia Casirati3, Giulia Passignani1, Guido Alessandro Baselli1, Luisa Ronzoni1, Sara Della Torre2, Paolo Dongiovanni3, Daniele Prati1, Stefano Romeo6, Luca Valent1.7
1Fondazione IRCCS Ca’Granda Ospedale Maggiore Policlinico, Transfusion Medicine, Milano, Italy, 2Gothenburg University, Department of Molecular and Clinical Medicine, Gothenburg, Sweden, 3University of Milan, Pathophysiology and Transplantation, Milano, Italy, 4University of Milan, Department of Pharmaceutical Sciences, Italy, 5Fondazione IRCCS Ca’Granda Ospedale Maggiore Policlinico, General Medicine and Metabolic Diseases, Milano, Italy, 6University of Gothenburg, Department of Molecular and Clinical Medicine, Sweden, 7University of Milan, Pathophysiology and Transplantation, Italy

Method: The female sex*PNPLA3 p.I148M interaction on FLD was tested in the Liver Biopsy (n = 1861), severe FLD case-control (n = 4374), Liver-Bible-2021 (n = 817) and UK Biobank (n = 347,127) cohorts. PNPLA3 expression was determined in transcriptomic alterations in the expression of cytochrome P450 family and modulation of neutrophils aggregation, pathologies that well characterize NASH. The results of gene ontology analysis were experimentally verified using the liver tissues of BDNF± mice and immunostaining with myeloperoxidase, a marker for activated neutrophils, indicating the infiltration of neutrophils in the liver of mutant animals. Gene expression analysis by RNA-seq also suggests that the BDNF± mice are under oxidative stress, as indicated by alterations in the expression of cytochrome P450 family and reduction of glutathione S-transferase p, an antioxidant enzyme (Figure). Lastly, histopathologic phenotypes of NASH were observed in BDNF± mice as well.

Background and aims: Brain-derived neurotrophic factor (BDNF) is associated with the development of brain diseases. The aim of the present study was to investigate the role of BDNF in peripheral disease in life stages from adulthood to advanced age.

Method: Male BDNF knock-out mice (BDNF−/−) and controls (BDNF+/+) were fed with a normal diet in group housing. At 10 months of age, whole body organs were histopathologically analysed. Histological findings from the liver were scored using the non-alcoholic steatohepatitis (NASH) Clinical Research Network Scoring System. RNA-seq and gene ontology analysis were performed on the liver of animals. In addition, to ensure the implication of reduced BDNF expression, the histological study was performed in the liver of proBDNF knock-in (BDNFpro/pre) mice, genetically engineered mouse line in which precursor BDNF is inefficiently converted into the mature form of BDNF.

Results: BDNF−/− mice developed symptoms of NASH: zone 3 steatosis, lobular inflammation, ballooning hepatocytes, and fibrosis, while no histological lesions were seen in the head, kidney, intestine, lung, pancreas and spleen. Obesity and higher serum levels of glucose and insulin—major pathologic features in human NASH—were dramatic. Dying adipocytes were surrounded by macrophages in visceral fat, suggesting that chronic inflammation occurred in adipose tissue. RNA-seq studies of the liver revealed that the most significantly enriched term includes the fatty acid metabolic process and modulation of neutrophils aggregation, pathologies that well characterize NASH. The results of gene ontology analysis were experimentally verified using the liver tissues of BDNF± mice and immunostaining with myeloperoxidase, a marker for activated neutrophils, indicating the infiltration of neutrophils in the liver of mutant animals. Gene expression analysis by RNA-seq also suggests that the BDNF± mice are under oxidative stress, as indicated by alterations in the expression of cytochrome P450 family and reduction of glutathione S-transferase p, an antioxidant enzyme (Figure). Lastly, histopathologic phenotypes of NASH were observed in BDNF± mice as well.

Conclusion: This is the first report demonstrating that reduced BDNF expression induces the critical pathogenic mechanism leading to the development of the full spectrum of NASH. Our study thus describes a new model animal of the brain-liver connection.
Background and aims: The liver is the central organ in the human body responsible for carbohydrate and lipid metabolism and plays a key role in fat storage under conditions of overnutrition. Fat deposition is modulated by environmental factors and genetic predisposition. GWAS studies identified PNPLA3 p.I148M as a common variant that increases risk of developing non-alcoholic fatty liver. The association of this variant to harmful phenotypes is supported by increasing evidence that PNPLA3 is a cell body responsible for carbohydrate and lipid metabolism and plays a role in fat deposition.

Method: 6444 published ancient (modern humans, Neanderthal, Denisovan) and 3943 published present-day genomes were used for analysis after extracting genotype calls for PNPLA3 p.I148M (rs738409). The deeper evolutionary context was explored using reference genome sequences of current primates. To quantify changes through time, two regression analyses were performed: logistic regression based on presence/absence of the risk allele in ancient and modern individuals from different continents; linear regression based on allele frequencies by grouping individuals according to geography and age. To compare these changes with expected changes due to neutral factors such as genetic drift, we compiled a reference dataset of 1000 randomly selected SNPs for genome-wide analysis, and performed the exact same logistic and linear regressions.

Results: The ancestral (reference) allele is fixed among all great apes (Chimpanzee, Bonobo, Gorilla, Orangutan). In contrast, on the human lineage, all available Neanderthal (n = 5) and Denisovan individuals (n = 3 including a Neanderthal/Denisovan hybrid) exclusively carry the derived allele, suggesting fixation of the allele in the ancestor of all archaic humans (Figure). In contrast, present-day humans exhibit a wide range of minor allele frequency ranging from ~8% in Kenya up to 72% in Peru. Over the last 15,000 years, distributions of ancestral and derived alleles roughly match the present day allele distribution.

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is characterized by intracellular lipid accumulation in the liver and associates with pathogenic changes in additional metabolic tissues, particularly the adipose tissue (AT). In parallel, increasing evidence supports a functional role for extracellular vesicles (EVs) in inter-organ crosstalk during NAFLD progression. Finally, activation of Takeda G-protein coupled bile acid receptor 5 (TGR5) ameliorates NAFLD in experimental mouse models. Here, we aimed to elucidate whether modulation of TGR5 activity in adipocytes affects the content of its secreted EVs and in turn alters hepatocyte function, in vitro. In parallel, we evaluated the role of AT TGR5 in a mouse model of NAFLD.

Method: AT-derived EVs were isolated from adipocytes exposed to LPS and then incubated with unstimulated hepatocytes. Alternatively, EVs were isolated from adipocytes after silencing of TGR5 or upon exposure to different TGR5 agonists and then incubated with hepatocytes stimulated with LPS. AT-derived EVs were isolated by polymer-based precipitation and characterized by nanoparticle tracking analysis. AT-specific TGR5 KO mice and respective littermate controls were fed a high-fat diet (HFD) for 14 weeks. Gene and protein expression levels were analyzed by qRT-PCR and immunoblotting, respectively.

Results: Results showed that AT TGR5 plays a key role in the metabolic response of mice to high-calorie intake. In particular, AT-specific TGR5 KO mice fed an HFD displayed significantly increased body weight, compared to littermate controls, starting at 9 weeks of feeding. EVs released from LPS-stimulated adipocytes triggered an inflammatory response in hepatocytes, as seen by the increased mRNA expression of different pro-inflammatory cytokines, resulting in enhanced cell death. Interestingly, incubation of unstimulated hepatocytes with EVs from TGR5-silenced adipocytes similarly increased the expression of pro-inflammatory cytokines, while also promoting lipogenesis. Compared to unstimulated cells, incubation of adipocytes with different TGR5 agonists activated critical intra-cellular signalling mediators and led to decreased EV release. Of note,
EVs released from TGR5-activated adipocytes reduced the inflammatory response of hepatocytes stimulated with LPS.

**Conclusion:** Overall, our results suggest that EVs from TGR5-activated adipocytes contain anti-inflammatory molecules capable of exerting a functional role within hepatocytes, with in vivo data underscoring the role of TGR5 in ameliorating obesity and interorgan lipid accumulation. A better characterization of TGR5-dependent fat-to-liver signalling will unravel the prospective therapeutic potential of TGR5 agonists for metabolic diseases (HR17-00601, Fat2LiverTGR5; PTDC/MED-PAT/31882/2017, EXPL/MED-OUT/1317/2021 and SNSF 31003A_125487).

**WED-398**

**Hepatic lipid flux, and not lipid amount, damages the liver during starvation-induced steatosis**

Macarena Pozo-Morales1, Ana Cobham2, Cielo Centola2, Nicolas Rohner2, Sumeet Singh1, 1UNIVERSITÉ LIBRE DE BRUXELLES (ULB), IRIBHM, Anderlecht, Belgium, 2Stowers Institute for Medical Research, United States

**Email:** sumeet.pal.singh@ulb.be

**Background and aims:** During starvation, animals utilize the liver as lipid storage organ. For instance, patients suffering from anorexia nervosa, overnight fasted mice and starved zebrafish larvae have been reported to develop fatty liver. Like other cases of non-alcoholic fatty liver diseases (NAFLD), starvation-induced hepatic steatosis is related to liver damage. But it is not clear if the organ damage is due to the accumulation of lipid droplets in hepatocytes or their utilization as an energy source. Also, it remains unknown if the resolution of lipid droplets is beneficial to the animal. Here, we use the zebrafish model system to investigate the impact of lipid amount and lipid flux on liver damage. Further, we study how cavefish, a model of starvation resistance, protects its liver from atrophy during starvation.

**Method:** Our previous work in the zebrafish model system had shown that starvation-induced hepatic steatosis is regulated by calcium signaling (Pozo-Morales et al, Hepatology, 2022; doi: 10.1002/hep.32663). In line with our findings, in this study we manipulated lipid droplet flux by altering calcium flux. We increased calcium oscillations in the liver by mobilization of endo-lysosomal calcium stores, using TPC2 agonist. In contrast, we utilized a genetically encoded calcium chelator to reduce the turnover of lipid droplets.

Further, to understand how animals with enhanced starvation resistance deal with hepatic steatosis and liver damage, we investigated the starvation response in Mexican cavefish, Astyanax mexicanus. Here, we labeled hepatic lipid droplets using Nile Red staining and performed comparative analysis between surface and cavefish.

**Results:** In zebrafish, increase of calcium flux using TPC2 agonist efficiently reduced lipid droplets in the liver. However, the resolution of steatosis enhanced macrophage infiltration, hepatitis, phagocytosis and starvation-induced mortality. Thus, suggesting that fatty liver helps with starvation resistance.

On the other hand, buffering cytoplasmic calcium reduced the turnover of lipid droplets, increasing hepatic steatosis in later stages of starvation. The reduced lipid turnover led to reduced liver inflammation and increased the lifespan of starved animals, thereby suggesting that hepatic lipid flux damages the liver.

In the caveresh fish model, we found that, surprisingly, caveresh do not accumulate lipid droplets in the liver upon starvation and are protected from liver damage. In contrast, surface fish accumulate lipid droplets in the liver during starvation and display liver atrophy. Using transcriptome analysis, we identify the long-chain fatty acid importer, SLC27A2, as one of the gene responsible for hepatic steatosis during starvation. Zebrafish and surface fish, but not cavefish, upregulate the expression of slc27a2a in the liver upon starvation. Pharmacological inhibition of SLC27A2 inhibits lipid accumulation in the starved zebrafish liver.

**Conclusion:** Our study demonstrates that the turnover of lipid droplets in hepatocytes during starvation is detrimental to liver health and identifies a protective mechanism in caveresh against liver atrophy.

**WED-399**

**Targeting Apolipoprotein J restores autophagy and improves metabolic-associated fatty liver disease and diabetic nephropathy**

Wang Hsin-Tzu1, Duan Shuangdi2, Qin Nong2, Pi Jiayi2, Sun Pei2, Sun Hung-Yu1, 1National Cheng Kung University, Taiwan, 2Hunan University, China

**Email:** c5893149@gmail.com

**Background and aims:** Metabolic disorders affect 20–25% of adult population globally and have become a heavy burden on society. Targeting hepatic lipid deposition represents a therapeutic strategy against metabolic syndromes. In this investigation, Apolipoprotein J (ApoJ) was identified as a potential target of aberrant lipid accumulation to relieve metabolic-associated fatty liver disease (MAFLD) and diabetic nephropathy (DN).

**Method:** The diet-induced MAFLD, streptozotocin-induced type-II diabetes (T2DM), and genetically diabetic db/db mice were administered intravenously with ApoJ antagonist peptide (10 mg/kg/3 days) or intraperitoneally with liraglutide (200 μg/kg/day) for 8 weeks. The tissue pathology was examined by histochemical staining. The glucose and insulin tolerance test was performed to address insulin sensitivity.

**Results:** We first demonstrated that targeting ApoJ reactivates autophagy and lysosomal activity and prevents intracellular lipid deposition. Next, a peptide with a Kd of 2.54 μM was applied to antagonize ApoJ and restore mTOR-FWB7 E3 ligase interaction to promote proteasomal degradation of mTOR. Administration of ApoJ antagonist peptide improved hepatic pathology, serum lipid and glucose homeostasis, and insulin sensitivity in mice with MAFLD or T2DM. In addition, the peptide reactivated TFEB, restored autophagy, and prevented accumulation of lipid and reactive oxygen species of renal tubular, thus reversed renal injury and fibrosis in mouse models of DN.

**Conclusion:** The findings demonstrated ApoJ would be a therapeutic target for intracellular lipid deposition and a proof-of-concept ApoJ antagonist peptide was proposed as a novel strategy against metabolic syndromes.
WED-400
mTORC1 response to glucose via dihydroxyacetone phosphate is regulated by MAT1A. Role in NAFLD
María de los Reyes Luque Urbano1,2, Jon Bilbao3, David Fernández Ramos1,4, Fernando Lopitz Otsoa1, Virginia Gutiérrez de Juan1, Ganeko Bernardo-Seisdedos1,4, Luis Manuel Cervera Seco5, Uriko M Marigorta5, Lúa Barbir Torres6, Shelly C. Lu6, Oscar Millet1,3,4, José M. Mato1,3,1, CIC bioGUNE-Centro de Investigación Cooperativa en Biociencias, Precision Medicine and Metabolism Laboratory, Derio, Spain, 2Atlas Molecular Pharma, Spain, 3CIBERehd, Instituto de Salud Carlos III, Spain, 4Atlas Molecular Pharma, Spain, 5CIC bioGUNE-Centro de Investigación Cooperativa en Biociencias, Integrative Genomics Laboratory, Derio, Spain, 6Karsh Division of Gastroenterology and Hepatology, Department of Medicine, Cedars-Sinai Medical Center, Los Angeles, CA., United States
Email: director@cicbiogune.es

Background and aims: Deletion in mice of MAT1A, the main enzyme responsible for the hepatic synthesis of S-adenosylmethionine (SAMe), leads to the spontaneous development of liver steatosis and its progression to NASH, fibrosis, and hepatocellular carcinoma. Because it is not yet fully understood how MAT1A loss induces hepatic fat accumulation, we studied how MAT1A-deficient mouse hepatocytes respond to glucose challenge.

Method: Murine primary hepatocytes were isolated by liver perfusion from wild-type (WT) and MAT1A knockout (-KO) mice. After plating, hepatocytes were serum starved overnight and incubated with [13C]-glucose (25 mM, 3 hours). Protein and mRNA expression of glycolysis, pentose phosphate pathway (PPP), AMPK and mTOR pathways were studied by western blot and qPCR. Metabolites content was measured by NMR.

Results: Here we show that glucose sensing by mTORC1 is impaired in MAT1A-KO hepatocytes exposed to high glucose, as evidenced by inhibition of phosphorylation of mTORC1 and its downstream substrate S6K1, leading to reduced synthesis of phosphatidylcholine via the CDP-choline pathway, impaired VLDL export, and accumulation of intracellular lipids. We found that the concentration of dihydroxyacetone phosphate (DHAP), a glycolytic intermediate and activator of mTORC1, is reduced 8-fold in MAT1A-KO hepatocytes exposed to 25 mM glucose compared with WT hepatocytes. We also found that mRNA content of aldolase B (ALDOB), the enzyme that catalyzes the reversible conversion of fructose 1, 6-bisphosphate to DHAP and glyceraldehyde 3-phosphate (G3P), was reduced in MAT1A-KO hepatocytes. To neutralize this reduction in glucose flux between the upper and lower glycolysis, MAT1A-KO hepatocytes increased the expression of glucose-6-phosphate dehydrogenase (G6PD), the rate-limiting step of the PPP, and transketolase (TKT), the enzyme that channels excess sugar phosphates in the PPP to lower glycolysis at the G3P level. These alterations were prevented by the addition of SAMe to the culture medium. Consistent with the redirection of glucose flux through the PPP, we found that at high glucose AMPK and its target enzyme acetyl-CoA carboxylase 1, the rate limiting step in fatty acid synthesis, were hypophosphorylated in MAT1A-KO hepatocytes leading to increased lipogenesis.

Conclusion: The present findings, together with the observation that MAT1A expression is often reduced in NASH patients and our
previous finding demonstrating that NAFLD patients displaying a serum lipidomic signature similar to MAT1A-KO mice (subtype A) have lower VLDL secretion rate and serum VLDL levels than patients with a different lipidomic profile, suggest that DHAP-mediated mTORC1 response to glucose is impaired in NAFLD patients with subtype A. These results suggest that increasing hepatic DHAP content may be a therapeutic target in NAFLD patients with subtype A.

**WED-401**

**Development of a target engagement biomarker for HSD17B13: preclinical pharmacodynamic studies of small molecule inhibition of HSD17B13 by INI-822**

Cindy McReynolds1, Michael Carlton1, Chuhan Chung1, Heather Hsu1.

1Inipharm, RandD, Bellevue, United States

Email: hhsu@inipharm.com

**Background and aims:** Polymorphisms rendering the lipid droplet-located protein HSD17B13 enzymatically inactive protect against NASH, cirrhosis, and liver cancer. Analysis of human liver tissue demonstrated increased hepatic phosphatidylcholines in individuals with inactive HSD17B13 (Luukkonen 2020 JCI). INI-822, a selective small molecule inhibitor of HSD17B13, was used to test for lipidomic changes consistent with humans carrying the inactive HSD17B13 gene.

**Method:** INI-822 was dosed orally once daily in multiple rat models of liver injury including Zucker rats (3 weeks dosing, n = 4/group) on an atherogenic diet and CDAA-HFD and Sprague-Dawley rats (2 weeks dosing, n = 8/group). Changes in liver transaminase levels, circulating and hepatic phospholipids (GC/MS, LC/MS) and hydroxylated lipid substrates (LC/MS) were measured. Statistical significance was evaluated by ANOVA followed by a Bonferroni multiple comparison test. All parameters presented have a p < 0.05. The ED50 was calculated by a nonlinear 4 parameter fit.

**Results:** INI-822 treatment of Zucker obese rats led to a decrease in ALT in all models. INI-822 treatment in Zucker rats led to increased hepatic phosphatidylcholines seen in both diets but to a greater degree in rats on the CDAA-HFD. In contrast, plasma levels of phosphatidylcholines were decreased in animals treated with INI-822 on the CDAA-HFD. There was an increase in plasma levels of esterified hydroxy-lipid HSD17B13 substrates while these same substrates were decreased in free fatty acid form. This was seen on both diets but was more pronounced on the atherogenic diet. There was a dose-dependent increase in a panel of hydroxy-lipid HSD17B3 substrates with a mean ED50 of 5.6 ± 2.4 mg/kg. The change in these endogenous hydroxy-lipids was as great as 5.9-fold for 15-HETE under these conditions. There was also a dose-dependent decrease in the keto-lipid HSD17B13 product, 9-oxoODE, with an ED50 also of 5.6 mg/kg (r² = 0.5215).

**Conclusion:** INI-822 inhibition with INI-822 decreased liver transaminases and led to increased hepatic phosphatidylcholine content in multiple preclinical models. Inhibition of HSD17B13 resulted in increases in plasma levels of hydroxy-lipid HSD17B13 substrates, particularly in the esterified form. These changes in hydroxy-lipid substrates indicate their use as potential target engagement biomarkers and suggest that INI-822 phenocopies the human protective allele of HSD17B13.

**WED-402**

**Modelling the biological mechanisms of a PNPLA3 polymorphism in a 3D human liver spheroid for NASH progression and drug efficacy**

Francisco Verdeguer1, Radina Kostadinova1, Philipp Vonschallien1, Jesus Glaus2, Thomas Hofstetter2, Simon Ströbel1.

1InsPhero, Liver Discovery, Switzerland

**Background and aims:** Non-alcoholic steatohepatitis (NASH) is a progressive severe disease characterized by lipid accumulation, inflammation and fibrosis in the liver. Single nucleotide polymorphisms (SNPs) at specific loci have revealed differential propensity to develop NASH. Among them, “GG” rs738409 located in PNPLA3 results in the I148M amino acid change. PNPLA3 is a triacylglycerol lipase localized in lipid droplets but its function in the context of NASH is not fully understood and yet represents an interesting therapeutic target. The aim of this study was to investigate the effect of PNPLA3 (I148M) mutant on the development of NASH hallmarks in a 3D human liver in-vitro culture model.

**Method:** We generated a human in-vitro liver spheroid model by coculturing primary human hepatocytes, Kupffer cells, endothelial cells and hepatic stellate cells obtained from human donors. Hepatocytes were obtained from either the major allele for PNPLA3 or PNPLA3 (I148M) variant. Spheroids were incubated with either physiological or steatotic and proinflammatory media conditions to assess the influence of PNPLA3 in NASH hallmarks by performing biochemical, imaging and transcriptomics analysis.

**Results:** We show that steatotic and proinflammatory conditions lead to increased intracellular triglycerides levels and secretion of inflammatory markers IL-6, MIP-1α, TNF-α, IL-10, MCP-1 and IL-8 and increased secretion of procollagen peptides I and III. These results show a recapitulation of the hallmarks of NASH. PNPLA3 (I148M) genotype in liver spheroids resulted in an increased levels of steatosis and fibrosis measured by triglyceride content and collagen secretion compared to the major allele. In line with these results, transcriptomics analysis show that both de-novo lipogenesis and fibrotic pathways are elevated in the PNPLA3 (I148) donors compared to the major allele. These results are in agreement with the expected phenotypic propensity to develop NASH in the human population carrying the PNPLA3 (I148M) variant.

Finally, small molecules Firsocostat, Selonsertib and ALK5i lead to a decrease levels of triglycerides and inflammatory markers and collagen secretion compared to NASH, and the response was exacerbated in PNPLA3 (I148M) variants.

**Conclusion:** In summary we show a spheroid model that recapitulates NASH hallmarks and differential drug responses to specific SNPs relevant for NASH.

**WED-403**

**Perivascular macrophages contribute to adipose tissue angiogenesis in patients with advanced non-alcoholic fatty liver disease**

Celia Martínez-Sanchez1,2, Octavi Bassegoda3, Hilmar Berger4, Xenia Almodovar2, Laia Aguilar2, Ylliam Fundora2, Ainitzé Ibáñez2, Ana de Hollandia2, Pep Vidal2, Anna Soria2, Irina Luzko1, Alex Guillamon1, Frank Tacke4, Pau Sancho-Brull2, Pere Giné3,2,3, Isabel Graupera1,3, Mar Coll4. 1Institut d’Investigacions Biomèdiques August Pi i Sunyer (IDIBAPS), Spain, 2Centro de Investigación Biomédica en Red de Enfermedades Hepáticas y Digestivas (CIBEREHD), Spain, 3Department of Internal Medicine, University Hospital of Bellvitge, Spain, 4Department of Biochemistry and Molecular Biology, University of Navarra, Spain.

**Background and aims:** The expression of the triacylglycerol lipase PNPLA3 is increased in liver tissue from patients with severe non-alcoholic steatohepatitis (NASH). PNPLA3 variants have been associated with increased risk of NASH. The PNPLA3 (I148M) variant is present in 10-20% of the population, and is associated with increased rates of hepatic fibrosis and advanced NASH. PNPLA3 is located in the lipid droplets and has been shown to attenuate the lipid droplet angiogenic phenotype of adipose tissue. PNPLA3 (I148M) affects the expression of the adipokine adiponectin. In this study, we aimed to investigate the role of PNPLA3 in perivascular macrophage (PVM) accumulation in human adipose tissue.

**Methods:** Adipose tissue was obtained from 33 patients with NASH and from 33 control subjects. Adipose tissue was characterized by histological and immunohistochemical analyses, as well as by quantification of adiponectin and adiponectin receptors (adipoR1 and adipoR2) expression.

**Results:** Patients with NASH had increased adiponectin expression in comparison to healthy controls, and this was associated with increased accumulation of perivascular macrophages. The PNPLA3 (I148M) variant was present in 11% of the patients with NASH and in 6% of the controls. There was a trend towards an increased accumulation of perivascular macrophages in patients with the PNPLA3 (I148M) variant compared to patients with the major allele. The expression of adiponectin receptors was also increased in patients with NASH, and this was more pronounced in patients with the PNPLA3 (I148M) variant.

**Conclusion:** These results suggest that PNPLA3 (I148M) variant is associated with increased perivascular macrophage accumulation in human adipose tissue, which may contribute to the development of NASH.

Figure: INI-822 Impact on Plasma Product Levels

**Conclusion:** HSD17B13 inhibition with INI-822 decreased liver transaminases and led to increased hepatic phosphatidylcholine content in multiple preclinical models. Inhibition of HSD17B13 resulted in increases in plasma levels of hydroxy-lipid HSD17B13 substrates, particularly in the esterified form. These changes in hydroxy-lipid substrates indicate their use as potential target engagement biomarkers and suggest that INI-822 phenocopies the human protective allele of HSD17B13.
Background and aims: In non-alcoholic fatty liver disease (NAFLD) macrophages infiltrating the adipose tissue (ATMs) acquire a pro-inflammatory phenotype and contribute to liver damage. However, the heterogeneity of ATM populations and its relationship along disease progressions is still unknown. The aim of the present study is to unveil the main ATMs’ subsets with a significant role in NAFLD patients.

Method: Single cell RNA sequencing from sorted myeloid cells (CD14 +) was performed from the adipose tissue of obese patients without NAFLD (n = 2); NAFLD patients with mild hepatic fibrosis (n = 2) and NAFLD patients with advanced fibrosis (n = 2). We integrated our single cell data with those of previously reported single cell data from obese adipose tissue (Hildreth et al. 2021). Validation of scRNAseq findings by gene expression and immunohistological analysis was performed in adipose tissue of a larger cohort of NAFLD patients without fibrosis (n = 24) and with advanced fibrosis (n = 12).

Moreover, we performed an adipose tissue clearing technique to have a 3D volumetric image of the entire tissue. Finally we isolated ATMs and collected their secretome to evaluate the secretion of angiogenic ELISA.

Results: scRNAseq analysis of myeloid cells clustered into 10 different sub-types according to their transcriptome signature. Interestingly perivascular macrophages (PVMs) subset was found significantly enriched in patients with advanced fibrosis. The increase of PVMs was confirmed by gene expression of several key PVMs markers including RNASEI, DDIT3, MAF, Csf1r and by IHC using the surface marker FOLR2 (p = 0.006) in the adipose tissue of the NAFLD cohort. The functional analysis revealed, among others, the role of PVMs on local endothelial cell proliferation. Moreover integration of our ATMs’ scRNA seq with adipose tissue scRNAseq confirmed the interaction between PVMs and adipose tissue endothelial cells in the VEGF signaling pathway. By assessing the gene expression of the angiogenic markers: NRP1, EGF7 and CXCL12 (p = 0.004, p = 0.037 and p = 0.04, respectively) and protein expression of CD31 and VWF (p = 0.023 and p = 0.001), we confirmed the presence of increased angiogenesis in the adipose tissue in patients with advanced fibrosis. Furthermore, we found a positive correlation between angiogenesis and PVMs (r = 0.51, p = 0.04). Finally, using the clearing technique we found that the angiogenic EGF7 co-localize with PVMs. Moreover, we found that PVMs from patients with advanced fibrosis had higher EGF7 secretion compared to PVMs from patients without hepatic fibrosis (p = 0.042).

Conclusion: We report an increased abundance of PVMs’ subset in the adipose tissue at advanced stages of NAFLD which might contribute to local angiogenesis. The correlation between PVMs and adipose tissue angiogenesis in advanced NAFLD suggests that this subset of ATMs could promote liver disease progression.

WED-404
The E2F2-miR34a-5p axis is involved in the biliary metabolism dysregulation in NASH
Maider Apodaka-Biguri1, Francisco Gonzalez-Romero1, Andre L. Simao1, Daniela Mestre Congregado1, Igor Auvrekoette1, Beatriz Gómez Santos1, Ignot Delgado1, Xabier Buge1, Ane Nieva-Zuluaga1, Mikel Ruiz de Gauna1, Ainhoa Iglesias1, Ana Maria Aransay5,6, Juanjo Lozano5,7, Cesar Augusto Martin4,5, Idoia Fernandez-Puertas1, Pedro Miguel Rodrigues1,4,11,12, Jesus Maria Banales4, Ana Zubiaga4, Rui E. Castro1, Patricia Aspichueta1,5, S1212, 1Department of Physiology University of the Basque Country UPV/EHU, Faculty of Medicine and Nursing, Leioa, Spain, 2Research Institute for Medicines, Faculty of Pharmacy, Universidade de Lisboa, Lisbon, Portugal, 3Biocruces Bizkaia Health Research Institute, Cruces University Hospital, Barakaldo, Spain, 4Department of Genetic, Physical Anthropology and Animal Physiology, Faculty of Science and Technology, University of Basque Country UPV/EHU, Leioa, Spain, 5National Institute for the Study of Liver and Gastrointestinal Diseases (CIBEREhd, Carlos III Health Institute), Madrid, Spain, 6Genome analysis platform, Center for Cooperative Research in Biosciences (CIC bioGUNE), Derio, Spain, 7Bioinformatic Platform, Clinic Hospital, Barcelona, Spain, 8Department of Molecular Biophysics, Biofisika Institute (University of Basque Country and Consejo Superior de Investigaciones Científicas (UPV/EHU, CSIC)), Leioa, Spain, 9Department of Biochemistry and Molecular Biology, University of the Basque Country (UPV/EHU), Leioa, Spain, 10GIGER, University of Basque Country UPV/EHU, Leioa, Spain, 11Department of Liver and Gastrointestinal Diseases, Biodonostia Health Research Institute, Donostia University Hospital, University of the Basque Country UPV/EHU, San Sebastian, Spain, 12IKERBASQUE, Basque Foundation for Science, Bilbao, Spain

Background and aims: Accumulation of toxic bile acids together with lipotrophic lipids promote non-alcoholic steatohepatitis (NASH) progression. E2F2 transcription factor is upregulated in metabolic associated fatty liver disease (MAFLD). A connection between E2F2 and miRNAs has been described in several pathologies but not in liver disease. Our aims were 1) to identify if liver E2F2 regulates biliary metabolism in NASH-progression 2) to investigate the implication of liver E2F2 in bile acid induced liver damage.

Method: Progressive NASH was induced in E2f2−/− and WT mice by injection of diethylnitrosamine (DEN) and feeding a high-fat diet (HFD) for 6 months or by a Choline-deficient HFD (Chd-HFD) for 6 months. Chow diet-fed (CD) 3 month-old mice were also used. E2F2 was overexpressed in liver using adeno-associated viruses serotype 8 (AAV8). Biliary duct ligation (BDL) was included as a cholestasis model. miRNA sequencing was performed in mouse livers. Metabolic fluxes, lipid content, transcriptome analysis and gene expression were analyzed.

Results: E2f2−/− mice were protected from NASH in DEN-HFD and Chd-HFD models. The expression of Chpt1, involved in phosphatidylcholine (PC) synthesis, Abcg5 and Abcg8, regulators of cholesterol (CL) secretion in bile, and Cyp7a1 and Bsep, involved in bile acid metabolism, was increased in DEN-HFD E2f2−/− and Chd-HFD E2f2−/− compared with corresponding WTs. Analysis of metabolic fluxes showed that in DEN-HFD E2f2−/− mice the increased synthesis of PC and CL did not induce their storage in liver, suggesting an increased efflux into bile. Moreover, hepatic bile acid content was lower in Chd-HFD E2f2−/− mice when compared with their controls. miRNA sequencing and validation by qPCR showed that in DEN-HFD E2f2−/− mice, resistant to MAFLD-progression, miR34a-5p, miR155-5p and miR146a-5p were downregulated. miR34a-5p was the only miRNA found decreased in CD-fed E2f2−/− mice, and increased when E2F2 was overexpressed in liver. The same profile was observed in E2f2−/− Chd-HFD mice, showing lower miR34a-5p levels when compared with corresponding WTs. A crosschecked analysis between upregulated genes in DEN-HFD E2f2−/− mice and miR34a-5p predicted targets, according to miRWalk software, showed that analyzed genes involved in synthesis and secretion of bile and biliary lipid genes were among them. E2f2−/− mice were also protected from BDL-induced cholestasis, a model in which E2F2 and miR34a-5p are upregulated. This protection was lost when primary hepatocytes of E2f2−/− mice were treated with bile acids and miR34a-5p mimic.

Conclusion: E2F2 regulates miR34a-5p expression in liver disease. Its deficiency promotes the generation and efflux of bile acids and biliary lipids, protecting the liver against their accumulation in NASH and cholestasis.
The PNPLA3 I148M variant initiates metabolic reprogramming in macrophages

Emmanuel Dauda Dixon1, Thierry Claudel1, Jakob-Wendelin Genger2, Ct Zhu3, Sarah Stadlmayr4, Erika Paolini5, Alexander D Nardo1, Veronika Mlitz1, Claudia Fuchs1, Andreas Berghalter2, Christine Radtke4, Paola Dongiovanni5, Wilfried Ellmeier3, Michael Trauner1. 1Medical University of Vienna, Hans Popper Laboratory of Molecular Hepatology, Division of Gastroenterology and Hepatology, Department of Internal Medicine III, Wien, Austria, 2CeMM Forschungszentrum für Molekulare Medizin GmbH, Center for Pathophysiology, Infectiology and Immunology, Wien, Austria, 3Medical University of Vienna, Institute of Immunology, Austria, 4Medical University of Vienna, Institute of Plastic, Reconstructive and Aesthetic Surgery, Austria, 5Fondazione IRCCS Cà Granda Ospedale Maggiore Policlinico; Department of Pharmacological and Biomolecular Sciences, Università degli Studi di Milano, Italy
Email: michael.trauner@meduniwien.ac.at

**Background and aims:** Progressive non-alcoholic fatty liver disease is increasingly becoming a global health problem associated with underlying genetic polymorphism, the rs738409; C > G in patatin-like phospholipase domain-containing protein 3 (PNPLA3). Inflammation is the main driver for advanced liver injury, and we previously established that PNPLA3 I148M (148M oe) macrophage is pro-inflammatory. Since the metabolic state of macrophage determines its pro-inflammatory phenotype, we were interested in whether the PNPLA3 I148M affects mitochondrial function and thereby alters metabolic function.

**Method:** To explore mitochondrial and metabolic function in a macrophage cell line, we established a THP-1 stable cell line overexpressing the PNPLA3 wildtype and I148M isoforms. Gel-shift, gene expression analysis, metabolomics, and extracellular flux analysis were conducted. Reactive oxygen species (ROS) was measured by flow cytometry using MitoSOX assay.

**Results:** In 148M oe M1 macrophages, glycolytic genes like GLUT1, HK1, LDHA, and HIF-alpha were significantly increased compared to the WT oe. The 148Moe M1 macrophage had reduced basal (−29%) and maximum (−48%) mitochondrial respiration, as well as downregulation of CPT1-alpha (−63%), compared to the WT oe. In agreement, the metabolic fluxes like itaconate, succinate, fumarate, FAD, and NAD were reduced significantly in the I148M oe macrophage, suggesting reduced oxidative phosphorylation. In line with the extracellular flux analysis, the I148Moe, compared to the WT oe, has reduced mitochondrial ROS-positive cells (−15%). Significantly downregulated MCU and IP3R suggest that impaired Ca²⁺ signaling may, at least in part, be responsible for the reduced ROS in 148M oe macrophages. Despite high ROS levels in the WT oe, their mitochondrial function remained intact, suggesting that potential protective mechanisms are in place. The expression levels of SOD2, SOD3, and TXNRD1, TXNRD2 were significantly upregulated in the WT oe compared to 148M oe. In addition, glutathione biosynthesis and metabolism were reduced in the I148M oe compared to the WT oe. In line, genes associated with mitochondrial function like PGC1-alpha, NRF1/2, mt-ND1, 16sRNA,
LC3A, and LC3B were markedly reduced in the 148Moe. WToe macrophages had a higher number of mitochondria, as reflected by significantly upregulated mt-ND1 and 16sRNA compared to the 1148Moe. Interestingly, MAFR (~57%), which controls phagocytosis through the opsonic phagocytic receptor, FCγR2B (~30%), was significantly reduced in the 148Moe macrophage. Likewise, NOS2 and NOX2, the two components of the phagolysosome, were reduced, respectively, by 61% and 55% in the 1148Moe macrophages. In addition, itaconate, a macrophage-induced metabolite that acts as an antimicrobial effector, was reduced by 59% in 148Moe macrophage. Reduction of mitochondrial ROS, macrophage metabolism away from mitochondrial respiration. Our findings show that the PNPLA3 148Moe reprograms disease. may represent therapeutic targets in NASH. Flagellin and TLR5 have signals such as lipopolysaccharide (via TLR4) and flagellin (TLR5) and common, progressive inflammatory liver condition with no approved Email: wenhao.li@doctors.org.uk

Background and aims: Non-alcoholic steatohepatitis (NASH) is a common, progressive inflammatory liver condition with no approved therapies. Hepatocyte lipotoxicity results in inflammation, immune (T cell) infiltration and stellate cell activation leading to fibrosis. Hepatic Toll-like receptors (TLR) sense gut-derived inflammatory signals such as lipopolysaccharide (via TLR4) and flagellin (TLR5) and may represent therapeutic targets in NASH. Flagellin and TLR5 have been implicated in murine NASH models and here we test the hypothesis that this pathway plays a pathogenic role in human disease.

Method: Plasma TLR5 binding capacity and flagellin, stool Flic gene load (shotgun metagenomics sequencing) and hepatic TLR5 gene expression were measured in samples from 139 patients and 24 controls recruited from outpatient clinics and elective bariatric surgery. Lipotoxicity was modelled in vitro using oleic (1 mM) and palmitic (0.5 mM) acid in human hepatocyte-like (HepG2) and stellate (LX2) cells.

Results: Compared to controls, plasma TLR5-binding capacity was increased in advanced NASH fibrosis but not earlier stages of disease (TLR4-binding increased at all disease stages) as was flagellin concentration (538.3v 745.8 pg/ml, p = 0.004) which normalised in samples taken median 83 days following bariatric surgery (n = 20, p = 0.005). Stool Flic gene expression and hepatic TLR5 (but not TLR2 or TLR4) expression were increased in NASH, along with markers of intestinal permeability (FABP2, D-lactate). In vitro, TLR5 inhibition attenuated toxic lipid-mediated IL8 protein expression (all p < 0.001, vs control) in HepG2. TLR5 inhibition also attenuated both flagellin- and toxic lipid-induced IL8 production in LX2 cells by 1.9-fold (p = 0.019) and 2.1-fold (p = 0.032) respectively. Although neither flagellin nor toxic lipids directly induced pro-collagen 1A1 production in LX2 cells, lipid-injured HepG2-conditioned media induced 3.2-fold increase in pro-collagen 1A1 production compared to control (p = 0.0015). TLR5 inhibition in HepG2 cells prior to media transfer led to a reduction in LX2 pro-collagen 1A1 production (p = 0.030). Similarly, lipid-injured HepG2-conditioned media induced Th1 differentiation of naïve T cells from healthy donors in a TLR5-dependent manner (p < 0.001).

Conclusion: TLR5 signalling is activated in human NASH, reverses following bariatric surgery and is associated with mechanisms of lipid-mediated inflammation and stellate cell activation. This pathway has potential as a novel therapeutic target in NASH.


Background and aims: Extracellular vesicles (EVs) are membranous and cell-derived vesicles that contain multiple biomolecules which reflect the cellular state. In non-alcoholic fatty liver disease (NAFLD), EVs show great potential in helping understand the pathogenesis of the disease and be used as biomarkers. However, so far, there is no information available on liver tissue-derived EVs in the context of NAFLD. Therefore, in this study, we aim to characterize tissue-derived EVs from an ex vivo model of human precision-cut liver slices (PCLS).

Method: EVs were isolated from human PCLS, prepared from either healthy livers (patients undergoing partial hepatectomy or organ donation) or non-alcoholic steatohepatitis (NASH) cirrhotic livers (liver explants from transplantations). PCLS were incubated for 48 hours in a normal medium (WEGG: Williams’ Medium E with GlutaMAX medium supplemented with 11 mM glucose and 10 µg/ml gentamycin) or a modified medium to mimic the pathophysiological condition of NAFLD (GFFW: WEGG supplemented with 25 mM glucose, 5 mM fructose, 1 mM insulin, 0.24 mM palmitic acid, 0.48 mM oleic acid). The PCLS-derived EVs were isolated by differential ultracentrifugation and further characterized by transmission electron microscopy (TEM), western-blot, nanoparticle tracking analysis and mass spectrometry.

Results: The transmission electron microscopy pictures showed the presence of particles with typical EV elements, with sizes between 50 and 250 nm. We confirmed by western blot typical markers of EVs: CD81, CD9 and Rab7 and the absence of cytochrome-c indicating high purity of the EV pellet. NASH PCLS produced a higher amount of EVs compared to healthy EVs (p < 0.005), although there was no significant difference regarding the size of EVs. Using mass spectrometry we identified 2636 proteins both in NASH PCLS-derived EVs and healthy PCLS-derived EVs. There are 151 proteins significantly up-regulated, and 142 proteins significantly down-regulated in EVs derived from NASH PCLS compared to EVs derived from healthy PCLS (FDR < 0.05). GO molecular function analysis showed that those significantly changed proteins were largely enriched for protein/lipid binding functions. By employing the EV proteins as ligands and using a manually curated ligand-receptor database-Cellinker, we found 150 cognate-binding partners that were significantly different in NASH PCLS-derived EVs. The up-regulated cognate-binding partners showed potential in modulating metabolic status (via inhibit βε (INHBE)), promoting fibrosis (via latent transforming growth factor β binding protein 1 (LTBP1), integrin subunit β9 (ITGB5)) and inducing inflammation (via C-X-C motif chemokine 12 (CXCL12)). Furthermore, we found that epithelial cell adhesion molecule (EPCAM) and integrin subunit α3 (ITGA3) enriched in our EVs are positively and increasingly associated with the progression of NAFLD, which showed the potential of liver-derived EVs as biomarkers for NAFLD.

Conclusion: In this study, we characterized the EVs derived from healthy and NASH human PCLS with the characterization of their protein compositions. The different protein cargos in EVs from NASH
**Background and aims:** Lipotoxicity is associated to non-alcoholic steatohepatitis (NASH) and generates stress and toxic species that activate the DNA damage response (DDR). This response is associated with the progression of the disease, characterized by the over-expression of the E2F transcription factors. The aims here were to: 1) Identify the role of DNA damage in the metabolic dysregulation of NASH; 2) Investigate the involvement of E2F2.

**Method:** A cohort of obese patients with liver biopsy classified as NASH or no-NASH was used to analyze hepatic levels of pH2AX (DNA damage marker) and E2F2, hepatic and serum parameters and the associated rewiring in lipid metabolism. In cell cultures, NAFLD-associated conditions including oxidative stress, lipid accumulation as well as TGFb1, IL-6 and IFNg associates with RNA binding proteins and binds a specific set of RNAs. Moreover, we have found that TRAIN activated pathways drive TRAIN expression in both hepatocytes and hepatic stellate cells. Hence, we are using genetic and viral approaches to modulate TRAIN expression in mice and in cell cultures in combination with NAFLD/NASH/liver injury inducing treatments to investigate the role of TRAIN in liver disease. Specifically, we have generated whole-body and hepatocyte-specific TRAIN knockout (KO) mice and are using adeno/adeno-associated virus (AAV) delivery systems to acutely induce, repress or KO TRAIN expression. These mice are then challenged in different models of NAFLD/NASH/liver injury including feeding mice on a western diet, methionine-choline deficient (MCD) diet or through CG4 injections. Hepatocyte and hepatocyte stellate cell lines as well as mouse and human primary hepatocytes are treated with NAFLD-associated stimuli to investigate the NAFLD-driven pathways regulating TRAIN expression. Lastly, we are using GST pull-down followed by mass spectrometry to investigate the molecular function of TRAIN.

**Results:** TRAIN expression is elevated in liver disease in both human patients and in various mouse models. Importantly, we have found that increasing liver TRAIN expression, within pathophysiological levels, is sufficient to drive NASH-like metabolic, morphological, histological, and hepatic transcriptional characteristics. This includes TRAIN-induced expression of a panel of genes associated with immune response, extracellular tissue remodeling and fibrosis. Interestingly, TRAIN gene ablation in hepatocytes ameliorates glucose homeostasis and energy expenditure in NASH-diet fed mice. In cell cultures, NAFLD-associated conditions including oxidative stress, lipid accumulation as well as TGFb1, IL-6 and IFNg activated pathways drive TRAIN expression in both hepatocytes and in hepatic stellate cells. Moreover, we have found that TRAIN associates with RNA binding proteins and binds a specific set of RNAs.

**Conclusion:** TRAIN is a novel regulator of inflammation involved in some of the key molecular and cellular events of NAFLD/NASH development and progression. Research in this project could form the foundation for finding a new class of pharmacological therapies for NAFLD/NASH and potentially other liver inflammatory diseases, such as alcoholic hepatitis.
**POSTER PRESENTATIONS**

**WED-410**

**mir-22 inhibition as glp1 agonist orthogonal mechanism for nafpl and nash treatment**

Riccardo Panella, Sakari Kauppinen, Simone Tomasinì, Henrik E. Hansen, Michael Feigh.

Aalborg University, Center for RNA Medicine, Clinical Medicine, Copenhagen SV, Denmark, Gubra, Hørsholm, Denmark

Email: riccardop@dcm.aau.dk

**Background and aims:** MicroRNA-22 (miR-22) orchestrates multiple pro-lipogenic and adipogenesis programs through both direct and indirect signaling mechanisms. Genetic ablation of miR-22 has been demonstrated to suppress these programs resulting in stimulated energy expenditure and brown adipose tissue activation. Collectively, this supports the relevance of miR-22 inhibition in the treatment of obesity and associated disease complications, notably non-alcoholic steatohepatitis (NASH). The present study aimed to characterize locked nucleic acid (LNA) oligonucleotide-based therapy targeting miR-22 in preclinical models of obesity and NASH.

**Method:** The LNA-based anti-miR-22 oligo was designed using a mix-mer strategy targeting the seed region of has-miR-22-3p, evolutionary conserved between mouse and human. Female C57BL/6 mice were made diet-induced obese by feeding a high-fat diet (60 kcal% fat) for 24 weeks (DIO mice). DIO mice (n = 5–8 per group) received (SC) vehicle, scrambled LNA (10 mg/kg) or LNA anti-miR-22 (10 mg/kg) once weekly throughout the feeding period. Other female C57BL/6 mice were fed the C57BL/6 mouse diet high in fat, fructose and cholesterol for 38 weeks prior to study start (GAN DIO-NASH mice). Only GAN DIO-NASH mice with liver biopsy confirmed NASH (NAFLD Activity Score, NAS) and fibrosis (stage ≥ 1) were included and stratified into treatment groups based on quantitative fibrosis histology. GAN DIO-NASH mice (n = 14–16 per group) were administered (SC) vehicle, scrambled LNA (SCR, 10 mg/kg) or LNA anti-miR-22 (10 mg/kg) once weekly for 24 weeks. Vehicle-dosed chow-fed mice (n = 10) served as normal controls. Histopathological pre-to-post individual assessment of NAS and fibrosis stage was performed in GAN DIO-NASH mice. In both studies, terminal end points included body weight and quantitative liver histology.

**Results:** Vehicle and SCR-dosed DIO mice showed similar robust and progressive weight gain during the course of the study. In contrast, LNA anti-miR-22 treatment completely prevented development of obesity and steatosis in DIO mice. Food intake in DIO mice was unaffected by treatments. LNA anti-miR-22 reduced body weight in GAN DIO-NASH mice while also reducing NAS, driven by significant improvements in steatosis and lobular inflammation scores. The benefits on liver histology in GAN DIO-NASH mice were further supported by reduced quantitative histological markers of steatosis (% area of lipids, % lipid-laden hepatocytes) and inflammation (galectin-3).

**Conclusion:** We have developed a locked nucleic acid (LNA) oligonucleotide efficiently inhibiting miR-22 function. LNA anti-miR-22 treatment effectively prevents development of obesity and improves liver disease hallmarks in clinical translational mouse models of obesity and NASH without affecting food consumption, supporting further development of LNA anti-miR-22 for obesity and obesity-related liver complications.

**WED-411**

**Biomarkers identifying hepatic inflammation in non-alcoholic fatty liver disease (NAFLD)**


Copenhagen University Hospital Hvidovre, Gastro Unit, Hvidovre, Denmark, Gubra, Maaloev, Denmark, Center for RNA Medicine, Copenhagen SV, Denmark, Novo Nordisk A/S, Research and Early Development, Maaloev, Denmark, Copenhagen University Hospital Hvidovre, Pathology, Hvidovre, Denmark, Aalborg University Copenhagen, Center for RNA Medicine, Copenhagen SV, Denmark, University of Copenhagen, Clinical Medicine, Copenhagen N, Denmark

Email: edg@novonordisk.com

**Background and aims:** Hallmarks of non-alcoholic steatohepatitis (NASH) are steatosis, lobular inflammation and hepatocyte ballooning driving fibrosis and progression to cirrhosis, end-stage liver disease and hepatocellular carcinoma. The aim of the study was to identify plasma proteins as non-invasive biomarkers of hepatic inflammation in NAFLD patients.

**Method:** LC-SM based plasma proteomics was conducted on 77 healthy controls and 198 NAFLD patients (F0 = 42, F1 = 55, F2 = 45, F3 ≥ 26, F4 = 30) in the Fatty Liver Disease in Nordic Countries (FLINC) cohort. A combination of differential expression analyses and machine learning (SVM) was used to identify novel biomarker candidates. Immunohistochemistry of pan-leucocyte marker CD45 in formalin-fixed paraffin-embedded (FFPE) liver biopsies determined overall hepatic inflammatory. CD45 proportionate area for 148 NAFLD and 14 controls were calculated by digital image analysis. Gene expression of candidate biomarkers was assessed from bulk transcriptomics in the same FFPE liver biopsies from 118 NAFLD patients and 12 controls.

**Results:** Analysis of the LC-MS dataset identified a 4-protein panel of plasma proteins and histological immune markers (CD45, Vimentin) as biomarkers for NASH. A combination of candidate biomarkers was assessed from bulk transcriptomics in the same FFPE liver biopsies from 118 NAFLD patients and 12 controls.

**Results:** Analysis of the LC-MS dataset identified a 4-protein panel of plasma proteins and histological immune markers (CD45, Vimentin) as biomarkers for NASH. A combination of candidate biomarkers was assessed from bulk transcriptomics in the same FFPE liver biopsies from 118 NAFLD patients and 12 controls.

**Results:** Analysis of the LC-MS dataset identified a 4-protein panel of plasma proteins and histological immune markers (CD45, Vimentin) as biomarkers for NASH. A combination of candidate biomarkers was assessed from bulk transcriptomics in the same FFPE liver biopsies from 118 NAFLD patients and 12 controls.

**Results:** Analysis of the LC-MS dataset identified a 4-protein panel of plasma proteins and histological immune markers (CD45, Vimentin) as biomarkers for NASH. A combination of candidate biomarkers was assessed from bulk transcriptomics in the same FFPE liver biopsies from 118 NAFLD patients and 12 controls.
increased hepatic CD45 proportionate area [High >3.5 (n = 60) % vs Low <2.5% (n = 49)]. Intracellular adhesion molecule 1 (ICAM1) mediating leukocyte endothelial transmigration), adenosine deaminase 1 (ADA2) expressed predominantly in macrophages, CD163 marker of monocyte/macrophage lineage, von Willebrand factor (vWF) increased with adverse changes to the endothelium, fibronectin 1 (FN1) a fibroblast-derived glycoprotein present both in plasma and extracellular matrix, and cathepsin D (CSTD) an endolysosomal protease linked to deregulated metabolism and inflammation in NAFLD. Interestingly, only CSTD was upregulated in non-cirrhotic NAFLD patients with biopsy-confirmed lobular inflammation. Hepatic gene expression of ICAM1, ADA2, CD163, and vWF was, moreover, positively associated with CD45 proportionate area when assessed by bulk transcriptomics (p = 0.0002, p = 1.06*10^-7, p = 0.0008, and p = 0.001, respectively). In contrast, hepatic CSTD and FN1 gene expression did not correlate with CD45 area fraction. Increased plasma levels of CSTD, ICAM1, ADA2, CD163, and vWF, but not FN1, were associated with fibrosis.

**Conclusion:** We identified 6 plasma proteins as potential biomarkers of overall hepatic inflammation in non-cirrhotic NAFLD patients. High levels of hepatic inflammation were associated with fibrosis and characterized by endothelial activation and increased monocyte/macrophage cell infiltration.

**WED-412**

***Peroxisome proliferator-activated receptor alpha and estrogen related receptor alpha ligand combinations ameliorate non-alcoholic fatty liver disease***

Milton Antwi1,2,3,4, Sander Lefere2,4, Lisa Koornneef1, Anneleen Heldens2,3, Louis Onghena1,2, Anja Geerts1,2, Lindsey Devisser1,2,3, Karolen De Bosscher1. 1Translational Nuclear Receptor Research lab, VIB-Ugent Center for Medical Biotechnology, UGent Department of Biomolecular Medicine, Gent, Belgium, 2Liver Research Center Ghent, Ghent University Hospital, Gent, Belgium, 3Gut-Liver Immunopharmacology unit, Ghent University, Department for Basic and Applied Medical Sciences, Gent, Belgium, 4Hepatology Research Unit, Department Internal Medicine and Pediatrics, Liver Research Center, Ghent University, Gent, Belgium. Email: milton.antwi@vib-ugent.be

**Background and aims:** As a result of the increasing prevalence of obesity, non-alcoholic fatty liver disease (NAFLD) has become the most common liver disease worldwide. Left untreated, NAFLD can progress to non-alcoholic steatohepatitis (NASH), cirrhosis and primary liver cancer. There is currently no approved pharmacotherapy available for NAFLD. Two nuclear receptor candidates, peroxisome proliferator-activated receptor (PPAR) alpha and estrogen-related receptor (ERR) alpha independent findings have been linked as a therapeutic target against NAFLD. Additionally, literature findings support a close functional interconnection between both receptors. We therefore studied whether pharmacological modulation of PPARalpha and ERRalpha in tandem can inhibit NAFLD progression.

**Method:** The in situ protein expression and localization of PPARalpha and ERRalpha in healthy control, NAFLD, and NASH patients from Ghent University Hospital were studied by confocal microscopy. To evaluate a potential nuclear receptor crosstalk, serum-starved human hepatoma (HEPG2) cells were treated with PPARalpha agonist Pemafibrate (5 μM) and ERRalpha inverse agonist compound C29 (5 μM). Using a diabetic background streptozotocin (STZ)-western diet (WD) mouse model, male mice were fed a western diet from 4 to 12 weeks of age, and treated with Pemafibrate (0.1 mg/kg) and C29 (10 mg/kg) from weeks 6 to 12 via daily oral gavage. Clinical features, blood parameters, histology and gene expression of the liver were evaluated.

**Results:** Total PPARalpha protein expression decreased in NAFLD patients and further diminished in NASH patients (p = 0.042). Conversely, ERRalpha protein expression was not significantly affected in both NAFLD and NASH patients. PPARalpha protein expression outside the nucleus of the hepatocytes decreased in NASH patients (p = 0.0293). ERRalpha protein expression was localized more outside the nucleus similarly in healthy, NAFLD and NASH patients. Both nuclear receptors overlapped to a greater extent in healthy controls compared to NASH patients (p = 0.046). In vitro, PPARalpha and ERRalpha ligand combination increased the expression of genes involved in lipid metabolism. In vivo, mice treated with the ligand combination showed improved steatosis, inflammation, NAFLD activity score (p < 0.0001) and fibrosis (p = 0.042), and fewer and smaller liver tumours compared to untreated or single treated mice. The ligand combination decreased blood serum triglyceride level (p = 0.0042), and improved gene expression of markers involved in glucose and lipid metabolism.

**Conclusion:** These findings support that dual nuclear receptor targeting by increasing PPARalpha and diminishing ERRalpha activity may represent a viable novel strategy against NAFLD.
POSTER PRESENTATIONS

WED-413
PNPLA3, MBOAT7 and TM6SF2 modify mitochondrial dynamics in NAFLD patients: dissecting the role of cell-free circulating mtDNA and copy number
Miriam Longo1, Erika Paolini1, Marica Meroni1, Michela Ripolone1, Laura Napoli1, Giada Tri2, Marco Maggioni1, Maurizio Moggio1, Anna Ludovica Fracanzani1, Paola Dongiovanni1, Fondazione IRCCS Cà Grande Ospedale Maggiore Policlinico, Milan, Italy, Italy
Email: paola.dongiovanni@policlinico.mi.it

Background and aims: Mitochondrial (mt) dysfunction is a hallmark of progressive NAFLD. MtDNA copy number (mtDNA-CN) and cell-free circulating mtDNA (ccf-mtDNA), which reflect mt-mass and mt-dysfunction, respectively, are gaining attention for NAFLD non-invasive assessment. We demonstrated that PNPLA3, MBOAT7 and TM6SF2 deficiency in HepG2 cells increased mt-mass, mtDNA-CN and ccf-mtDNA. To assess the genetic contribution on mt-dynamics, mtDNA-CN and ccf-mtDNA in 1) primary mouse hepatocytes silenced for PNPLA3/MBOAT7/TM6SF2 genes; 2) Discovery (n = 28) and Validation (n = 773) cohorts, including biopsied NAFLD patients, stratified according to number of risk variants (NRV = 3).
Method: Mt-morphology was assessed by TEM. mtDNA-CN was measured in the entire Validation cohort (n = 773), while ccf-mtDNA in a subgroup (n = 300) with available serum samples. mtDNA-CN and mt-related genes were evaluated in liver biopsies.
Results: Primary mouse hepatocytes challenged with fat overload or PNPLA3/TM6SF2/MBOAT7 co-silencing lowered mt-fusion paralleled by higher mt-fission and ccf-mtDNA release, suggesting that lipid accumulation and genetics may independently unbalance mt-dynamics. In the Discovery cohort, NRV = 3 patients showed the highest mtDNA-CN compared to those with 1–2 or no variants. At TEM, NRV = 3 carriers increased mt-mass and presented an elevated pattern of mt-morphological alterations (swollen shapes, double membranes rupture). In the Validation cohort, mtDNA-CN associated with the NAFLD histological spectrum and NRV = 3 at multivariate analyses, supporting that both NAFLD severity and genetics may modulate mt-dynamics. In liver biopsies, mtDNA-CN was higher in NRV = 3 patients together with reduction of mt-fusion and activation of mt-fission, resembling what observed in hepatocytes. Ccf-mtDNA was augmented in NRV = 3 patients with low-moderate/severe NAFLD, thereby sustaining that this effect was amenable to the 3 at-risk polymorphisms. ROC curves showed that mtDNA-CN discriminated NAFLD subjects vs controls (AUC: 0.71), while ccf-mtDNA was highly predictive of NAFLD-HCC vs NAFLD (AUC: 0.79).
Conclusion: mtDNA-CN and ccf-mtDNA may have pathological and predictive significance in NAFLD patients at high-risk, especially in those genetically-predisposed.

WED-414
NAT10-mediated N4-acetylcytidine of hepatic lipogenesis-associated mRNA contributes to maternal high-fat diet-induced non-alcoholic fatty liver disease in juvenile offspring
Qianren Zhang1, Tianyi Ren1, Jiangao Fan1, Xinhu Hospital Affiliated to Shanghai Jiao Tong University School of Medicine, China
Email: fanjiangao@xinhuamed.com.cn

Background and aims: Growing evidence have shown that early life exposure to maternal high fat diet (HFD) during pregnancy and lactation increases the risk of non-alcoholic fatty liver disease (NAFLD) in juvenile offspring, which is regulated by epigenetic machinery. As a novel epi-transcriptomic modification, N4-acetylcytidine (ac4C) could enhance the expression of target gene by increasing mRNA stability and translation efficiency. The aim of this study was to explore the involvement of ac4C and its writer protein N-acetyltransferase 10 (NAT10) in maternal HFD-induced NAFLD.
Method: 6-week-old female C57BL/6J mice were fed either chow diet or HFD for 6 weeks before fertilization and kept on the same diet throughout gestation and lactation. At weaning, morphological and biochemical indicators of pups were analyzed. Hepatic NAT10 expression and ac4C abundance were also assessed. Hepatocyte-specific Nat10 knockout (Nat10fl/fl) mice were generated by inter-crossing Nat10fl/fl mice with Alb-Cre mice. Chow-fed male Nat10HKO mice were mated with chow-fed or HFD-fed (6-week feeding before fertilization, maintained respective diets during gestation and lactation) female Nat10fl/fl mice to generate Nat10fl/fl and Nat10HKO litters which could be subdivided into 4 groups: chow Nat10fl/fl, chow Nat10HKO, HFD Nat10fl/fl and HFD Nat10HKO. All pups were sacrificed at weaning to assess body weight, liver histopathology and lipid metabolism. Transcriptomic-wide mapping of ac4C modification was performed on mRNA samples isolated from primary hepatocytes of pups, with the aid of RNA-seq and acetylated RNA immunoprecipitation sequencing (acRIP-seq).
Results: C57BL/6J offspring of HFD dams weighed more at weaning, exhibited higher hepatic triglyceride levels, had more hepatic lipid accumulation, expressed significantly higher NAT10, and presented markedly improved ac4C abundance in hepatocyte mRNAs, when compared with pups of chow C57BL/6J dams. Similarly, pups of the HFD Nat10HKO group exhibited more lipid droplets and triglyceride contents in livers than offspring from the chow Nat10fl/fl group. However, genetic ablation of Nat10 in offspring hepatocytes markedly ameliorated hepatic steatosis induced by maternal HFD. Moreover, expression of lipogenesis-associated proteins, including SREBP-1c, phosphorylated ACC and FASN were also inhibited in HFD Nat10HKO pups when compared with HFD Nat10fl/fl pups. RNA-seq and acRIP-seq results showed that Nat10 deletion led to significantly reduced ac4C abundance in Srebp1c, Acc and Fasn, which was in line with suppressed transcriptional expressions and reduced half-lives of these mRNAs.

Figure:

Conclusion: NAT10-mediated ac4C modification on mRNAs of lipogenic genes played an important in maternal HFD induced offspring NAFLD, which serves as a potential therapeutic target.

WED-415
Type I NKT cells are involved in exacerbation of steatohepatitis in aged mice
Kazuyoshi Kon1, Kumiko Arai1, Akira Uchiyama1, Hiroo Fukada1, Toshifumi Sato1, Shunhei Yamashina1, Kenichi Ikejima1, Juntendo University School of Medicine, Department of Gastroenterology, Japan
Email: kazukon@juntendo.ac.jp

Background and aims: The pathogenesis of non-alcoholic steatohepatitis (NASH) is still unclear. Aging is an independent risk factor for
Background and aims: Non-alcoholic fatty liver disease (NAFLD) is one of the most common chronic liver diseases worldwide, composed of metabolic dysfunction, steatosis, inflammation, and fibrosis. Importantly, non-alcoholic fatty liver (NAFL) caused by the elevated hepatic lipid deposition acts as not only the consequence of obesity, but also the early stage of the NAFLD. It has been reported that morbidly obese patients represent more than 90% of patients with NAFLD. Till now, no effective resolutions have been approved to effectively prevent the disease progression. Current evidence suggests that the weight loss has been considered as a potential treatment for NAFLD by remising hepatic steatosis, inflammation and fibrosis. Weight loss approaches include lifestyle alterations (mainly diet management), metabolic medicine and bariatric surgery (BS). Recently, BS is considered as a novel disease-modifying therapy for NAFLD, according to clinical studies. Despite physiological alterations, underlying mechanisms of cellular crosstalk and microenvironment remain indeterminate.

Method: In this study, we gathered open bulk RNA-seq datasets from patient’s cohorts. Gene alterations of metabolism, inflammation and carcinogenesis were compared according to liver-derived transcriptomic data from post-surgery and diet managed patients. Furthermore, we established mouse BS models (including sleeve gastrectomy and by-pass surgery). As the ongoing work, we perform the single-cell transcriptomic analysis on liver tissues from mouse models [healthy, high-fat diet (HFD) + regression, HFD + sham surgery and HFD + BS mice]. Furthermore, we will identify metabolism reprograming and immune landscape according to cell clustering, cellular interactions and functional enrichment analysis. To reveal the metabolism-related immune modulation, the metabolism-immune association and key factor will be demonstrated.

Results: We demonstrated that the post-BS livers show more improvements of metabolism-, inflammation- and carcinogenesis-related markers, compared to the diet management. In addition, differences were disclosed in immune cell infiltration (especially macrophage populations) in post-BS patients’ livers. Accordingly, we speculate that the immune modulation in post-surgery livers might contribute to metabolic improvement, exerting superior effectiveness than the diet management. On this basis, we will be able to reveal the metabolism reprograming and immune modulation, aiming to characterize metabolism-inflammation interactions and key molecules in BS intervened NAFLs.

Conclusion: These findings demonstrated that the type I NKT cells become more dominant for the induction of inflammatory cytokines and development of fibrosis. It was concluded that the activation of type I NKT cells plays an key role in the exacerbation of steatohepatitis with aging.

WED-416
Single-cell transcriptomics depicts metabolism reprograming and immune landscape of bariatric surgery intervened non-alcoholic fatty liver
Shuai Chen1, Xiurong Cai2, Liming Tang1, Adrien Guillot3, Frank Tacke4, Hanyang Liu1,2, 4Nanjing medical university, Changzhou medical center, China. 4Charité Universitätsmedizin Berlin, Department of hematology, oncology and tumor immunology (CVK), Germany.
Email: hanyang.liu@charite.de

Figure:
Background and aims: Drug efficacy studies in animal models of non-alcoholic steatohepatitis (NASH) typically include histopathological end points. While the clinical-derived NAFLD Activity Scoring (NAS) and Fibrosis Staging system, outlined by Kleiner et al., is largely reproducible in preclinical models of NASH, manual histopathological scoring systems are prone to inter- and intra-observer variability which can influence robustness and reproducibility of study results. To enable objective and unbiased histopathological assessment in liver biopsies from mouse models of NASH, we developed Gubra Histopathological Objective Scoring Technique (GHOST), an automated deep learning-based digital imaging analysis pipeline for the NAS and fibrosis staging system.

Method: Liver biopsies were obtained from two rodent models of NASH, i.e. the GAN diet-induced obese (GAN DIO-NASH) mouse and choline-deficient L-amino acid defined high fat diet (CDAA-HFD) rat model, respectively. Age-matched chow-fed mice and rats served as normal controls. Automated GHOST deep learning computational analysis of NAS and fibrosis scores was performed on hematoxylin-eosin (HE) and picrosirius red (PSR) stained sections, respectively. Also, the GHOST module was extended to enable automated analysis of fibrosis severity in CDAA-HFD rats using the Ishak scoring system. All GHOST data were validated against manual scoring by an expert histopathologist. Quantitative morphometrics were derived from the scoring variables, expressed as density of hepatocytes with lipid droplets, number of inflammatory foci, as well as fractional area of fibrosis.

Results: GHOST accurately and reproducibly detected central veins and portal areas in liver biopsy sections from GAN DIO-NASH mouse and CDAA-HFD rat mice, enabling segmentation of zones relevant for clinical histopathological scoring. In HE stained sections, hepatocytes, inflammatory cells, and ballooned hepatocytes were identified. Inflammatory foci were considered as clusters of ≥4 inflammatory cells. NAS was computed and validated using a test set of 338 mouse liver biopsies with a Cohen’s Kappa value of 0.72 between the AI and manual scoring of NAS. PSR-stained collagen fibers were localized in the sinusoidal and periportal space by GHOST, reproducibly identifying collagen forming bridges and branch points. From these segmentations, Kleiner fibrosis stage was computed and validated using a test set of 537 mouse liver biopsies, achieving a Cohen’s Kappa value of 0.84 between AI and manual scores. For Ishak fibrosis scores, PSR stained sections were divided into smaller images that was classified using convolutional neural network (CNN) analysis. The output of the CNN model was used in a machine learning algorithm (random forest) to predict fibrosis stage and a Cohen’s Kappa value of 0.82 was achieved with a test-set of n = 86 liver biopsies from CDAA-HFD rats.

Conclusion: In conclusion, we confirm high concordance between GHOST-automated and expert histopathologist manual scores in industry-standard rodent models of NASH, including the GAN DIO-NASH mouse and CDAA-HFD rats. Using GHOST for automated assessment of NAS and fibrosis scores provides fast, accurate and reproducible histopathological scoring, thus being instrumental for the assessment of test drug effects in preclinical models of NASH.
The disturbance of intracellular chloride induces the development and progression of non-alcoholic fatty liver disease

Jiaxing Zhu, Hai Jin, Xingyue Yang, Li Zhang, Liming Zheng, Hui Wang, Shun Yao, Yanxia Hu, Guorong Wen, Jiaxing An, Xuemei Liu, Biguang Tuo. Affiliated Hospital of Zunyi Medical University, Gastroenterology, China

Email: tuobiguang@aliyun.com

**Background and aims:** Non-alcoholic fatty liver disease (NAFLD) has become the most common chronic liver disease worldwide. The advanced stage of NAFLD, non-alcoholic steatohepatitis (NASH), has been recognized as a leading cause of end-stage liver diseases. Although many clinical and experimental studies have been performed, the mechanisms of NAFLD remain to be elucidated. Chloride is a physiologically important anion. Changes in intracellular chloride concentration affect diverse cellular functions. Here we demonstrate that the disturbance of intracellular chloride induces the development and progression of NAFLD.

**Method:** Hepatocyte-specific transgene mice for chloride channels, ANO1, CLIC1, CLCN2, and SLC26A6, were generated by Cyagen Biosciences Inc. High-fat diet (HFD)-induced simple NAFLD and high-fat high-cholesterol (HFHC) diet-induced NASH models in mice were established. Intracellular chloride was measured with chloride assay kit. Intracellular lipid deposition was examined with oil red O staining assay and triglyceride level measurement.

**Results:** The hepatocyte-specific ANO1, CLIC1, CLCN2, and SLC26A6 overexpression mice all spontaneously developed liver steatosis at the age of 6 months and marked features of NASH, liver steatosis, ballooning, and inflammation accompanied by liver fibrosis at the age of 12 months, whereas the wild type control mice had no liver steatosis and NASH at the same age. These transgene mice also displayed higher fasting blood glucose, insulin, HOMA-IR (homeostasis model assessment of insulin resistance) levels, less glucose tolerant and insulin sensitive at the age of 6 and 12 months compared to control littermates. The results from intracellular chloride assay in the liver tissues revealed that the intracellular chloride content in ANO1, CLIC1, and SLC26A6 overexpression mice was higher than that in control mice, but intracellular chloride content in CLCN2 overexpression mice was lower than that in control mice. In primary hepatocytes, LO2 cells and HepG2 cell, low chloride (58 mM) and high chloride (158 mM) mediums, which induced the decrease and increase of intracellular chloride respectively, markedly enhanced palmitate-induced intracellular lipid deposition in comparison with normal chloride (118 mM) medium. Further studies showed that 4, 4′-diiodothiocyano-2, 2′-stibenedisulfonic acid disodium salt, a chloride channel blocker, markedly inhibited the incidence of HFD-induced simple NAFLD and HFHC diet-induced NASH and attenuated HFD-induced simple NAFLD and HFHC diet-induced NASH in mice.
Background and aims: The large percentage of the population affected by NAFLD/NASH is in need of new effective treatments developed from drugs previously shown to be effective in animal models that replicate human disease. In mice, repeated administration of the potent hepatotoxin carbon tetrachloride (CCL4), together with the “western diet” (WD) of high-fat, high-sugar, and high-cholesterol chow and high-sugar solution, reproduces many prominent features of human NAFLD/NASH, including high NAFLD Activity Scores and liver fibrosis. We previously reported that the pan-cyclophilin inhibitor drug CRV431 (reconfilstat) decreased NASH in both CCl4-only and CCl4+WD conditions in mice lacking Cyclophilin B, but not Cyclophilin A, are significantly reduced features of NASH in this model, relative both to WT C57/BL/6J control mice, and mice under CCL4-only and CCL4+WD conditions did not significantly differ from their respective WT controls in either liver fibrosis or NAS.

Conclusion: Cyclophilin inhibition is a promising and novel avenue of treatment for diet-induced NAFLD/NASH. In this study, mice without CypB, but not mice without CypA, were significantly protected from the development of the characteristic features of NASH. Further investigation is necessary to determine whether the specific role of CypB in the ER secretory pathway is of significance to its effect on NASH development.

WED-420
Mice lacking Cyclophilin B, but not Cyclophilin A, are significantly protected from the development of major features of NAFLD/NASH in a diet and chemical-induced model
Winston Stauffer1, Daren Ure2, Robert Foster2, Philippe Gallay1.
1Scripps Research, United States, 2Hepion Pharmaceuticals, Canada
Email: wstauffer@scripps.edu

Background and aims: The large percentage of the population affected by NAFLD/NASH is in need of new effective treatments developed from drugs previously shown to be effective in animal models that replicate human disease. In mice, repeated administration of the potent hepatotoxin carbon tetrachloride (CCL4), together with the “western diet” (WD) of high-fat, high-sugar, and high-cholesterol chow and high-sugar solution, reproduces many prominent features of human NAFLD/NASH, including high NAFLD Activity Scores and liver fibrosis. We previously reported that the pan-cyclophilin inhibitor drug CRV431 (reconfilstat) decreased NASH in mice under the western-diet/CCL4 model. Reconfilstat inhibits several cyclophilin isoforms, among which cyclophilin A (CypA) and B (CypB) are most abundant. Here, we report evidence that Ppib/-/- mice lacking CypB, an endoplasmic reticulum (ER) chaperone, develop significantly reduced features of NASH in this model, relative both to wild-type (WT) mice, and to knockout mice lacking CypA.

Method: 10-week-old male Ppib/-/- mice, together with Ppia/-/- and WT C57/BL/6j control mice, were administered 0.2 uL/g CCL4 intraperitoneally twice weekly. While some groups continued on normal chow and water, other groups received ad libitum WD chow containing 21.1% fat, 41% sucrose, and 1.25% cholesterol by weight, together with high-sugar solution (23.1 g/L fructose and 18.9 g/L glucose) instead of water. After 20 weeks, mice (n = 10 per group) were sacrificed at 30 weeks old. Body and liver weight were recorded and livers were fixed for histological analysis. Sections of livers stained with HandE were assigned NAFLD Activity Scores (NAS) based on inflammation, steatosis, and hepatocyte ballooning. Liver sections were also stained with Sirius Red for examination of collagen fibrosis. Unpaired Student’s t-tests were conducted with GraphPad Prism.

Results: Naive Ppib/-/- mice were smaller than WT but neither exhibited liver fibrosis or steatosis. In both CCL4-only and CCL4+WD conditions, Ppib/-/- mice exhibited liver fibrosis that was reduced by more than 40% and 72%, respectively, compared to WT counterparts, (p < 0.001). Additionally, in the CCL4+WD condition, WT livers exhibited a NAS over 7, indicative of NASH, while Ppib/-/- livers were not significantly changed (p > 0.05) from naive conditions. Ppia/-/- mice under CCL4-only and CCL4+WD conditions did not significantly differ from their respective WT controls in either liver fibrosis or NAS.

Conclusion: Cyclophilin inhibition is a promising and novel avenue of treatment for diet-induced NAFLD/NASH. In this study, mice without CypB, but not mice without CypA, were significantly protected from the development of the characteristic features of NASH. Further investigation is necessary to determine whether the specific role of CypB in the ER secretory pathway is of significance to its effect on NASH development.
some cholangiocytes and in a small subset of non-parenchymal cells, with high expression in fibrotic areas.

Hepatic GDF15 was increased in NAFLD patients (p = 0.007) compared to controls, but there was no association with liver fibrosis (p = 0.93). Among NAFLD patients, GDF15 expression was highest in patients with non-alcoholic steatohepatitis (NASH, p = 0.01). GDF15 levels in plasma and liver were found to be correlated to the p62 area fraction (β = 0.12, p = 0.006; β = 0.49, p < 0.0001, respectively).

Conclusion: Plasma GDF15 was highest in patients with advanced fibrosis, while the hepatic expression of GDF15 mRNA was highest in patients with NASH. Both plasma and hepatic GDF15 are associated with the degree of oxidative stress in the liver. Further research is necessary to understand the molecular connection between GDF15 expression and oxidative stress in the NASH liver.

WED-422
Decoding hepatocyte transcriptional responses in murine non-alcoholic steatohepatitis using single-nucleus RNA-sequencing
Juliet Luft1, Mulugeta Seneshaw2, Faridoddin Mirshahi2, Eleni Papachristoforou1, Huiping Zhou3,4, Arun Sanyal2, Prakash Ramachandran1. 1University of Edinburgh, Centre for Inflammation Research, United Kingdom, 2Virginia Commonwealth University, Department of Internal Medicine, United States, 3Virginia Commonwealth University, Department of Microbiology and Immunology, United States, 4Central Virginia VA Health Care System, United States
Email: juliet.ed.ac.uk

Background and aims: Single cell transcriptomics has transformed our understanding of liver non-parenchymal cell (NPC) heterogeneity in non-alcoholic steatohepatitis (NASH). Despite hepatocytes being the primary target of NASH-related injury, it remains unknown how NASH impacts the hepatocyte transcriptome at single-cell resolution, how these effects differ across the zones of the liver lobule and how hepatocyte injury regulates NPC activation to drive the fibroinflammatory cascade. Consequently, we utilised single-nucleus RNA-seq (snRNAseq) to interrogate changes in hepatocyte transcription in the diet-induced animal model of non-alcoholic fatty liver disease (DIAMOND) model of murine NASH.

Method: NASH was induced in B6/129 mice by treatment Western diet for 40 weeks (DIAMOND model). Age matched mice fed with standard chow were used as controls. SnRNAseq was performed on liver nuclei of NASH (n = 2) or healthy controls (n = 2) using the 10X Genomics Chromium platform. A total of 17,511 single nuclei passed quality control. Computational analysis was performed in R.

Results: DIAMOND mice developed NASH with advanced bridging fibrosis. Unsupervised clustering and annotation enabled atlassing of all major liver cell lineages (Figure A), identifying subpopulations of NASH-associated Trem2+CD9+ macrophages and Pdgfra+Col1a1+ myofibroblasts, key NPC populations which regulate liver inflammation and fibrosis. Focusing on hepatocytes, NASH resulted in global transcriptional changes with significant increases in genes associated with cytokine signaling and apoptosis. Trajectory inference was performed using Slingshot to reconstruct the spatially defined periportal-pericentral axis of hepatocyte zonation, defining zone-specific NASH responses. Ligand-receptor analysis using CellChat, showed that NASH resulted in an increase in both the number and strength of predicted cell-cell interactions between hepatocytes and NPCs (Figure B). Specifically, hepatocytes from NASH livers signaled to mesenchymal, endothelial and immune cells via families of ligands including Angiopoietin-Like Proteins, Platelet derived Growth Factors, Complement and Ephrins. Ligand expression also varied zonally across the liver lobule, with Neuregulins and Junctional Adhesion Molecules upregulated in the periportal hepatocytes of NASH livers, and Fibroblast Growth Factors in the pericentral.

Conclusion: Using snRNAseq in a tractable pre-clinical model, we have defined the transcriptional responses of hepatocytes in NASH, identifying zone-specific injury responses and modelling cross-talk between injured hepatocytes and NPCs which drive liver inflammation and fibrosis. This work provides a molecular framework for future interventional studies aimed at targeting hepatocyte-NPC interactions as a therapeutic strategy for NASH.

WED-423
Hepatic inactivation of the epigenetic regulators Suv420h1-h2 mitigates NAFLD development and progression in mice
Alessia Pagani1, Valeria Furiosi1, Mariateresa Pettinato1, Letizia Ravuso Volpe1, Sandro Altamura2, Antonella Nal1,3 Davide Gabellini4, Simona Pedrotti4, Laura Silvestri1,3,1IRCCS Ospedale San Raffaele, Regulation of Iron Metabolism Unit- Division of Genetics and Cell Biology, Milan, Italy, 2University of Heidelberg and Molecular Medicine Partnership Unit (MMPU), Department of Pediatric Hematology, Oncology and Immunology, Heidelberg, Germany, 3Università Vita-Salute San Raffaele, Milan, Italy, 4IRCCS Ospedale San Raffaele, Gene Expression and Muscular Distrophy Unit, Division of Genetics and Cell Biology, Milan, Italy
Email: pagani.alessia@hsr.it

Background and aims: The molecular mechanisms involved in the development and progression of NAFLD to NASH are still under investigation, and their identification represent an unmet clinical

Figure: (abstract: WED–422).
need. Several factors contribute to NAFLD development, including deregulated iron metabolism. Notably, a genomic region encompassing the histone methyltransferase Suvsr20h has been associated to iron-dependent liver steatosis in mice. Thus we hypothesize that liver Suvsr20h, by modulating the crosstalk between lipid- and iron metabolism, may play a role in NAFLD-NASH.

**Method:** we generated mice lacking both Suvsr20h1 in the liver and Suvsr20h2 in whole body (dKO). Eight week-old male mice were fed a NAFLD-NASH-inducing diet (FPC diet) or a normal diet for 16 weeks. Body weight was monitored weekly. At termination, histological, biochemical and gene expression analysis was performed for phenotypic characterization.

**Results:** dKO mice showed no developmental defects and perinatal lethality, and their body weight was comparable to control mice. FPC diet induced mild obesity and hepatomegaly in control mice, whereas dKO animals were protected. Inactivation of Suvsr20h1 in hepatocytes counteracted hepatocyte ballooning, reduced lipid droplet formation, monocyte recruitment and inflammation, and collagen deposition. Hypertrophy of subcutaneous and visceral adipose tissues was mitigated by Suvsr20h deletion, and decreased lipid droplet numbers and size were observed in brown adipose tissues. RNAseq was performed on total liver: dKO mice showed enrichment of PPARa-dependent genes and reduced SMAD3-dependent genes, suggesting a protective gene signature. Since deregulated iron metabolism contributes to NAFLD-NASH, we analyzed iron-related genes in control and dKO mice. In normal diet, expression of Tfr1, ferroportin, Bmp6, BMP-SMAD target genes and the iron-regulatory hormone hepcidin were comparable between genotypes. However, in FPC-treated control mice hepcidin was downregulated in a BMP-SMAD independent way, and Tfr1 upregulated, suggesting liver iron deficiency. On the contrary, in FPC-treated dKO mice hepcidin and Tfr1 expression remained unchanged.

**Conclusion:** Suvsr20h1/2 deletion in hepatocyte counteracts NAFLD-NASH in mice. Hepcidin expression, decreased by FPC in control mice, remains unchanged in dKO animals, suggesting a protective effect in counteracting body iron accumulation. Further studies are needed to dissect the signaling pathway modulated by Suvsr20h1/2 in hepatocytes. However, these methyltransferases can be considered a promising therapeutic target for NAFLD treatment and NASH prevention.

**Figure:** (abstract: WED-424).
basal and maximal respiration, although a part of this respiration was dissipated by proton leak and not finalized to the ATP production. Moreover, we found that NASH monocytes presented a higher respiratory chain (RC) complex I enzymatic activity and higher mRNA expression of several RC subunits and mitochondrial biogenesis markers such as TFAM and PGC-1α. Taken together these results underline that monocytes in NASH exhibit an aberrant bioenergetic profile characterized by high glycolysis and high MR levels with mitochondrial dysfunction. Therefore, in order to analyse the potential effects of targeting immunometabolism, HFFC-fed mice were treated with DMM. In fact, DMM is a malonate derivative and a known immunometabolic modulator in macrophages. Interestingly, DMM treated mice improved in terms of liver injury, steatosis and inflammation as indicated by serum ALT levels, hepatic fat, number of inflammatory foci and expression of inflammatory cytokines (e.g., IFN-γ and IL-1β).

Conclusion: Immunometabolism candidates as a novel therapeutic target in NASH.

**WED-425**

**Co-stimulatory signals mediated by inducible T-cell co-stimulator (ICOS) influence the hepatic expansion auto-aggressive CD8+T-cells in non-alcoholic steatohepatitis (NASH)**

Cristina Vecchio1, Alessia Provera1, Laila Ijavena Gadipudi1, Ramavath Naresh Naik1,2, Renzo Boldorini1, Nausicaa Clemente1, Luca C. Gigliotti1, Elena Boggio1, Umberto Dianzani1, Emanuele Albano1, Salvatore Sutt1, 1University of East Piedmont, Dept. of Health Sciences, Italy, 2Washington University in St. Louis, Dept. of pediatrics, endocrinology and diabetes, United States

Email: cristina.vecchio@uniupo.it

**Background and aims:** Recent evidence indicated that cytotoxic CD8+ T-lymphocytes play important role in the progression of non-alcoholic steatohepatitis (NASH) toward fibrosis. The Inducible T-cell co-stimulator (ICOS) present on T lymphocytes and its ligand ICOSL (B7h) expressed on myeloid cells are members of the B7/CD28 family and play multiple roles in immunity by regulating T-cell activation/survival. From the observation that ICOS-expressing CD8+ T-cells are crucial for ICOS receiving the MCD diet for 6 weeks had milder steatohepatitis. This effect was confirmed in mice fed with the WD diet for 24 weeks that also showed reduced hepatic fibrosis. The characterization of ICOS+/CD8+ T-cells in WD-fed mice showed that they featured C-X-C motif chemokine receptor 6 (CXCRL6) and programmed cell death protein-1 (PD-1) previously associated with the capacity of killing hepatocytes. Conversely, ICOS-/- MoMFs expressed CD9 and the triggering receptor expressed on myeloid cells-2 (TREM-2) that characterize NASH-associated macrophages (NAMs). ICOS deficiency strongly reduced CD8+ T-cell expansion and prevented PD-1 upregulation. Such effect also associated with a lowering in the expression of CD122, the β-chain component of both IL-2 and IL-15 receptors responsible for CD8+ T-cell proliferation and survival.

**Conclusion:** Altogether these data indicate that ICOS signals are critical for the expansion auto-aggressive CD8+ T cells in NASH and suggest a possible interaction between these lymphocytes and NAMs, thus indicating ICOS/ICOSL dyad as a possible target for therapeutic interventions.

**WED-426**

**Uncovering the role of ISOC1 in non-alcoholic fatty liver disease**

Fabrice Marger1, Etienne Delangre1, Tiffany Schae1, Francesco Negro1,2, Sophie Clément-Leboube3, Michelangelo Foti1, Nicolas Goossens1,2, 1University of Geneva, Geneva, Switzerland, 2Hôpitaux Universitaires de Genève (HUG), Genève, Switzerland

Email: nicolas.goossens@hcuge.ch

**Background and aims:** Non-alcoholic fatty liver disease (NAFLD) is a complex disease with heterogeneous hepatic molecular pathways and gene expression alterations. Innovative strategies to identify novel molecular targets of NAFLD are urgently needed to help drive therapeutic discovery. Using a large scale computational approach we identified Isochorismatase Domain Containing 1 (ISOC1) gene deregulation as a novel molecular target in NAFLD and we aimed to validate its role in vitro and in an animal model of NAFLD.

**Method:** We generated a consensus human NAFLD liver gene expression signature (NAFLD-sig) using whole-genome meta-analysis of multiple available datasets. Comparison of NAFLD-sig with over one million perturbagen gene signatures in the CMap database resulted in the identification of ISOC1 downregulation as the most closely associated signature with human NAFLD in both early and late stages. Knockdown (KD) of ISOC1 was performed through siRNA-mediated KD and CRISPR/Cas9-mediated knockout in human hepatocyte (Huh7) and hepatic stellate (LX2) cell lines. The effects of ISOC1 KD were also evaluated in a mouse model using hepatotropic AAV8 encoding for shRNA directed against ISOC1 in C57BL/6 mice following a 19-day Methionine/Choline Deficient (MCD) diet.

**Results:** To identify the NAFLD-sig we identified 14 publicly available datasets comparing 300 subjects at different stages of NAFLD. We combined these datasets using gene expression meta-analysis and found that the ISOC1 downregulation gene expression signature most closely approximated the NAFLD-sig at all stages of NAFLD. We next proceeded to validate the association between ISOC1 deregulation and NAFLD in vitro. CRISPR/Cas9-mediated knockout of ISOC1 in Huh7 cells was associated with a significant increase in lipid droplet size, number and total area. Expression of key genes involved in lipid metabolism and transport were deregulated (CPT1A, ACAT2, MTP, all p < 0.05). In hepatic stellate cells, ISOC1 knockdown and KD was associated with increased expression of fibrogenic genes (COL1A1, MMP2, TGFB1), all p < 0.05) expression. Microarray analysis of ISOC1 KD in LX2 cells showed induction of pathways associated with hepatic stellate cell activation and collagen deposition. In the murine model of NAFLD, a 19-day MCD diet was associated with a reduction of the hepatic gene expression of ISOC1 and development of steatosis but no fibrosis due to the relatively short duration. Preliminary analysis showed that ISOC1 KD was associated with increased serum ALT levels and increased hepatic lobular inflammation.

**Figure:** ISOC1 KD in MCD mice is associated with increased inflammatory infiltrates characterized by increased infiltration of IBA1 positive macrophages.
Conclusion: Our study provides novel insights into the role of the ISOC1 gene in the development of NAFLD. Using a large-scale computational approach, we identified ISOC1 downregulation as the most closely associated gene expression signature with human NAFLD in both early and late stages. Our in vitro and animal model results validate ISOC1 as a novel molecular target in NAFLD however, further studies are necessary to fully understand the mechanisms and potential consequences of ISOC1 modulation in NAFLD.

WED-428
In vitro investigation of the role of adipocyte-derived exosomes in the development of non-alcoholic steatohepatitis
Robim M Rodrigues1, Berta Vazquez Oliver2, Alexandra Gatzios2, Matthias Rombaut2, Vera Rogiers2, Joost Boeckmans2, Joery De Kock2, Tamara Vanhaecke2, 1Faculty of Medicine and Pharmacy-Free University of Brussels (VUB), In vitro Toxicology and Dermato-cosmetology, Brussels, Belgium, 2Faculty of Medicine and Pharmacy-Free University of Brussels (VUB), In vitro Toxicology and Dermato-cosmetology, Belgium
Email: robim.marcelino.rodrigues@vub.be

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is associated with visceral obesity. Adipocyte atrophy and accompanying inflammation of the adipose tissue (AT) lead to the secretion of a plethora of factors that once taken up by the liver, exacerbate the development of non-alcoholic steatohepatitis (NASH). Yet, the exact mechanisms behind the interplay between AT and the liver is not fully understood. In this study, we investigate the potential steatogenic and inflammatory effects that adipocyte-derived exosomes might have on the liver using multipotent stem cell-based in vitro models.

Method: Human adipose-derived stromal cells (hATSc) were isolated from liposuction material after ethical approval and informed consent of the patients. Upon expansion, the cells were differentiated towards adipocyte-like cells (hATSc-adipo). To mimic the micro-environment of AT in NASH patients, these cells were then exposed for 24 h to a cocktail of multiple NASH-specific factors. The latter were identified from transcriptomics datasets of AT samples of patients with histologically proven NASH and also mimic hyperglycemic and hyperterglyceridemic blood levels of obese patients. Upon a recovery wash-out period of 24 h, exosomes were isolated from the cell supernatants of hATSc-adipo cells. The steatogenic and inflammatory effects of the isolated exosomes were evaluated using human skin-derived precursors (hSKP) differentiated towards hepatic cells (hSKP-HPC).

Results: Compared to control conditions, the expression of proinflammatory leptin (LEP, 1.5 fold) was upregulated in hATSc-adipo cells exposed to the NASH cocktail, whereas the expression of anti-inflammatory adiponectin was downregulated (ADIPQ, −4.0 fold). Furthermore, an upregulation of interleukin beta (IL1B, 1.5 fold), tumour necrosis factor alpha (TNFA, 1.5 fold), interleukin 6 (IL6, 62 fold) and the chemokines C-X-C motif chemokine 5 (CXCL5, 1510 fold) and C-C motif chemokine ligand 2 (CCL2, 243 fold) was observed in the triggered hATSc-adipo cells. These results suggest that hATSc-adipo cells exposed to a NASH-specific cocktail respond in a similar way as inflamed adipose tissue. Of note, the expression of the exosomal marker human exosome component 9 (EXOS9) remained constant. The exosomes isolated from the cell supernatants of the hATSc-adipo cells exposed to the cocktail or vehicle control conditions had a diameter of 101 nm (91% mode) and 117 nm (82% mode), respectively. Exposure of hSKP-HPC to these exosomes triggered hATSc-adipo cells, induced stearoyl-CoA desaturase-1 (SCD1, 1.6 fold) and fatty acid synthase (FASN, 1.2 fold), which both play a role in de novo lipogenesis. Contrarily, perilipin 2 (PLIN2), which promotes the formation of lipid droplets and CD36 that play a role in fatty acids uptake, were 1.5 and 6.3 fold downregulated, respectively. Strikingly, the expression of proinflammatory cytokines IL6, IL1α, CCL2 and CXCL5 was highly upregulated (2.9, 3.7, 3.3 and 46.3 fold, respectively).

Conclusion: Our data show that adipocyte-like cells derived from human hATSc can mimic cellular responses specific to inflamed AT during NASH. The exosomes secreted by these cells induce the expression of steatogenic and inflammatory markers in an established hepatic in vitro system. This study shows the value of human-based in vitro cell systems in the investigation of complex pathophysiological processes, such as the interplay between AT and the liver during NASH.

Figure: APB-R3 treatment exhibits significant reduction of hepatic injury and fibrosis in mice NASH models, and our results emphasized the marked value of APB-R3 as a novel therapeutic arsenal in treating NASH especially when combined with anti-steatotic agents.
**WED-429**

A novel HIF2A mutation causes dyslipidemia and promotes hepatic lipid accumulation

Feiqiong Gao1, Qigu Yao 1, Jiaqi Zhu1, Wenyi Chen1, Xudong Feng1, Bing Feng1, Jiong Yu1, Hongcui Gao1. 1The First Affiliated Hospital, Zhejiang University School of Medicine, China

Email: hccao@zju.edu.cn

**Background and aims:** Hypoxia-inducible factor −2α (HIF-2α) is a transcription factor responsible for regulating genes related to angiogenesis and metabolism. Mutations in the oxygen-dependent domain (O DD) of HIF-2α have been reported in association with erythrocytosis and tumors. This study aims to explore the effect of a previously unreported mutation c.C2473T (p.R825S) in the C-terminal transactivation domain (CTAD) of HIF-2α that we detected in tissue of patients with liver disease.

**Method:** We sequenced liver samples obtained during partial liver resection or liver transplantation performed for clinical indications such as hepatocellular carcinoma and liver failure. In tandem, we constructed cell lines and a transgenic mouse model bearing the corresponding identified mutation in HIF-2α from which we extracted primary hepatocytes. We evaluated lipid accumulation in these cells and liver tissue from the mouse model using Oil Red O staining; serum, intrahepatic, and intracellular lipid levels from the same model were measured by biochemical detection kit. Lipidomics was used to assess the lipid metabolism of mouse liver.

**Results:** Herein, we found a mutation in the CTAD of HIF-2α (c.C2473T; p.R825S) in 5 of 356 liver samples obtained from patients with hepatopathy and dyslipidemia. We also found that introduction of this mutation into the transgenic mouse model led to an increase in triglyceride levels, lipid droplet accumulation in the liver of the mutant mice and in their extracted primary hepatocytes, and increased transcription of genes related to hepatic fatty acid transport and synthesis in the mutant compared to the control groups. In mutant mice and cells, the protein levels of nuclear HIF-2α and its target gene perilipin-2 (PLIN2) were also elevated. Decreased autophagy was observed in mutant groups.

**Conclusion:** We identify a mutation in HIF-2α and find that patients with it are more likely to have dyslipidemia. The HIF-2α<sub>R825S</sub> mutation elevates blood fatty levels and leads to non-alcoholic fatty liver disease (NAFLD). Identification of the subset of patients with HIF-2α<sub>R825S</sub> mutation may help to cure patients with surgery and developed targeted personalized therapeutics.

---

**WED-430**

Adipose tissue macrophage dysfunction and depletion are associated with a breach of vascular integrity in non-alcoholic steatohepatitis

Markus Boesch1, Andreas Lindhorst2, Rita Furtado Feio de Azevedo1, Paola Brescia3, Alessandra Silvestri3, Matthias Lannoo4, Ellen Deleus4, Joris Jaekers3, Halit Topal4, Baki Topal4, Marie Wallays1, Lena Smets1, Lukas Van Melkebeke1,4, Tania Roskams5, Pierre Bedossa4, Jef Verbeek1,4, Sven Francque7,8, Alejandro Sifrim1, Thierry Voel1, Maria Rescigno3,9, Martin Gericke2, Hannele Korf1, Schalk van der Merwe1,4, 1KU Leuven, Belgium, 2Leipzig University, Germany, 3IRCCS Humanitas Research Hospital, Italy, 4UZ Leuven, Belgium, 5KU Leuven and University Hospitals Leuven, Belgium, 6Liverpat, France, 7Antwerp University Hospital, Belgium, 8University of Antwerp, Belgium, 9Humanitas University, Italy

Email: markus.boesch@kuleuven.be

**Background and aims:** Non-alcoholic fatty liver disease (NAFLD) is reaching epidemic proportions, fueled by the obesity pandemic. In NAFLD, monocytes infiltrate visceral adipose tissue that promote local and hepatic inflammation. It however remains unclear what drives inflammation and how the immune landscape in adipose tissue differs across the NAFLD severity spectrum. We aimed to assimilate the adipose tissue macrophage (ATM) heterogeneity in a NAFLD cohort.
**Method:** Visceral adipose tissue macrophages from obese patients stratified into NAFLD phenotypes underwent single-cell RNA sequencing. Adipose tissue vascular integrity and breaching was assessed via immunohistological staining on paraffin embedded human adipose tissue sections of plasmalemma vesicle-associated protein 1 (PV1) and albumin, respectively.

**Results:** We discovered multiple ATM populations, including resident vasculature-associated macrophages (ResVAMs) and distinct metabolically active macrophages (MMacs). Using trajectory analysis, we show that ResVAMs and MMacs replenish from a common transitional macrophage subtype (TransMac) and localize around the vasculature, where they interact with endothelial cells. Across the NAFLD severity spectrum, the adipose tissue MMac subset is progressively depleted and not effectively replenished by TransMac precursors. This coincided with an adipose tissue vasculature breach characterized by albumin extravasation into the perivascular tissue.

**Conclusion:** NAFLD-related macrophage depletion and dysfunction coincides with a loss of adipose tissue vascular integrity providing a strong plausible mechanism by which tissue inflammation is perpetuated in adipose tissue and downstream in the liver.

---

**WED-431**

**Circadian sleep-wake rhythms in non-alcoholic fatty liver disease**

Sofia Roth¹,², Andrijana Bogdanovic¹, Talitha Hildebrandt¹, Anne Geng¹, Emilio Flint³, Michael Strumberger⁴, Martin Meyer⁵, Markus Heim¹⁺, Christian Cajochen⁶, Christine Bernsmießer⁶⁺.

¹Department of Biomedicine, University of Basel, Switzerland, ²University Centre for Gastrointestinal and Liver Diseases, Basel, Switzerland, ³Department of Biomedicine, University of Basel, Switzerland, Basel, Switzerland, ⁴Centre for Chronobiology, Psychiatric Hospital of the University of Basel, Basel, Switzerland, ⁵Centre for Chronobiology, Psychiatric Hospital of the University of Basel, Switzerland, ⁶University Centre for Gastrointestinal and Liver Diseases, Switzerland

Email: sofia.roth@unibas.ch

**Background and aims:** Non-alcoholic fatty liver disease (NAFLD) has a multifactorial pathogenesis including dietary, environmental and genetic factors. Previous mouse models and data from sleep questionnaires suggested circadian misalignment might influence liver homeostasis and development of NAFLD. In this study, we aimed to objectively assess the sleep-wake rhythm in patients with NAFLD and healthy controls (HC) using actigraphy.

---

**Figure A:** (abstract: WED-431).

**Figure B:** (abstract: WED-431).

---

**C**

- WASO (minutes)
  - Healthy: 15
  - NAFLD Cirrhosis: 20

**D**

- Awakenings
  - Healthy: 50
  - NAFLD Cirrhosis: 60

**E**

- Sleep efficiency
  - Healthy: 70%
  - NAFLD Cirrhosis: 60%

---

**Figure C:** (abstract: WED-431).

**Figure D:** (abstract: WED-431).

**Figure E:** (abstract: WED-431).
**Method:** We included 62 subjects: patients with NAFLD (non-alcoholic fatty liver (NAFL, n = 11), non-alcoholic steatohepatitis (NASH, n = 16), NASH with cirrhosis (n = 8)), patients with cirrhosis of other origin (n = 11) and HC (n = 16). Sleep-wake rhythm was assessed by actigraphy (ActTrust, Condor) 24/7 for 4 weeks. Additionally, metabolic, laboratory data and subjective sleep parameters were assessed at baseline and week 4. After 2 weeks a single standardised sleep hygiene counselling was performed.

**Results:** Actigraphy analysis revealed NAFLD patients had more fragmented sleep with more nocturnal awakenings per night (NAFLD vs. HC 8.5 vs. 5.5, p = 0.003) and longer wakefulness after sleep onset (WASO: NAFLD vs. HC, 45.4 min vs. 21.3 min, p = 0.0004) compared with HC, while sleep duration was comparable. Sleep efficiency was lower in NAFLD and cirrhosis patients compared with HC (NALFD vs. HC 86.5% vs. 92.8%, p = 0.0008: cirrhosis vs. HC 88.7% vs. 92.8%, p = 0.03). A single session of sleep hygiene counselling did not change sleep and laboratory parameter, nor subjective sleep quality (p > 0.05).

**Conclusion:** Using an objective method, NAFLD patients had more fragmented nocturnal sleep with increased awakenings and reduced sleep efficiency compared with HC. A single session of sleep hygiene education was not successful in improving objective or subjective sleep parameters.

**WED-432**

A novel ALK5 inhibitor (TLR-X) attenuates steatosis and fibrosis in non-alcoholic steatohepatitis in vivo

Marit ten Hove1, Ruchi Bansal1. 1University of Twente, Enschede, Netherlands

Email: m.m.tenhove@utwente.nl

**Background and aims:** Non-alcoholic steatohepatitis (NASH) represents a major health burden worldwide with no FDA-approved therapies available. Transforming growth factor-beta 1 (TGF-β) is significantly upregulated in human NASH. Through Smad signaling, TGF-β promotes NASH by inducing lipid accumulation in hepatocytes and contributing to hepatocyte death, and activating hepatic stellate cells (HSCs). TGF-β receptor I (ALK5) is an attractive target for intervention in canonical TGF-β1 signaling due to its druggability, centrality, and specificity in the pathway. Silencing this pathway is expected to attenuate hepatic steatosis and fibrosis. In this study, we investigated the novel, highly selective, and orally administrable ALK5 inhibitor (TLR-X) for the treatment of NASH.

**Method:** Based on promising in vitro results, we investigated the effects of orally administered TLR-X in a NASH mouse model. C57BL/6j mice (8-weeks old) were fed western-diet (WD) containing 21.1% fat, 41% sucrose and 1.25% cholesterol by weight supplemented with high sugar solution (23.1 g/L d-fructose and 18.9 g/L d-glucose), combined with increasing low weekly doses (0.05–0.2 ml/kg) of carbon tetrachloride (CCl4) for 12 weeks. In the last three weeks, TLR-X (30 mg/kg) was orally administered twice daily. Blood, liver and different organs were collected for subsequent analysis.

**Results:** We observed a significant decrease in plasma cholesterol levels in TLR-X-treated WD/CCl4 mice (n = 7) compared to vehicle-treated mice (n = 7). Oil-red-O staining showed a significant decrease in intrahepatic fat accumulation in TLR-X-treated mice. Additionally, the expression of genes involved in de novo synthesis of fatty acids (FASN, SCD1 and ACACA) was significantly decreased in the TLR-X-treated group compared to the vehicle-treated group. We further assessed the effect of TLR-X on fibrosis and observed that total hydroxyproline content, collagen-I immunostaining and profibrotic gene expression (TGFB1, PDGFRB and ACTA2) were significantly decreased in the TLR-X treated group compared to the vehicle group. Overall, these results indicate the attenuation of hepatic steatosis and fibrosis by TLR-X.

**Conclusion:** Our results demonstrate that inhibition of the canonical TGF-β signaling using TLR-X represents a potential therapeutic approach for the treatment of NASH, by attenuating steatosis and fibrosis, with possible clinical implications.

Figure: (abstract: WED-432).
Gamma-muricholic acid inhibits steatosis-dependent peroxidative impairment to attenuates non-alcoholic steatohepatitis by activation of FXR/SHP/LXRα/FASN signaling
Yang Xie, Rui-Xu Yang, Feng Shen, Jiangao Fan, Qin Pan
Xinhua Hospital Affiliated To Shanghai Jiaotong University School of Medicine, Department of Gastroenterology, Shanghai, China
Xinhua Hospital Affiliated To Shanghai Jiaotong University School of Medicine, Endoscopy center, Shanghai, Shanghai University of Medicine and Health Sciences Affiliated Zhoupu Hospital, Research center, Shanghai, China
Email: pan_qin@yeah.net

Background and aims: Non-alcoholic steatohepatitis (NASH) reflects the key step from non-alcoholic fatty liver to hepatic fibrosis/cirrhosis and hepatocellular carcinoma depending on steatosis-induced oxidative stress. γ-muricholic acid (γ-MCA) with effect of lipogenic inactivation by farnesoid X receptor (FXR) agonizing plays potential role against liver steatosis and then peroxidative impairments.

Method: Except for the normal controls, experimental NASH was established in mice by 16-week high-fat high-cholesterol (HFHC) diet, with (NASH+10 mg/kg γ-MCA, NASH+100 mg/kg γ-MCA groups) or without simultaneous γ-MCA exposure (NASH, NASH+vehicle groups). Both oil red O staining and triglyceride (TG) analysis revealed the impact of γ-MCA on hepatic steatosis. Liver concentrations of malondialdehyde (MDA) and 4-hydroxynonenal (4-HNE) exhibited steatosis-dependent lipid peroxidation. Peroxidative injury and related hepatocyte apoptosis were further investigated by transferase and terminal deoxynucleotidyl transferase nick end labeling (TUNEL) assay, respectively. NAFLD activity score (NAS) finally exhibited the outcome of γ-MCA treatment. Mechanically, effect of γ-MCA on FXR and downstream signalling of small heterodimer partner (SHP)/liver X receptor α (LXRα)/fatty acid synthase (FASN) was investigated in vivo and in vitro.

Results: γ-MCA agonized FXR to upregulate the SHP expression of hepatocytes. An increase in SHP attenuated the TG-dominated hepatic steatosis induced in vivo by HFHC diet, and in vitro by free fatty acids, on the basis of LXRα and FASN inhibition. In contrast, FXR knockdown abrogated the γ-MCA-dependent lipogenic inactivation. When compared to their excessive production in HFHC diet-induced rodent NASH, products of lipid peroxidation (MDA, 4-HNE) exhibited significant reduction upon γ-MCA treatment. Moreover, the decreased levels of serum ALT and AST demonstrated an improvement in peroxidative injury of hepatocytes. By TUNEL assay, injurious amelioration protected the γ-MCA-treated mice against hepatic apoptosis. The abolishment of apoptosis resultantly prevented lobular inflammation, which downregulated the incidence of NASH by lowering NAS (NASH group vs NASH+100 mg/kg γ-MCA group: 5.75 ± 0.590 vs 1.375 ± 0.420, p < 0.05).

Conclusion: γ-MCA inactivates lipogenesis to ameliorate hepatic steatosis by targeting FXR/SHP/LXRα/FASN signalling. Mitigation of steatosis-based peroxidative injury results in the NASH attenuation.

Statins regulate PNPLA3 through a mechanism that requires SREBF2 in human liver cells
Osman Ahmed, Vladimir S Shavva, Wanmin Dai, Laura tarnawski, Stephen Malin, Anders Franco-Cereceda, Per Eriksson, Hanna Björc, Peder Olofsson, Karolinska institutet and Karolinska University Hospital, Department of Medicine Solna, Stockholm, Sweden
University of Khartoum, Department of Biochemistry, Khartoum, Sudan, Karolinska institute and Karolinska University Hospital, Department of Molecular Medicine and Surgery, Stockholm, Sweden
Email: osman.ahmed@ki.se

Background and aims: Genetic variation within the patatin-like phospholipase domain containing 3 (PNPLA3) gene is associated with both susceptibility to NAFLD and response to statin treatment in NAFLD patients. Here, we studied the association between statin treatment and hepatic expression of PNPLA3 from liver biopsies of patients without any known liver diseases.

Method: Liver biopsies were collected from 261 patients undergoing open-heart surgery. Patients were stratified by 1) Statins versus non-statin users in all cohort 2) by presence of the metabolic syndrome among non-statins users 3) Statins versus non-statins users among patients with metabolic syndrome only. In this cohort, 81 patients were treated with statins and 144 were not while 36 patients did not fulfill the inclusion criteria. Among the 144 non statins users 26 patients fulfilled the criteria of metabolic syndrome defined by the International Diabetes Federation. Liver gene expression and genotypes data in addition to plasma proteomic and lipoprotein profile were analyzed. Using atorvastatin, we validated the data from the human liver cohorts using in vitro models of HepG2 and hepatic stellate cells (HSC) LX2.
**Results:** Among non-statin users, mRNA levels of NAFLD- and lipogenesis-associated genes (PNPLA3, ACACA, SCD-1 and ACYP) were significantly different between patients that did and did not fulfill criteria for the metabolic syndrome. Moreover, patients with metabolic syndrome and on statin therapy have higher fasting glucose, insulin and Hba1c levels in plasma compared to non-statintreated metabolic syndrome patients. In addition, the mRNA levels of PNPLA3, ACACA and ACYP in liver were higher in patients with metabolic syndrome and on than in non-statin-treated metabolic syndrome patients. Exposure of HepG2 hepatocyte-like cells and LX2 stellate-like cells, respectively, to atorvastatin in vitro significantly increased mRNA levels of SREBP2, HMGCOR, PCSK9, LDLR and PNPLA3 when compared to vehicle-treated cells. Knock-down of SREBP2 in HepG2 hepatocyte-like cells and LX2 hepatocyte-like cells, respectively, abolished this effect and significantly reduced levels of these mRNAs both in cultures exposed to vehicle- and to atorvastatin.

**Conclusion:** Both statin treatment and the metabolic syndrome itself are associated with upregulation of lipogenesis-associated genes and PNPLA3 mRNA levels in the human liver. SREBP2 is essential for the regulation of PNPLA3 by atorvastatin in hepatocyte-like cells and hepatic stellate-like cells. Our study suggests that statins exaggerate hyperglycemic features in patients that fulfilled criteria for metabolic syndrome which may be a consequence of transcriptionally induced hepatic lipogenesis.

**WED-435**

Deletion of mixed lineage kinase domain like pseudokinase aggravate chronic alcohol induced liver injury via increasing apoptosis


¹Myoungji Hospital, Hanyang University College of Medicine, Korea, Rep. of South,
²Hanyang University College of Medicine, Korea, Rep. of South,
³Hanyang University, College of Medicine, Korea, Rep. of South,
⁴Nowon Eulji Medical Center, Eulji University School of Medicine, Korea, Rep. of South,
⁵Soonchunhyang University College of Medicine, Korea, Rep. of South,
⁶Hallym University Medical Center, Korea, Rep. of South,
⁷CHA Bundang Medical Center, Korea, Rep. of South

Email: noshin@hanyang.ac.kr

**Background and aims:** The mixed lineage kinase domain like pseudokinase (MLKL) is known to play a protective role in non-alcoholic fatty liver disease (NAFLD) via inhibition of necroptosis pathway. However, the role of MLKL in alcoholic liver disease (ALD) is not yet clear.

**Method:** C57BL/6N wild-type (WT) and MLKL-knockout (KO) mice (8–10 weeks old) were randomly divided into eight groups. To establish ALD model of different durations ethanol (EtOH) was fed to WT and MLKL KO for 10 days, 4 weeks and 8 weeks. The control group was fed with Lieber-DeCarli control diet for 8 weeks. Mortality, degree of hepatic inflammation, and steatosis were compared among the groups. Bulk mRNA transcriptome analysis was performed. Abundance of transcript and gene expressions were calculated based on read count or Transcript by Million (TPM) value.

**Results:** Survival rate of MLKL KO mice compared to WT was similar until 4 weeks, but the survival of MLKL KO mice significantly decreased after 8 weeks in ALD model. There was no difference in degree of inflammation, steatosis, and NAS scores between EtOH fed MLKL KO and EtOH fed WT mice at 10 days. However, at 4 weeks and 8 weeks, the degree of hepatic steatosis, NAS and inflammation were increased in MLKL KO mice. RNA transcriptome data showed that fatty acid synthesis, and lipogenesis, mitochondria, and apoptosis related pathways were upregulated in EtOH fed MLKL KO mice compared to EtOH fed WT mice. Although hepatocyte apoptosis (BAX/BCL2 ratio, caspase-3, and TUNEL staining) increased after EtOH intake; however, apoptosis was more significantly increased in EtOH fed MLKL KO mice compared to the WT group. At the same time, hepatic cFLIP was decreased in EtOH fed MLKL KO mice compared to the WT group.

**Conclusion:** MLKL deletion did not prevent chronic alcohol-induced liver damage independently of necroptosis and exacerbated hepatic steatosis by increasing hepatocyte apoptosis.

**WED-436**

Validation and utility of artificial intelligence-based zonal annotations as an additional assessment tool for the histopathologic review of fibrosis in non-alcoholic steatohepatitis patients


¹National University Hospital, Department of Pathology, Singapore, ²Yong Loo Lin School of Medicine, National University of Singapore, Department of Pathology, Singapore, ³Singapore General Hospital, Singapore and Duke-NUS Medical School, Department of Anatomical Pathology, Singapore, ⁴Hiustonex Pte Ltd, Singapore, ⁵Peking University Hepatology Institute, Peking University People’s Hospital, China, ⁶Hepatopancreatobiliary Center, Beijing Tsinghua Changgung Hospital, China, ⁷Stravitz-Sanyal Institute of Liver Disease and Metabolic Health, VCU School of Medicine, United States

Email: gwyneth_st_soon@nuhs.edu.sg

**Background and aims:** Inter-observer variability for categorical scores of liver fibrosis among pathologists ranges from fair to moderate weighted kappa. Artificial intelligence (AI) and advances in digitised whole-slide imaging (WSI) have facilitated the use of AI-assistive tools in pathology to improve histopathologic interpretation. Second harmonic generation/two-photon excitation fluorescence (SHG/TPEF) microscopy with qFibrosis staging and continuous values as AI-assistive tools has been shown to help standardize pathologist assessment, contributing to higher overall intra- and inter-rater agreements. With the additional provision of AI-based zonal annotations, we aim to explore whether there will be further improvements on the overall inter-pathologist agreement on fibrosis assessment.

**Method:** Unstained sections of liver biopsies from 50 untreated NASH patients (F0-F4) were evaluated. Fibrosis was quantitated using SHG/TPEF microscopy (qFibrosis). Unassisted reads comprised digitized HandE and Masson trichrome-stained images uploaded to a WSI platform. Level I assisted reads included additional SHG images with qFibrosis outputs. Level II assisted reads further included zonal annotations. The zonal annotations serve to highlight the portal tract (PT), central vein (CV), peri-PT, peri-CV and perisinusoidal regions. To evaluate performance for assisted and unassisted reads, three pathologists with 5 to 40 years’ experience interpreted images in 2 sessions: a) Unassisted versus Assisted level I, b) Unassisted versus Assisted level II. Each session consisted of 4 reads, starting with the unassisted read followed by sample randomization before proceeding to the assisted read. This was repeated after a 3–4-week washout period.

**Results:** When assisted by the level I AI tool, the concordance rate between pathologists improved to near-perfect agreement, with 0.82 linear weighted kappa, as compared to 0.72 for the unassisted review. Mean overall percentage agreement (PA) between pathologists ranges from fair to moderate weighted kappa. Artificial intelligence (AI) and advances in digitised whole-slide imaging (WSI) have facilitated the use of AI-assistive tools in pathology to improve histopathologic interpretation.
Figure: Zonal annotations and the impact of AI-assistant tools on intra- and inter-rater agreements.

<table>
<thead>
<tr>
<th></th>
<th>Unassisted</th>
<th>Assisted level I</th>
<th>Assisted level II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inter-observers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean percentage agreement</td>
<td>89.4%</td>
<td>92.0%</td>
<td>93.8%</td>
</tr>
<tr>
<td>Mean weighted kappa (linear)</td>
<td>0.72</td>
<td>0.83</td>
<td>0.84</td>
</tr>
<tr>
<td>Intra-observers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean percentage agreement</td>
<td>92.1%</td>
<td>96.5%</td>
<td>95.03%</td>
</tr>
<tr>
<td>Mean weighted kappa (linear)</td>
<td>0.70</td>
<td>0.91</td>
<td>0.88</td>
</tr>
</tbody>
</table>

**Conclusion:** qFibrosis as an AI-assitant tool can improve inter-pathologist weighted kappa to near-perfect (~93%) agreement. Additional AI-based zonal annotations provide negligible improvement in inter-pathologist weighted kappa.

**WED-437**

**Anti-inflammatory and anti-fibrotic effects by simultaneous activation of glucagon, GIP, and GLP-1 of efocipegtrutide (HM15211) in thioacetamide-induced mouse model of liver injury and fibrosis**

Jung Kuk Kim, Yohan Kim, Jong Suk Lee, Hyunjoo Kwon, Eun Jin Park, Jeong A Kim, Sung Min Bae, Dae Jin Kim, Sang Hyun Lee, In Young Choi. 1Hanmi Pharm.Co., Ltd., Korea, Rep. of South

**Email:** iychoi@hanmi.co.kr

**Background and aims:** Despite of increase in number of fibrosis due to NASH which becomes a major cause of liver-related outcomes, no approved drug is available. Recently, potential benefit of incretins such as glucagon (GCG), GIP and GLP-1 beyond metabolism has been proposed especially in inflammation and fibrosis. Thus, to optimally implement these incretins, efocipegtrutide, a long-acting GCG/GIP/GLP-1 triple agonist, was developed. Here, we evaluated and compared the therapeutic effects of efocipegtrutide with available incretin drugs in TAA (thioacetamide)-induced liver injury and fibrosis mouse.

**Method:** TAA was intraperitoneally injected to mouse for 12 weeks to induce liver injury and fibrosis, and efocipegtrutide was administered during last 10 weeks, and semaglutide as well as tirzepatide were included as comparative controls. At end of treatment, hepatic hydroxyproline content was measured and the liver tissues were subjected to HandE and Sirius red staining followed by histological grading. qPCR and ELISA were performed to evaluate relevant hepatic and blood bio-markers.

**Results:** Efocipegtrutide treatment was associated with significant reduction of hepatic hydroxyproline content (231.9 nmol/g vs. 350.4 nmol/g for TAA, vehicle; p < 0.001) while that of semaglutide (322.5 nmol/g) or tirzepatide (322.1 nmol/g) had minor effects. Similarly, treatment of efocipegtrutide (0.83%, p < 0.001), significantly reduced Sirius red positive area (vs. 5.75% for TAA, vehicle), unlike neither semaglutide (4.93%) nor tirzepatide (3.61%). To further confirm the potential benefit of efocipegtrutide, histological grading was conducted by using Sirius red and HandE staining, in which efocipegtrutide (1.29, 1.00 vs. 3.00, 3.00 for TAA, vehicle) exhibited greater reduction effects on both fibrosis and portal inflammation score compared to semaglutide (2.14, 2.71) or tirzepatide (2.00, 2.57). Consistent with such histologic analysis, expression of hepatic marker genes for fibrosis and inflammation were significantly/numerically reduced only in efocipegtrutide group. Significant reduction in blood TIMP-1 level was also observed.

**Conclusion:** Efocipegtrutide effectively improved liver inflammation and fibrosis in TAA mice. Notably, greater improvement effect over semaglutide and tirzepatide highlights the potential benefit of simultaneous use of GCG, GIP, and GLP-1. Thus, efocipegtrutide could be a novel therapeutic option for fibrosis due to NASH. Human study is ongoing to assess the clinical relevance of these findings.
Collagen co-localized with macrovesicular steatosis better differentiates fibrosis progression in non-alcoholic fatty liver disease mouse models

XiaoXiao Wang1, Rui Jin1, Xiaohui Li1, Qiang Yang2, Xiao Teng3, Fangfang Liu4, Nan Wu1, Huiling Rao1, Feng Liu1. 1Peking University People’s Hospital, Peking University Hepatology Institute, Beijing Key Laboratory of Hepatitis C and Immunotherapy for Liver Diseases, Beijing International Cooperation Base for Science and Technology on NAFLD Diagnosis, Beijing, China, 2Hangzhou Choutu Technology Co, China, 3HistolIndex Pte Ltd, Singapore, 4Peking University People’s Hospital, China

Email: liu1116m@sina.com

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is a global commonly occurring liver disease. However, its exact pathogenesis is not fully understood. The purpose of this study was to quantitatively evaluate the progression of steatosis and fibrosis by examining their distribution, morphology, and co-localization in NAFLD animal models.

Method: Six mouse NAFLD groups were established: (1) western diet (WD) group; (2) WD with fructose in drinking water (WDF) group; (3) WDF + carbon tetrachloride (CCl4) group, WDF plus intraperitoneal injection of CCl4; (4) high-fat diet (HFD) group, (5) HFD with fructose (HFDF) group; and (6) HFDF + CCl4 group, HFDF plus intraperitoneal injection of CCl4. Liver tissue specimens from NAFLD model mice were collected at different time points. All the tissues were serially sectioned for histological staining and Second-harmonic generation (SHG)/two-photon excitation fluorescence imaging.

Figure: (abstract: WED-439) The Sema7aN557Y heterozygous mutation aggravates liver injury, steatosis and inflammation in NAFLD induced by high-fat diet in mice. Liver weights and the liver/body weight ratios. HFD-WT (n = 7), HFD-Sema7aN557Y (n = 6). (B) Serum ALT and AST levels. (C) HandE and oil red O-stained liver histology. Scale bar, 100 μm. NAFLD activity score is shown. (D) Representative images of IHC staining of Cd11b and their quantitative assessments of randomly selected microscopic fields. Scale bar, 50 μm. Data are presented as mean ± SD. *p < 0.05 versus the HFD-WT mice. The data were analyzed with Student’s t test.
heterozygous mutated mice to investigate the role of SEMA7A.

Results: qStat showed a strong correlation with steatosis grade (R: 0.823–0.953, P < 0.05) and demonstrated high performance (AUC: 0.617–1) in six mouse models. Based on their high correlation with histological scoring, qFibrosis containing four shared parameters (#LongStrPS, #ThinStrPS, #ThinStrPSAgg, and #LongStrPSDis) were selected to create a linear model that could accurately identify differences among fibrosis stages (AUC: 0.725–1). qFibrosis co-localized with macrosteatosis generally correlated better with histological scoring and had a higher AUC in six animal models (AUC: 0.846–1).

Conclusion: Quantitative assessment using SHG/TPEF technology can be used to monitor different types of steatosis and fibrosis progression in NAFLD models. The collagen co-localized with macrosteatosis could better differentiate fibrosis progression and might aid in developing a more reliable and translatable fibrosis evaluation tool for animal models of NAFLD.

WED-439
A heterozygous N559Y mutation in Semaphorin 7A promotes non-alcoholic fatty liver disease progression through induction of hepatic ROS production and inflammation

Yao Tong1, Xiaoxun Zhang1, Nan Zhao1, Jin Chai1. The First Affiliated Hospital (Southwest Hospital) of Third Military Medical University (Army Medical University), China

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is a serious liver disease of worldwide concern, which can lead to cirrhosis and hepatocellular cancer. Notably, genetic factors play an important role in the pathogenesis of NAFLD. Semaphorin 7A (SEMA7A), as a membrane-bound protein, contributes to axon growth, T cell activation, and other biological processes. In this study, we examined the mechanism of SEMA7A(N559Y) heterozygous mutation aggravating non-alcoholic fatty liver disease.

Method: We generated Sema7a(N559Y) (equal to human SEMA7A(N559Y), heterozygous mutated mice to investigate the role of SEMA7A(N559Y) mutation in the progression of NAFLD. 8-week-old wild type mice and Sema7a(N559Y) heterozygous mutated mice were fed with high-fat diet (HFD) for 8 weeks. All mice were sacrificed and their serum and liver tissue were collected and analyzed. Hande staining, Oil Red O staining, and immunohistochemistry (IHC) of Cd11b protein were performed to evaluate liver steatosis and inflammation. Western blot analysis was used to measure the expression of lipid metabolism and cell pyroptosis-related proteins. NOX, CAT, and MDA content were measured as oxidative stress markers in liver tissue.

Results: In our previous study, SEMA7A(N559Y) heterozygous mutation was identified in NAFLD patients. HFD-Sema7a(N559Y) mice had higher liver weight, liver index, serum ALT and AST levels than that of HFD-WT mice. Liver histologic analyses revealed that the Sema7a(N559Y) variant markedly increased liver steatosis and inflammation. Further studies indicated that Sema7a(N559Y) mutation can significantly increase the proteins expression of lipid metabolism and ROS levels by enhancing PI3 K/AKT signaling. In addition, Sema7a(N559Y) mutation markedly activate the ROS/NLRP3 pathway and cause liver inflammatory responses.

Conclusion: In conclusion, our research demonstrates that SEMA7A(N559Y) heterozygous variant may be a new genetic determinant of NAFLD and promotes liver injury by inducing hepatocytes pyroptosis and liver inflammation.

WED-440
Endothelial and platelet-derived microvesicles as a biomarker of cardiovascular risk in patients with metabolic dysfunction-associated fatty liver disease (MAFLD)

Sheila Gato Zambrano1, Rocío Munoz Hernandez1, Rocío Montero-Vallejo2, María del Carmen Rico1, Vanessa García Fernández1, Angela Rojas Alvarez-Ossorio1, Antonio Gil-Gomez1, Javier Gallego1, Rocío Gallego-Durán1, Douglas Maya Miles1, Javier Ampuero1, Manuel Romero Gomez1. Servicio de Aparato Digestivo. Hospital Universitario Virgen del Rocio; Seliver Group, Instituto de Biomedicina de Sevilla (HUVIR/CSIC/US), Departamento de Medicina Universidad de Sevilla; CIBEREHD, Sevilla, Spain

Email: mromerogomez@us.es

Background and aims: MAFLD is associated with cardiovascular risk (CVR), but it is not clear if it contributes independently to the development of this disease. Early detection of endothelial dysfunction and CVR reduces premature morbidity and mortality. Endothelial dysfunction is associated with increased plasma levels of endothelial (EMVs) and platelet-derived microvesicles (PMVs). The objective of the study was to evaluate the levels of EMVs and PMVs in MAFLD patients and their relationship with CVR.

Method: 97 MAFLD biopsy-proven patients were included and classified according to the SAF-score as steatosis (SS) or steatohepatitis (NASH). We assessed the presence of subclinical atherosclerosis using the ankle-brachial index (ABI) and the atherosclerotic cardiovascular disease risk index (ASCVD). We quantified PMVs (A V+CD31+CD41+) and EMVs (A V+CD31+CD41+) and activated EMVs (A V+CD62e+) in heparin-plasma samples by flow cytometry.

Results: Baseline patient characteristics are represented in Table 1. We did not observe differences in the proportion of patients with pathological ABI and ASCVD between the different MAFLD groups. In contrast, PMVs (A V+CD41+) are increased in patients with NASH vs. SS (p = 0.02) (Fig 1a), although platelet levels are similar. In addition, patients with lobular inflammation present higher levels of PMVs (A V+CD31+CD41+) compared to those without inflammation (p = 0.029, Fig 1b); on the other hand, there were no differences according to the degree of ballooning. Moreover, levels of activated EMVs (A V+CD62e+) are increased in MAFLD and hypertension (AHT) patients vs. those without AHT (p = 0.037) (Fig 1c), in the same way, are increased in patients with ASCVD > 10% (n = 16) vs. those with ACSVP < 10% (n = 17) (365.7 ± 104.3 vs. 649.7 ± 158.6; p = 0.045). Finally, according to the severity of liver disease and the presence of atherosclerosis (depending on ABI and ASCVD), we did not observe differences in the levels of EMVs or PMVs.

Conclusion: PMVs levels are associated with disease and lobular inflammation, suggesting the presence of endothelial damage. Activated EMVs increase in patients with hypertension, suggesting that the impact of MAFLD on endothelial activation and, therefore, on vascular structure, may depend on the coexistence of other CVR factors such as hypertension.
A novel orally available type IV autotaxin inhibitor, IOA-289, ameliorates steatosis and fibrosis in a preclinical model of non-alcoholic steatohepatitis

Marit ten Hove 1, Giusy Di Conza 2, Karolina Niewola 2, Marcel Deken 2, Lars van der Veen 2, Ruchi Bansal 1.

1University of Twente, Netherlands, 2iOnctura SA, Geneva, Switzerland

Email: m.m.tenhove@utwente.nl

Background and aims: Non-alcoholic steatohepatitis (NASH) represents a major health burden worldwide with no FDA-approved therapies available. Lysophosphatidic acid (LPA), produced by autotaxin (ATX), is correlated with the progression of NASH, and regulates lipid homeostasis, and induces liver inflammation and fibrosis. Hepatic ATX knockdown in a high-fat diet mouse model showed protection against NASH by decreasing hepatic steatosis, inflammation, and fibrosis. Recently, we have shown that inhibiting ATX using a type-IV inhibitor (that occupy the tunnel and the pocket of ATX) possess better potential in ameliorating NASH than a type-I inhibitor (that targets the catalytic site and the pocket of ATX). In this study, we aim to further investigate the therapeutic effects of a novel and orally available type IV ATX inhibitor, IOA-289, for the treatment of NASH.

Method: First, we examined the expression of ATX and LPA receptors in different liver pathologies. Thereafter, we tested the efficacy of IOA-289 in vitro employing disease-specific stimulated hepatic cell types to recapitulate different processes of NASH. Based on promising in vitro results, we investigated the effects of orally administered IOA-289 in a NASH mouse model. C57BL/6j mice were fed western-diet (WD) containing 21.1% fat, 41% sucrose and 1.25% cholesterol supplemented with high sugar solution (23.1 g/L d-fructose and 18.9 g/L d-glucose), combined with increasing low weekly doses (0.05–0.2 ml/kg) of carbon tetrachloride (CCl4) for 12 weeks. In the last six weeks, IOA-289 (30 mg/kg) or PF-8380 (a type-I ATX inhibitor, 30 mg/kg) was orally administered twice daily. Blood, liver, and different organs were collected for subsequent analysis.

Results: In our NASH mouse model, Oil-red-O staining showed a significant decrease in intrahepatic fat accumulation in IOA-289-treated mice (n = 7) and PF-8380-treated mice (n = 7) compared to vehicle-treated mice (n = 7). Additionally, the expression of genes involved in de novo synthesis of fatty acids (FASN, SCD1 and ACACA) were significantly decreased in the ATX inhibitor-treated groups compared to the vehicle-treated group. We further assessed the effect of both ATX inhibitors on fibrosis and observed that total hydroxyproline content, collagen-I immunostaining and profibrotic gene expression (TGFB1, PDGFRB and ACTA2) were significantly attenuated only in the IOA-289 treated group, but not in the PF-8380 treated group, compared to the vehicle group. Overall, these results indicate the amelioration of hepatic steatosis and fibrosis by IOA-289.

Conclusion: Our results demonstrate that inhibition of the LPA-ATX pathway, particularly using a type IV inhibitor, represents a potential...
therapeutic target in NASH, by attenuating steatosis and fibrosis, with possible clinical implications.

**WED-442**

Cannabidiolic acid (CBDA) regulates energy homeostasis and protects against non-alcoholic fatty liver disease (NAFLD) in mice

Albert Giralt1, Battsetseg Batchuluun2,3, Robin Willows1, Steve Lassueur1, Christian Chabert1, Dongdong Wang2,3, Emily Day2,3, Marisa Morrow2,3, Evelyn Tsakiridis2,3, Russfa Fayazi2,3, Sonia Rehal2,3, James Lally2,3, Eris Desjardins2,3, Jaya Gautam2,3, Philippe Derelive4, Gregory Steinberg5,6, Marine Kraus7, Matthew Sanders1, 1Nestlé Institute of Health Sciences, Nestlé Research, Centre des Produits Nestlé S.A., Lausanne, Switzerland, 2Centre for Metabolism, Obesity and Diabetes Research, McMaster University, Hamilton, Canada, 3Division of Endocrinology and Metabolism, Department of Medicine, McMaster University, Hamilton, Canada, 4Nestlé Health Sciences, Société des Produits Nestlé S.A, Switzerland, 5Department of Biochemistry and Biomedical Sciences, McMaster University, Hamilton, Canada

**Background and aims:** There has been growing interest in the potential health benefits of cannabinoids found in Cannabis Sativa, especially cannabidiol (CBD), which is a minor cannabinoid acid derivative. The aim of this study was to evaluate whether the main cannabinoid found in Cannabis Sativa, cannabidiolic acid (CBDA), could improve NAFLD in a mouse model.

**Method:** We examined the effect of CBDA on de novo lipogenesis (DNL) in mouse primary hepatocytes and in mice after a 4-day treatment with CBDA (10 mg/kg or 30 mg/kg, oral gavage). NAFLD was induced in C57Bl/6J male mice by placing them at thermoneutrality (29°C) and feeding them a NASH diet (40% fat, 20% fructose, 0.02% cholesterol) for 16 weeks. After the onset of obesity and NAFLD, mice were treated daily with either CBDA (10 mg/kg or 30 mg/kg, oral gavage) or a vehicle for an additional 9 weeks. Insulin tolerance and glucose tolerance tests were performed at week 7 and 8 after the beginning of treatment, respectively. The impact of CBDA on liver triglycerides and lipid droplet area were quantified. NASH status was assessed by a blinded pathologist (NAFLD activity score) and liver fibrosis was quantified by pico-Sirius red staining area. Liver gene expression was assessed by RNA-seq. Primary human hepatic stellate cells (hHSC) were pre-treated with CBDA (1 h) and stimulated with TGB/B (48 h) and alpha-SMA1 levels and pro-collagen secretion in the media were measured. The effects of CBDA on cellular respiration in cells were evaluated using the Seahorse analyzer (Agilent) and the effects of CBDA on mitochondrial respiration in isolated mouse liver mitochondria were evaluated using the Oroboros (Oroboros Instruments).

**Results:** CBDA inhibited hepatic DNL in mouse primary hepatocytes and in vivo. CBDA treatment in a NAFLD mouse model successfully improved glucose tolerance and insulin sensitivity without significant changes in body weight. CBDA stimulated whole-body fat oxidation and significantly reduced hepatic steatosis. CBDA promoted NASH resolution and significantly decreased liver fibrosis. Liver gene expression analyses revealed a stimulation of pathways linked to lipid oxidation and a decrease in pathways associated with inflammation and fibrosis in response to CBDA treatment. In agreement, CBDA blunted TGF-β-induced activation of primary human HSCs and procollagen secretion, which was associated with DNL inhibition. Mechanistically, CBDA activates AMP-activated protein kinase (AMPK) in vitro and acutely stimulates cellular and mitochondrial respiration. These effects extended to several cannabinoid acid derivatives and were not observed in their respective neutral derivatives (e.g., cannabidiol, CBD).

**Conclusion:** This study demonstrates that CBDA inhibits hepatic DNL and improves several features of NAFLD, concomitantly with an improvement in glucose tolerance and insulin sensitivity. Additionally, for the first time, we show that CBDA and other cannabinoid acids increase mitochondrial respiration. These data provide evidence for a novel mechanism of action for the cannabinoid acids that could be exploited for the treatment of NAFLD and other metabolic diseases.

**WED-443**

Quantification of vessel and bile duct parameters using Second Harmonic Generation in patients with NAFLD across fibrosis stages

Jörn Schattenberg1, Yayun Ren2, Dean Tai2, Elaine Chng2, Maurice Michel1, Christian Labenz3, Beate Straub4, 1Metabolic Liver Research Center, University Medical Center of the Johannes Gutenberg-University, Germany, 2Histolindex Pte Ltd, Singapore, 3University Medical Center of the Johannes Gutenberg-University, Department of Medicine, Germany, 4University Medical Center of the Johannes Gutenberg-University, Department of Pathology, Germany

**Background and aims:** Liver histology defines the pathophysiological alterations occurring in patients with NAFLD while they...
develop progressive (especially perisinusoidal) fibrosis and progress to liver cirrhosis. Fibrosis and cirrhosis are defined by changes in the vascularisation as well as bile ducts, but they have not been systematically assessed in patients with NAFLD so far. The aim of this exploratory analysis was done to identify features of the hepatic vasculature and bile ducts using second harmonic generation imaging (SHG) and to correlate them with the histological fibrosis scores.

**Method:** Unstained sections from 132 patient with NAFLD that underwent liver biopsy between 2016 and 2018 for suspected NASH were included. Fibrosis staging was done based on the NASH CRN fibrosis score on Gomori and evG stained liver biopsies. Second harmonic generation/two-photon excitation fluorescence (SHG/TPEF) microscopy was done using unstained liver sections.

**Results:** Among the 132 patients, 52.7% were male with a mean age of 51.6 years [43.0–60.0] and a mean BMI of 32.2 kg/m² [28.7–37.0]. Laboratory findings included ALT (U/l) 73.0 [50.0–115.7], AST 50 [38–67], gGT 109 [60.7–115.7], A1c 6.0 [5.4–6.9]. Mean transient elastography was 8.2 kPa [5.7–13.2]. Comorbidities included Type 2 Diabetes (41.2%), arterial hypertension (72.5%), hypertriglyceridemia (32.8%) and obesity (BMI ≥ 30; 54.2%). Advanced fibrosis was present in 34.4% of liver biopsies. The histological fibrosis stages were distributed, according to Kleiner, as follows F0 (3.1%), F1a-c (27.5%), F2 (35.1%), F3 (23.7%) and F4 (10.7%).

SHG was used to quantify histological characteristics of the intrahepatic vasculature. A total of 50 pathological changes, including those of central veins, portal veins, arteries, as well as bile ducts and their respective morphological features were identified and quantified. The correlation of these features with fibrosis stages are shown as a heat map in the figure attached. A pattern that followed fibrosis states. Concentration of intrahepatic lipids positively correlated with plasma profiles indicating substantial heterogeneity in metabolic relationships between brain MRI readouts and liver lipids and gene expression, and plasma fatty acids and bile acid concentrations.

**Results:** Participants differed considerably in intrahepatic lipid load and plasma profiles indicating substantial heterogeneity in metabolic states. Concentration of intrahepatic lipids positively correlated with cerebral blood flow in the cortex of the temporal lobe and with putamen volume. Hepatic gene expression strongly correlated with these MRI readouts and distinct canonical pathways, among which ‘oxidative phosphorylation’ and ‘mitochondrial dysfunction’, were enriched with the correlating gene transcripts. Correlating genes also included genes implicated in lipid and bile acid metabolism. Consistently concentration of many plasma fatty acids (e.g. trans-fatty acids) and bile acids were inversely correlated with brain MRI readouts.

**Conclusion:** This exploratory study supports the view that general loss of metabolic homeostasis, rather than a specific metabolite, is critical for brain health already in mid-life.

**WED-445**

Combination therapy of TERN-501, a selective agonist of thyroid hormone receptor (THR) beta with TERN-101, a farnesoid X receptor (FXR) agonist improves non-alcoholic steatohepatitis (NASH) in a GAN diet-induced and biopsy-confirmed mouse model.

Christopher Jones1, Malte H. Nielsen2, Denise Oré3, Michael Feigh2, Xiao Teng3, Anthony Lie4, Gideon Ho5, Jeffrey Jasper1. Terns Pharmaceuticals, Foster City, United States, 2Gubra, Harsholm, Denmark, 3Histolndex Pte Ltd, Singapore, Singapore

**Email:** cjones@ternspharma.com

**Background and aims:** Non-alcoholic steatohepatitis (NASH) is a serious disease of the liver that will likely require a combination therapy to achieve maximal therapeutic response. TERN-501, a potent and selective agonist of thyroid hormone receptor (THR) beta, and TERN-101, a non-steroidal agonist of farnesoid X receptor (FXR), were tested alone and in combination in a Gubra-Amylin NASH (GAN) diet-induced obese mouse model of NASH (DIO-NASH).

**Method:** TERN-101 (10 mg/kg, PO) and TERN-501 (0.3 [Low], 2 [Med], and 10 [High] mg/kg, PO) were administered once daily as...
single agents or in combination in biopsy-confirmed GAN DIO-NASH mice (n = 16/group) for 12 weeks. Histological analyses were performed at baseline and end of treatment to assess steatosis, inflammation, and fibrosis on stained biopsies. Liver biopsies were also assessed by stain-free artificial intelligence (AI)-based digital pathology (Histoln dex®) using second harmonic generation and two photon emission.

**Results:** The NAFLD Activity Score (NAS) was improved to a greater extent by combination treatment with 19%, 25%, and 43% of mice showing ≥2-pt NAS improvement from baseline in the Low, Med, and High combination arms, respectively. Quantitative liver histomorphometry on stained biopsies showed the combination treatment had greater anti-steatotic activity, including reduced liver lipids, fewer hepatocytes containing lipid droplets, and reduced lipid droplet size. Analyses by Histolndex indicated that the combination treatment significantly lowered fibrosis colocalized with microsteatotic vesicles and reduced the progression of fibrosis colocalized with microsteatotic vesicles. The periportal area showed significant reduction of fibrosis in the Med and High combination arms.

**Conclusion:** Treatment with the THR-beta agonist TERN-501 in combination with the FXR agonist TERN-101 led to greater NAS and fibrosis improvements from baseline compared with single agent treatments, likely driven by increased anti-steatotic activity. These data suggest that combining the robust anti-steatotic effects of a selective THR-beta agonist with an FXR agonist may provide a superior therapeutic benefit for NASH over either agent alone. The use of AI-digital pathology can provide granularity in NASH drug development during the preclinical phase, which may be translated to current use in NASH clinical trials.

**WED-446 Unravelling the role of iron-catalysed ferroptotic cell death in non-alcoholic steatohepatitis**

Cédric Peleman1,2,1, Irene Koeken1, Geraldine Veeckmans3, Astrid Van den Branden1, Emily Van San4,5, Behrouz Hassannia4,5, Luc Van Nassauw6, Els Goeman6, Ann Driessen7,8, Lieve Vits1, Annelies Van Eyck1,9, Wilhelmus Kwanten1,2, Luisa Vonghia1,2, Tom Vanden Bergh3,4,5, Sven Franque4,5, University of Antwerp, Laboratory of Experimental Medicine and Pediatrics, Infia-Med Centre of Excellence, Belgium, 2Antwerp University Hospital, Department of Gastroenterology and Hepatology, Belgium, 3University of Antwerp, Laboratory of Pathophysiology, Belgium, 4Ghent University, Department of Biomedical Molecular Biology, Belgium, 5VIB-Ugent Center for Inflammation Research, Belgium, 6University of Antwerp, Department of Academic Faculty of Medicine and Health Sciences, Belgium, 7Antwerp University Hospital, Department of Pathology, Belgium, 8Antwerp University, Centre for Oncological Research, Belgium, 9Antwerp University Hospital, Department of Pediatrics, Belgium

**Background and aims:** Hepatocyte cell damage and cell death are hallmarks of non-alcoholic steatohepatitis (NASH). Cell death inhibition might constitute a therapeutic option for NASH, but the dominant subtype of hepatocyte cell death in NASH remains to be elucidated. Accumulating evidence points towards ferroptosis as an important driver in NASH pathogenesis. Ferroptosis is a type of regulated necrotic cell death executed by iron-catalysed peroxidation of polyunsaturated fatty acids (PUFA) in membrane phospholipids. In the present study we examined the determinants of increased ferroptosis sensitivity of hepatocytes in vitro and the effects of ferroptosis inhibition on NAS in vivo in a murine dietary model.

**Method:** In vitro, we studied the sensitivity of HepG2 cell line to undergo ferroptosis after exposure to a NASH environment, i.e. oleic and palmitic acid (non-PUFA), hyperglycemia, hyperinsulinemia and cytokines. Finally, lipidomics assessed membrane phospholipid composition of HepG2 cells to elucidate determinants of ferroptosis sensitivity. In vivo, in C57BL/6J mice fed the choline-deficient L-arginine acid defined high-fat diet (CDAHFD) for 4 weeks, the ferroptosis markers malondialdehyde (MDA) and 4-hydroxynonenal (4HNE) were assessed. The effect of ferroptosis inhibition by the third-generation ferrostatin analogue UAMC-3203 was tested in mice fed CDAHFD or standard diet (SD) on serum liver enzymes, hepatomegaly, liver fat and histology.

**Results:** In vitro, steatotic HepG2 cells displayed higher sensitivity towards ferroptosis inducer ML162, as evidenced by lower EC50 values for cell death with Sytox Green assay. Mechanistically, excess non-PUFA fatty acids increased PUFAs incorporation in membrane phosphatidylglycerol in HepG2 cells, making them more vulnerable towards Ferroptosis. In vivo, murine livers displayed NASH with increased hepatic MDA levels and panlobularly increased 4HNE staining on immunohistochemistry, compared to controls displaying normal liver histology. Simultaneous (preventive) treatment with UAMC-3203 for 4 weeks reduced hepatic MDA (p < 0.01 treatment effect, Fig 1A), hepatomegaly (p < 0.001, Fig 1B) and alanine transaminase levels (p < 0.01, Fig 1C) in CDAHFD, compared to vehicle. Likewise, therapeutic administration of UAMC-3203 during the last 2 out of 4 weeks of diet reduced MDA (p < 0.05) and alanine transaminase levels (p < 0.01), while attenuating macrovesicular steatosis and immune cell infiltration, compared to vehicle.

**Figure:**

**Conclusion:** Ferroptotic cell death is present in murine NASH livers, while its inhibition reduces systemic liver enzymes and attenuates hepatic lipid accumulation and immune cell infiltration. Mechanistically, non-PUFA fatty acids increased the vulnerability of hepatocytes to ferroptosis. Our findings imply that ferroptosis is a detrimental factor in NASH and thus may constitute a new therapeutic target.

**WED-447 Antagonism of C-C motif chemokine receptor 2 (CCR2) using a novel in silico designed peptide attenuates macrophage infiltration and non-alcoholic steatohepatitis in vivo**

Eline Geervelt1,2,1, Ralf Weiskirchen2, Ruchi Bansal1,1, University of Twente, Medical cell biophysics, Enschede, Netherlands, 2RWTH Aachen, Institute of Molecular Pathobiology, Experimental Gene Therapy and Clinical Chemistry, Aachen, Germany

**Email:** ekgeervliet@gmail.com

**Background and aims:** Non-alcoholic steatohepatitis (NASH) represents a major health burden worldwide. Upon injury, C-C motif chemokine ligand 2 (CCL2) secreted by hepatocytes, hepatic stellate cells, and Kupffer cells trigger the recruitment of C-C motif chemokine receptor 2 (CCR2) expressing circulating monocytes that significantly contribute to the macrophage compartment of the liver and liver inflammation that further progresses to liver fibrosis, cirrhosis and/or hepatocellular carcinoma. CCR2 antagonism by Cenicriviroc (CVC), a small molecule CCR2/CCR5 dual inhibitor, showed reduction in macrophage/monocyte recruitment in vitro and in vivo in acute and chronic mouse models. Despite promising results in the phase 2b (Centaur) trial, CVC failed in phase 3 (Aurora) trial due to the lack of efficacy possibly because of poor pharmacokinetic profile and lack of specificity. Using in silico modelling

Figure:

**Conclusion:** Ferroptotic cell death is present in murine NASH livers, while its inhibition reduces systemic liver enzymes and attenuates hepatic lipid accumulation and immune cell infiltration. Mechanistically, non-PUFA fatty acids increased the vulnerability of hepatocytes to ferroptosis. Our findings imply that ferroptosis is a detrimental factor in NASH and thus may constitute a new therapeutic target.
approach, we have designed an antagonizing peptide against CCR2 to inhibit monocyte recruitment and liver inflammation. Our previous data has shown that AP2 significantly attenuated CCL2-induced macrophage/monocyte infiltration in vitro and in vivo in an acute carbon tetrachloride (CCL4)-induced liver injury mouse model. Here, in this study, we investigate the effects of AP2 in a chronic NASH mouse model.

**Method:** We established a NASH mouse model by feeding mice with western diet (21.1% fat, 41% sucrose and 1.25% cholesterol) supplemented with high sugar solution (23.1 g/L d-fructose and 18.9 g/L d-glucose), combined with low weekly doses of CCL4 for 12 weeks. After 8 weeks, mice were treated intraperitoneally with 1 μmol/kg AP2 or CVC (2x per day) for 4 weeks. To assess intrahepatic monocyte infiltration in vivo, liver tissues were mechanically dissociated using Tissue Grinder, and cell population characterized by CD11b and F4/80 expression levels were analyzed using flow cytometry. Effects of AP2 and CVC on disease pathogenesis (steatosis, inflammation and fibrosis) were assessed using immunohistochemistry, RNA-sequencing, and plasma analysis.

**Results:** Flow cytometric analysis revealed a decrease in intrahepatic monocytes-derived macrophages in AP2 and CVC treated mice. Immunohistochemical analysis evidenced decreased steatosis (oil-red-O), inflammation (F4/80) and fibrosis (Collagen-I) in AP2 (and CVC) treated mice. AP2 and CVC treatment significantly inhibited the total plasma levels of AST, ALT, cholesterol and triglycerides. RNA sequencing analysis showed an improved NASH specific gene expression profiles in AP2 and CVC treated animals. CVC-treated mice showed reduced body weight on treatment and higher mortality compared with AP2.

**Conclusion:** Our CCR2 antagonizing peptide successfully inhibited intrahepatic monocyte/macrophage infiltration and ameliorated liver disease progression in vivo, in a chronic NASH mouse model.

**WED-448**

**Longitudinal ultrasound imaging assessment of murine liver fibrosis in a high fat, fructose, cholesterol (FFC) model and its response to therapy**

Heather Holmes¹, Caroline Sussman¹, Qianqian Guo¹, Juan Rojas², Ryan Gessner², Tomasz Czernuszewicz², Matthew Urban¹, Samar Ibrahim¹, Michael Romero¹. ¹Mayo Clinic College of Medicine and Science, United States. ²PerkinElmer, Inc., United States

**Background and aims:** Ultrasound and shear wave elastography (SWE) can be used to non-invasively monitor liver disease phenotypes, such as steatosis and fibrosis, and are clinically widespread. These imaging technologies have recently been adapted for small animal use in a robotic in vivo imaging system capable of automated scanning (Vega®, PerkinElmer). Our goal was to evaluate the feasibility of using this device to monitor response to therapy in the high fat, fructose, and cholesterol (FFC) model, a highly translatable preclinical model of obesity and metabolic disease. Non-invasive imaging of FFC mice is of particular interest (as opposed to invasive/terminal studies) due to intra-group phenotypic variability, extended time required to instantiate the model, and associated costs for these mice. This work represents a feasibility study aimed to use a robotic ultrasound scanner to monitor a cohort of mice over time developing diet-induced fibrosis of the liver, and then attempt to detect differences between un-treated and treated mice responding to a therapy.

**Method:** Two-month-old male C57Bl6 mice (N = 22) were used for this study and imaged at 32 weeks. Mice were split into four groups: (a) standard chow without treatment, (b) standard chow with treatment, (c) FFC diet without treatment, and (d) FFC diet with treatment. N = 8 mice were placed on standard chow, and N = 14 were Healthy Vehicle AP-2 CVC

![Figure](abstract: WED-447)
Non-invasive in vivo ultrasound SWE measures of tissue stiffness as a biomarker of liver fibrosis. B: Ex vivo validation of collagen fiber density after final timepoint via CT-FIRE. C: Correlation between in vivo ultrasound and ex vivo CT-FIRE measures of liver fibrosis pooled across all groups. Pearson’s r correlation was 0.7 between the in vivo and ex vivo measurement approaches.

placed on FFC diet (AIN-76A, TestDiet, St Louis, MO); both diet groups were split evenly between treated and untreated. The treatment was delivered intraperitoneally at 10 mg/kg body weight/dose, 3 times a week for the last 4 weeks of the study. Imaging consisted of 3D B-mode for liver localization, and targeted SWE captures for liver stiffness measurements. For comparison, collagen fiber density, width, length, and straightness were determined by Sirius red staining and automated fiber detection and quantification using CT-FIRE software.

Results: Young’s modulus (YM), a measure of tissue stiffness known to correlate with liver fibrosis, was significantly increased in the FFC diet group when compared to the chow controls (p < 0.001). FFC animals in the treatment group exhibited a slight, but nonsignificant, decrease in YM compared to the untreated FFC animals. There was no significant difference in liver stiffness between the treated and untreated mice in the standard chow group. Similarly, fiber density was significantly increased in FFC diet vs chow controls and lower in the FFC treatment group vs FFC vehicle controls (p < 0.01). Overall, collagen fiber density positively correlated with YM (r = 0.70). Collagen fibers were narrower and longer with FFC diet than chow controls, and with greater fiber curvature in the FFC treatment group vs no treatment.

Conclusion: These studies demonstrate the potential of the automated robotic ultrasound system to provide insights into the progression (and regression) of liver fibrosis in NASH models non-invasively. Future work will investigate improvements to sensitivity and specificity of the technique.

WED-449

Inhibition of CCAAT/enhancer-binding protein beta-serpinB3 axis by 1-piperidin propionic acid: a new targeted therapy for non-alcoholic steatohepatitis

Francesca Protopapa, Gianmarco Villano, Erica Novo, Cristian Turato, Santina Quarta, Mariagrazia Ruvoletto, Alessandra Biasiolo, Monica Chinellato, Andrea Martini, Elisabetta Trevellini, Marnie Granzotto, Stefania Canno, Laura Cendron, Maria Guido, Maurizio Parola, Roberto Vettor, Patrizia Pontisso

Background and aims: Non-Alcoholic Fatty Liver Disease (NAFLD) is becoming the major cause of chronic liver disease worldwide, with a 25% prevalence in the general population and a higher prevalence in obese and type II diabetes patients. NAFLD includes a spectrum of liver diseases ranging from simple hepatic steatosis to non-alcoholic steatohepatitis (NASH). The serine protease inhibitor SerpinB3 has been proposed as a novel hepatokine able to modulate liver inflammation, fibrosis as well as insulin resistance during NASH development. In the present study we have tested a specific SerpinB3 inhibitor, 1-Piperidin Propionic Acid (1-PPA), in in vivo and in vitro models of NASH as a novel targeted therapeutic strategy for NASH.

Method: In vivo pre-clinical models: histological parameters and gene expression of pro-fibrotic and pro-inflammatory markers were analyzed in the liver of both SerpinB3-transgenic (TG) fed on either MCD or CDAA diets to induce experimental NASH; in some experiments, SerpinB3 TG mice, starting from the second month, were injected with 1-PPA (70 ng/g). In vitro models: expression of pro-fibrotic and pro-inflammatory genes was assessed in THP1 and LX2 cell lines exposed to human recombinant SerpinB3 (hrSB3, 200 ng/ml) alone or with 1-PPA (100 ng/ml). The expression of CCAAT Enhancer Binding Protein Beta (CEBP-beta), a SerpinB3 transcription factor, also involved in metabolic disorders and inflammatory response, was analyzed in the mentioned cell lines with or without 1-PPA as well as in mouse livers in relation to SerpinB3 expression.

Results: Treatment with 1-PPA of TG/SB3 mice fed on CDAA or MCD diet led to a significant reduction of liver fibrosis and inflammatory infiltrate as compared to control mice fed on the same diets, as showed by Sirius Red staining, immunohistochemistry for F4/80 and analysis of transcript levels of major fibrotic and inflammatory mediators. In vitro experiments showed that in LX2 cells, pre-treatment with 1-PPA led to a significant reduction of SB3-dependent chemotaxis as well as of transcript levels of Col1A1, alpha-SMA, TGF-beta1. Moreover, 1-PPA treatment also reduced transcript levels of pro-inflammatory mediators, including IL-1beta, CCL-2 and TNF-alpha in THP1 cells exposed to hrSB3. Moreover, the inhibitory mechanism exerted by 1-PPA is likely to also act by affecting a peculiar C/EBP-beta/SerpinB3 axis, in which C/EBP-beta transcription factor was found to up-regulate SB3 but at the same time to be elicited by this serpin.

Conclusion: C/EBP-beta-SerpinB3 axis could have a role in the development of NASH. The SerpinB3 inhibitor 1-PPA is effective in down-regulating inflammatory and fibrogenic responses both in vitro and in NASH murine models, suggesting that this molecule has the potential markedly to reduce NASH progression.
**WED-450**

**Senescence sensitizes hepatocytes for fatty acid-induced cytotoxicity by compromising the mitochondrial function**

Lilli Rausch¹, Pavitra Kumar², Felix Heymann³, Mohsin Hassan¹, Akosua Boakye Viadom¹, Fausto Andreola², Frank Tacke¹

¹Charité—Universitätsmedizin Berlin, Department of Hepatology and Gastroentrology, Berlin, Germany.
²University College London, Institute for Liver and Digestive Health, London, United Kingdom.
³Berlin Institute of Health (BIH), Berlin, Germany.

Email: cornelius.engelmann@charite.de

**Background and aims:** Senescence is an irreversible cell cycle arrest caused by cellular stressors leading to a senescent phenotype that includes elevated p53, p21, and H2A.X expression and cytokine release. Steatotic liver has increased hepatocellular senescence and in pre-clinical models, senolysis reduces the senescent phenotype and fat content in the liver. As the molecular link(s) between cellular senescence and fat accumulation remain unclear, in the present study we explore the cause or consequences of hepatocyte steatosis and senescence. We hypothesize that senescent hepatocytes are susceptible to steatosis and lipotoxicity and senolysis could provide therapeutic cues against the free fatty acid (FFA)-induced cytotoxicity.

**Method:** Primary hepatocytes were isolated from C57BL/6j mice and cultured overnight. Cells were sensitized for 24 hours with pre-optimized dosages of senescence inducers H2O2 (250 μM) (via oxidative stress) and Nutlin 3a (10 μM) (via p53 stabilization) and subsequently incubated with 0.3 mM oleic acid (OA, unsaturated fatty acid), palmitic acid (PA, saturated fatty acid), or their 1:1 mixture (MIX) for further 24 hours. For the rescue experiment, steatotic and senescent cells were treated with senolytics, dasatinib and quercetin (D+Q) for 24 hours. Neutral lipid accumulation in cells was measured by Oil Red O staining (ORO) and senescence markers (p53, p21 and H2A.X) were measured by immunofluorescence. Mitochondrial function was assessed by XFe Seahorse analyser with 10 mM glutamine as substrates.

**Results:** FFA treatment increased lipid accumulation in mice hepatocytes, OA and MIX by 4-fold, and PA by 3-fold (p < 0.02). Additionally, 24 h OA treatment resulted in the upregulation of senescent markers (p53, H2A.X, and p21) whilst MIX caused primarily a p53 and H2A.X elevation. PA downregulated senescent makers but acted toxic to the cells. In senescent cells (H2O2 or Nutlin 3a-treated), OA further increased lipids accumulation along with increased p53 and H2A.X levels (Figure 1A) when compared to non-senescent OA-treated cells and to MIX or PA treated cells. Senescent cells showed lower cellular respiration (glycolysis and oxidative phosphorylation), that was further compromised after fatty acid treatment. Senolysis (D+Q) rescued the cellular respiration (glycolysis and oxidative phosphorylation) significantly in both steatotic and senescent hepatocytes (Figure 1B).

**Conclusion:** Free fatty acids induce senescent phenotype in murine hepatocytes. Senescent hepatocytes are prone to steatosis. Senolysis could rescue the cytotoxic effects of free fatty acids-induced senescence via elevating cellular respiration.

**Figure:** (abstract: WED-450).

---

**WED-451**

**Aging rates and oxidative stress in patients with non-alcoholic fatty liver disease and profound insulin resistance**

Olena Kolesnikova¹, Anastasiia Radchenko¹, Vilena Chupina², LiT. Malaya Therapy National Institute of the National Academy of Medical Sciences of Ukraine, Department of Study of Aging Processes and Prevention of Metabolic-Associated Diseases, Kharkiv, Ukraine.
²Kharkiv National Medical University, Kharkiv, Ukraine.

Email: anastasha.radchenko@gmail.com

**Background and aims:** Redox imbalance can be both a cause and a consequence of many metabolic pathologies, including non-alcoholic fatty liver disease (NAFLD) and insulin resistance (IR). Data regarding ageing rates and redox markers in NAFLD patients based on the IR level is limited. The aim of our study was to evaluate the parameters of oxidative stress (OS) and aging rates in patients with NAFLD and IR of various severity.

**Method:** Our study included 82 patients with NAFLD with a mean age of 48.5 [41.0;57.0] years (62.5% women) and comparison group of 62 patients without NAFLD with a mean age of 49.0 [38.4;54.9] years (64.6% women). Patients were divided into subgroups according to IR index (HOMA-IR): patients without IR (n = 22 and n = 28 with/ without NAFLD accordingly), with IR less than 3 times the upper limit of normal (ULN) (n = 32 and n = 34) and with IR 3 times higher than ULN (n = 28, present only in NAFLD group). Markers of OS included content of total hydroperoxides (THP) and total antioxidant activity (TAA), measured using colorimetric method. Ageing rates were estimated based on the difference between biological age calculated...
The potential role of Omentin-1 in metabolic associated fatty liver disease (MAFLD): evidence from translational studies

Noel Salvoza1,2,3, Pablo J Giraudi1, Silvia Gazzin4, Deborah Bonazza5, Silvia Palmisano6, Claudio Tiribelli1,4, Natalia Rosso1,1Fondazione Italiana Fegato Onlus, Metabolic Liver Disease Unit, Basovizza, Italy, 2University of Trieste, PhD Program in Molecular Biomedicine, Trieste, Italy, 3Philippine Council for Health Research and Development, DOST, Taguig, Philippines, 4Fondazione Italiana Fegato Onlus, Brain-Liver Unit “Rita Moretti,” Basovizza, Italy, 5Cattinara Hospital, Surgical Pathology Unit, Trieste, Italy, 6Cattinara Hospital, Department of Medical, Surgical and Health Sciences, Trieste, Italy

Email: noel.salvoza@fegato.it

**Background and aims:** Obesity, characterized by excessive visceral adipose tissue (VAT) is tightly associated with MAFLD. The pathogenesis of MAFLD is complex but recent studies reveal that the adipose tissue-liver axis plays a key role in MAFLD development. We investigated the potential role of omentin-1, a novel adipokine expressed by VAT, in MAFLD pathogenesis.

**Method:** In silico analysis of differentially expressed genes in VAT from obese patients with and without MASH, showed that omentin-1 might play a significant role. For in vivo clinical validation, omentin-1 mRNA expression and plasma protein levels were measured in lean controls and obese patients with biopsy-proven MAFLD. mRNA and protein levels of omentin-1 in VAT of juvenile mice MAFLD model have also been assessed. For in vitro and ex vivo studies, we assessed the effects of omentin-1 in the MAFLD-related mechanisms such as steatosis, inflammation, and oxidative stress. Finally, the effects of D-glucose and insulin on VAT omentin-1 were also analyzed ex vivo.

**Results:** The obese groups showed significantly lower VAT mRNA expression and plasma levels of omentin-1 as compared to the lean group (all p values <0.05). Interestingly, within the MASH group, fibrosis does not affect omentin-1 expression. Likewise, VAT of mice fed with high-fat diet, showing histological signs of MASH showed decreased omentin-1 mRNA (p = 0.012) and protein expression (p = 0.038) as compared to their control diet counterpart. In vitro, the addition of omentin-1 on fat-loaded (FFA) human hepatocytes showed no effect on steatosis but significantly decreased TNF-alpha levels (mRNA and protein), reduction in ER stress markers (Bip and Chop), and enhanced superoxide dismutase (SOD) antioxidant activity (all p values <0.05 vs. FFA). The same results were obtained using ex vivo VAT explants from obese patients upon omentin-1 supplementation (all p values <0.05 vs. control). In addition, omentin-1 reduced nuclear factor kappa B (NF-κB) mRNA expression in both in vitro (p value <0.01 vs. FFA) and ex vivo (p value <0.01 vs. control) studies. In VAT explants, D-glucose and insulin significantly reduced omentin-1 mRNA expression and protein levels (all p values <0.05 vs. control).

**Conclusion:** Taken together, our findings suggest that reduced levels of omentin-1 contribute to MAFLD development. Omentin-1 supplementation reduces inflammation and oxidative stress probably via inhibiting the NF-κB pathway, and might also play a role in the regulation of glucose and insulin. Further studies are needed for omentin-1 to be considered as a therapeutic target and/or biomarker.
**WED-453**

**Two-dimensional versus one-dimensional transient elastography: benefits of ultrasound imaging-based processing for liver stiffness measurements**

Adrien Besson¹, Baptiste Hériard-Dubreuil¹, Victor de Lédinghen²,³, Dan Dutartre⁴, Françoise Manon⁵, Joëlle Alivern⁶, Anne-Laure de Araujo⁷, Rhizlane Houmadi⁷, Julie Dupuy⁸, Juliette Foucher⁹, Joel Gay¹, Claude Cohen-Bacrie¹, E-Scopics, Saint-Cannat, France; ²Bordeaux University Hospital, Hepatology Unit, Pessac, France, ³INSERM U1312, BRIC, Bordeaux University, Bordeaux, France, ⁴Inria Bordeaux Sud-Ouest, Bordeaux, France

**Email:** adrien.besson@escopics.com

**Background and aims:** Fibroscan® (FS) Transient Elastography (TE) performs liver stiffness measurements (LSM) using a measure of the velocity of a shear wave generated by a 50 Hz single element probe mechanical vibration. It relies on a high pulse repetition frequency capture of the one-dimensional (1D) ultrasound (US) signal of that same probe. A new point of care ultrafast US imaging device (POCUS), Hepatoscope™, has been used to compute maps of shear wave velocities generated by a 50 Hz mechanical vibration of a US imaging probe. That same POCUS device provides conventional US imaging of the liver to help positioning the 2DTE map. We hypothesized that 2D processing of shear wave speed in tissue using 2DTE would somehow overcome an intrinsic limitation of 1D TE, where shear wave propagation speed can only be measured in the direction of the single element piston as opposed to a measurement that follows the direction of the shear wave propagation. The aim of this work was to assess the benefits of 2DTE against 1D TE methods, as available on the FS device, and as processed from US per-channel raw-data collected with Hepatoscope on patients with chronic liver diseases.

**Method:** 96 adult patients referred to a routine hepatology consultation for chronic liver disease, including a FS exam, were enrolled in this prospective single centre study (NCT04782050). Four Hepatoscope consecutive liver exams were added to routine care, performed by 2 operators (1 expert and 1 novice). US per-channel raw-data corresponding to at least three 2DTE stiffness values measured by Hepatoscope were recorded for each exam. Hepatoscope LSM computed as the median of 3 stiffness values obtained from both 1D (LSM₁D) and 2D (LSM₂D) processing of these data were compared to FS LSM. The intra- and inter-operator reproducibility of LSM₁D and LSM₂D were also assessed.

**Results:** LSM₂D showed a significant improvement over LSM₁D of the intra-operator reproducibility for experts (ICCSeattle = 0.84; 95% CI [0.73, 0.91] vs ICC₁D = 0.53; 95% CI [0.33, 0.68]), and of the inter-operator reproducibility (ICCSeattle = 0.74; 95% CI [0.60, 0.84] vs ICC₁D = 0.59; 95% CI [0.43, 0.72]). Figure 1 illustrates the ability of 2DTE to better track the shear wave and measure its speed in its propagation direction, thus eliminating measurement bias.

**Conclusion:** 2D processing of US data to measure the shear wave velocity along the direction of shear wave propagation, has demonstrated its ability to eliminate over-estimation bias of LSM. In addition, the estimation of liver stiffness in 2D has led to an increased intra- and inter-operator reproducibility, even considering LSM performed by novices. These results are encouraging as they support a broader use of 2DTE LSM, as available on the Hepatoscope POCUS device, as a less user-dependent method for widespread screening programs of liver fibrosis.

**WED-454**

**Zebrafish larvae as a model system to characterize effects of metabolic, drug and genetic perturbations on liver fat accumulation**

Endrina Mujica¹, Hangqing Zhang¹, Anastasia Emmanouilidou¹, Amin Allalou², Marcel den Hoed¹. ¹The Beijer Laboratory and Department of Immunology, Genetics and Pathology, Uppsala University and SciLifeLab, Uppsala, Sweden, ²Department of Information Technology; Division of visual information and interaction; Uppsala University and SciLifeLab, Uppsala, Sweden

**Email:** endrina.mujica@igp.uu.se

**Background and aims:** Non-alcoholic fatty liver disease (NAFLD) has a complex pathology that includes a spectrum of liver insults. No FDA-approved pharmacological treatment is currently available. The aim of this study is to validate a zebrafish model system for systematic genetic and drug screens for liver fat using CRISPR/Cas9, fluorescence imaging, and deep learning-based image analysis.

**Method:** To validate the model system, we first compared liver fat in larvae fed 3x more than sibling controls (n = 721). In overfed larvae, we subsequently examined the effect of i) 4% extra dietary cholesterol; and/or ii) 3% glucose added to the water (n = 574). Next, we examined the effect of treating metabolically challenged larvae with 0, 10 or 25 μM rosiglitazone (n = 865). Finally, we targeted the zebrafish orthologues of MTARCI (n = 383) and GPAM (n = 307) using CRISPR/Cas9, in fertilized eggs from parents with transgenically expressed, fluorescently labeled hepatocytes (Tg (fisbp10α:EGFP)). Larvae from all experiments were phenotyped at 10 or 11 days post fertilization. Before imaging, lipids were stained by incubation with a fluorescent dye (monodansylpentane) that labels neutral lipids. Next, optical sections of the liver were acquired using fluorescence microscopy. Liver size and the number of lipid droplets in the liver were automatically segmented and quantified using deep learning-based image analysis pipelines.

**Results:** Overfeeding resulted in more liver fat (beta ± SE 0.49 ± 0.10 SD units, p = 6.5 × 10⁻³). In overfed larvae, both cholesterol (0.61 ± 0.10) and glucose (1.35 ± 0.10) challenges resulted in more liver fat, in a non-additive manner (−1.29 ± 0.14). In overfed larvae challenged with extra cholesterol and glucose, treatment with 10 or 25 μM rosiglitazone protected from liver fat accumulation (−0.25 ± 0.09, p = 5.8 × 10⁻³). Finally, mutations in zebrafish orthologues of MTARCI and GPAM resulted in less liver fat compared with controls (−0.28 ± 0.14 and −0.56 ± 0.24). These findings are directionally consistent with effects of loss-of-function mutations identified in humans and are in line with these genes being the culprits in loci recently identified by genome-wide association studies for NAFLD.

**Conclusion:** Image-based screens in zebrafish larvae can be used to systematically characterize genes and drugs for a role in the development of NAFLD and prioritize the most promising candidates for further in-depth characterization and drug development.
Cyclophilin inhibition with rencofilstat shifts the liver transcriptome and lipidome in preclinical models toward resolution of non-alcoholic steatohepatitis

Daren Ure1,2, Winston Stauffer3, Bhavesh Variya1,2, Lacey Haddon1,2, Patrick Mayo1,2, Philippe Gallay2, Robert Foster1,2, 1Hepion Pharmaceuticals, United States, 2Hepion Research, Canada, 3Scripps Research Institute, United States

Email: dure@hepionpharma.com

Background and aims: Cyclophilins are a multi-isofrom class of enzymes that regulate the structure and function of proteins across a wide cross-section of the human proteome and have been shown to contribute to many disease processes. Rencofilstat is a potent inhibitor of several cyclophilin isoforms and has demonstrated antifibrotic, anti-inflammatory, and other therapeutic activities in liver disease models, supporting its current evaluation in Phase 2 clinical trials for non-alcoholic steatohepatitis (NASH). The aim of the present investigations was to characterize rencofilstat’s effects on the liver transcriptome and lipidome in three liver disease models to better delineate its modes of action.

Method: Three liver disease studies were conducted: 1) DIAMOND mouse model of NASH; 2) western diet plus carbon tetrachloride mouse model of NASH/fibrosis; 3) thioacetamide-induced liver fibrosis in rats (Physiogenex, France). Rencofilstat was administered in all studies. Elfibranor (ELF) and obeticholic acid (OCA) were additionally administered in the DIAMOND mouse study. Liver steatosis, inflammation, and fibrosis were measured histologically. RNA sequencing and mass spectrometry-based lipidome analysis (OWL, Spain) was performed on liver samples from all three studies.

Results: Rencofilstat decreased liver fibrosis in all three experimental models by 50–80% as measured by percentage Sirius red. RNA sequencing showed that rencofilstat altered the expression of 500–1500 genes in diseased livers which was approximately one-third the number of differentially expressed genes (DEGs) from ELF-treated or OCA-treated mice. A range of 74–81% of the rencofilstat DEGs overlapped with ELF or OCA DEGs. KEGG pathway mapping and network hub gene prediction similarly showed extensive overlap among the three drugs. Furthermore, all three treatments significantly attenuated KEGG pathways that were activated in vehicle-treated animals and in human NASH. Lipidomic analyses revealed that rencofilstat altered 3–10% of the liver lipid species across the three models, which was similar to OCA but less than ELF. Rencofilstat effects included reductions in saturated triglycerides, lysophospholipids, and sphingolipids, and especially shorter-chain species of these lipids. The lipids decreased by rencofilstat were typically increased in vehicle animals and correlated with percentage-area Sirius red staining.

Conclusion: Despite no known mechanisms of transcriptional regulation, rencofilstat positively changed gene expression networks similarly to FXR and PPAR agonists. Rencofilstat also altered liver lipid signatures consistent with attenuation of lipotoxic processes. These findings suggest that cyclophilins contribute to many pathophysiologic processes and blocking their modulatory actions with rencofilstat shifts the liver transcriptome and lipidome towards NASH resolution.

Tyrosol reduces steatosis, fibrosis and inflammation in a murine model of NASH by modulating the immune hepatic phenotype

Daniela Gabbia1, Katia Saya2, Martina Colognesi1, Ilaria Zanotto1, Francesco Paolo Russo3, Sara De Martin1, 1University of Padova, Dept. of Pharmaceutical and Pharmacological Sciences, Italy, 2University of Padova, Department of Surgery, Oncology and Gastroenterology, Italy

Email: sara.demartin@unipd.it

Background and aims: Besides its metabolic and detoxifying activity, the liver is an immunological organ where innate and adaptive immune cells are in close contact with blood-borne and gut-derived pathogens. Recent evidence indicates that NASH patients display a dysregulation of the hepatic immune landscape, mainly due to the increased influx of myeloid-derived monocytes and monocye-derived cells. Such changes fuel uncontrolled inflammation and cooperate with hepatocytes, hepatic stellate cells (HSCs) and liver sinusoidal endothelial cells in disease progression. Phenolic compounds of natural origin including tyrosol are known to mitigate hepatic fibrosis through the regulation of NADPH oxidases (NOKs), whose exaggerated expression has been related to increased ROS-induced oxidative stress. This study aims at unravelling whether and how tyrosol modulates the hepatic recruitment of immune cells in a murine model of NASH.

Method: The murine model of NASH was obtained by feeding male C57BL6 mice with a high fructose-high fat diet for 14 weeks, combined to the IP administration of CCl4 (0.05 mg/kg) in the last 4 weeks. Starting from week 4, tyrosol was administered daily by oral gavage (10 mg/kg). Behavioral and motor tests, e.g. grid, rotarod and open field test, were performed to assess signs of extrahepatic manifestations of NASH, e.g. sarcopenia and mood disorders. Inflammation, fibrosis, and steatosis were evaluated by liver histology by means of HandE, Masson’s trichrome, and Oil Red O staining, respectively. NOX1 and aSMA expression was assessed by means of IHC. The presence of immune cells (CD4+, CD8+ lymphocytes, Tregs, M1- and M2- macrophages) in the liver was assessed by means of flow cytometry.

Results: Tyrosol attenuated fatigue and anxious behavior in NASH mice, restoring performances similar to those of healthy animals. Furthermore, tyrosol reduced steatosis, fibrosis and aSMA expression, that were significantly lower than those of NASH untreated animals (p < 0.01). Accordingly, tyrosol-treated NASH mice had less inflammatory foci in the liver than untreated ones (p < 0.05), a decreased expression of NOX1 (p < 0.05), suggesting a reduction of hepatic inflammation and oxidative stress. This was confirmed by the significant reduction in proinflammatory M1-type macrophages (p < 0.05), CD4+ (p < 0.05) and T helper effector lymphocytes (p < 0.05), and the significant increase of Treg cells (p < 0.05) observed in tyrosol-treated mice, with respect to untreated ones.

Conclusion: In a mouse model of NASH, tyrosol modulates the different populations of immune cells in the liver, counteracting steatosis, fibrosis, oxidative stress and inflammation, all hallmarks of this complex liver disease.
Fig 1. (abstract: WED-457) A) Circulating levels of ICAM-1/CD54 in biopsy-proven NAFLD patients (steatosis simple (SS), nash without fibrosis (NASH F0), nash with fibrosis F1/F2 (NASH F1-F2) and NASH with moderate fibrosis (F3-F4). B) VEGF expression in NAFLD patients with respect to NAS Score. C) VCAM-1/CD106 serum levels related to the levels of fibrosis in the disease. D) Circulating levels of Serpin E1/PAI-1 in NAFLD patients correlated to with steatosis levels. E) Immunohistochemistry of endothelial dysfunction markers CAV-1 and ICAM-1, of the different stages of patients biopsied for NAFLD suspected. F) Quantification of positive pixels of immunohistochemical images for ICAM-1 and CAV-1 antibodies with ImageJ.
Method: Forty patients were included with different stages of the disease (steatosis simple group (n = 7), NASH F0 group (n = 11), NASH F1-F2 group (n = 10) and NASH F3-F4 group (n = 12)). ELISA techniques were performed for the selected endothelial dysfunction markers (ICAM-1,CDS4, VCAM-1,CDD106, VEGF, Serpin E1,PAI-1 and ADAM12). The following outcomes were analysed: mild/moderate steatosis, mild/moderate fibrosis and NAS score. Due to relevant analyses results, subsequent validation of ELISA in ICAM included a total of 120 patients recruited. In addition, immunohistochemistry of hepatic sections was performed in 20 patients with different stages of the disease following the same groups as described below together with a control group (n = 4 patients/group) for caveolin-1 (Cav-1), angiotensinogen (AG) and intercellular adhesion molecule 1 (ICAM-1). Cardiovascular events were also recorded and Castelli index was calculated.

Results: Mean age was 60±9, of them, 52.5% (21/40) were women. Circulating levels of ICAM-1 were associated with liver fibrosis (SS: 18.35±5.26 vs. NAS-F0 20.48±7.79 vs. F1-F2 24.38±12.34 vs. F3-F4 26.21±16.05 ng/ml, p = 0.019; n = 120; Figure 1A). Moreover, ICAM levels positively correlated with the NAS Score (r: 0.413; p < 0.001). Circulating levels of ICAM-1 were associated with the presence of significant fibrosis (F0-F1 47.9 ± 26.2 vs. F2-F4 66.5 ± 33.9 ng/ml; p = 0.042; n = 40; Figure 1C); and a positive correlation was found between VCAM and ICAM (r: 0.523; p = 0.001). VEGF circulating levels were increased in patients with NAS Score >5: 284.05 ± 80.8 pg/ml; p = 0.03; n = 40; Figure 1B). Circulating levels of Serpin E1 increased with the degree of hepatic steatosis (mild steatosis 6.49 ± 5.9 vs. moderate/severe steatosis 8.73 ± 4.2 ng/ml; p = 0.036; n = 40; Figure 1D), and correlated with the Castelli index (r: 0.368; p = 0.023). No significant differences in circulating ADAM12 were found in this study. Moreover, the hepatic expression of Cav-1 and ICAM-1 were found to be increased following the hepatic injury, and no significant differences in angiotensin were found (Fig 1E and 1F). Finally, a correlation with liver fibrosis was observed in both ICAM-1 (r = 0.706; n = 19; p = 0.001) and Cav-1 (r = 0.681; n = 20; p = 0.001).

Conclusion: Markers of endothelial dysfunction are related to the main histopathological features of NAFLD, such as fibrosis, hepatic steatosis or NASH, both at the circulating and the hepatic level in NAFLD patients.

WED-458

Increasing gut microbiota produced secondary bile acids to protect against non-alcoholic steatohepatitis

Justine Gillard1,2, Martin Roumain1, Corinne Picalausa1, Morgane Thibaut1, Giulio G. Muccillo1, Anne Tailleux1, Bart Staels2, Laure Bindels2, Isabelle Leclercq1, Université catholique de Louvain, Laboratoire de Hepato-Gastroenterologie, Belgium, 3Université catholique de Louvain, Metabolism and Nutrition Research Group, Belgium, 4Université catholique de Louvain, Bioanalysis and Pharmacology of Bioactive Lipids, Belgium, 4University of Lille, Inserm, CHU Lille, Institut Pasteur de Lille, U1011-EGID, France

Email: justine.gillard@uclouvain.be

Background and aims: Bile acids (BAs) regulate immunometabolic pathways impaired in NASH by activating BA-receptors, such as FXR and TGR5. Hence, BAs are attractive candidates for therapeutic development. An imbalance between primary BAs (reflecting hepatic synthesis) and secondary BAs (reflecting transformation by gut microbe) is a recurrent feature in NASH. We previously reported that secondary BAs were low in mice with NASH. Here, we aimed at restoring the balance between primary and secondary BAs by (1) a dietary supplementation with deoxycholic acid (DCA), a secondary BA, or (2) a probiotic approach to enhance endogenous production of secondary BAs by gut bacteria. We evaluated the effects of both approaches on the composition and signaling of BAs and on NASH progression.

Method: We used high fat diet (HFD)-fed foz/foz mice as a model of NASH whose BA pool is depleted in secondary BAs. They received (1) a HFD containing DCA or a plain HFD or (2) an oral suspension of C. scindens, a gut bacterium supporting the conversion of primary BAs to secondary BAs, or vehicle for 12 weeks.

Results: Supplementation of the HFD with DCA increased total BAs, total secondary BAs and DCA concentrations in foz/foz mice, shifting the BA pool towards a more TGR5- and FXR-agonistic pool. Notably, DCA elevated the TGR5 activation capacity of the portal blood. The restoration of BA signaling by DCA supplementation significantly lowered body weight gain, fasting glycemia and insulinemia and protected from NASH (Figure). Indeed, DCA reduced steatosis, macrophage infiltration and ballooning. Hence, only 15% of treated mice still presented NASH, while 100% of untreated mice met the criteria for NASH diagnosis. We next aimed at increasing endogenous DCA production by targeting the gut microbiota with a probiotic approach. We confirmed by a functional assay that C. scindens transforms primary BAs to secondary BAs. However, C. scindens administration to foz/foz mice did not change the endogenous production of secondary BAs, the portal BA pool and the activation of BA-receptors FXR and TGR5. Coherently, it had no significant effect on liver and metabolic phenotype (Figure), despite a massive increase of the fecal load of C. scindens and its survival in the gut of treated mice.

Figure: Conclusion: The administration of C. scindens did not enhance the endogenous production of secondary BAs. A too low dose and frequency of administration, a too low biological effect of C. scindens on a complex microbial community or a high hepatic reconversion of secondary BAs to primary BAs are possible explanations for the lack of impact of C. scindens on the BA pool of a mouse model with a complex gut microbiota. Nevertheless, we demonstrated that the restoration of the balance between primary and secondary BAs by a dietary supplementation with the secondary BA DCA protected from NASH and associated dysmetabolic features.

WED-459

Combined hepatic and adipose tissue transcriptomics highlights circulating NASH biomarkers

Marica Meroni1, Emilia Rita De Caro1, Federica Chiappori2, Miriam Longo1, Erika Paolini1, Ettore Mosca2, Ivan Merelli3, Rosa Lombardi1, Sara Badioli1, Marco Maggioni1, Alessandro Orro2, Alessandra Mezzelani1, Luca Valentini1, Anna Ludovica Fracanzani1, Paola Dongiovanni1, Fondazione IRCCS Cà Granda Ospedale Maggiore Policlinico, Milan, Italy; General Medicine and Metabolic Diseases, Milan, Italy, 2Institute for Biomedical Technologies, National Research Council (ITB-CNR), Segrate, Italy, 3University of Milan, Department of Pathophysiology and Transplantation, Milan, Italy

Email: paola.dongiovanni@policlinico.mi.it

Background and aims: Obesity represents the main contributor to non-alcoholic fatty liver disease (NAFLD) and adipose tissue is strongly interlaced with the liver in the disease pathogenesis and progression. Previous studies were restricted to investigate the hepatic transcriptome across the entire spectrum of NAFLD, whereas the transcriptomic changes which occur in white adipose tissue (WAT) in relation to liver damage have been poorly investigated. Therefore, we aimed to compare hepatic and adipose tissue
transcriptome in NAFLD patients with the purpose to identify shared biomarkers useful for the diagnosis of advanced liver damage.

**Method:** We performed high-throughput RNA-sequencing in 167 hepatic samples from obese patients and in a subset of 79 matched adipose tissues. Patients were subdivided in normal liver, mild and severe NAFLD according to histology. Circulating cathepsin D (CTSD) was assessed by ELISA.

**Results:** We identified a specific transcriptomic signature that may discriminate patients with severe NAFLD and isolated steatosis, including 424 deregulated genes in liver and 209 in adipose tissue. According to pathway and network analyses, inflammation, ECM remodeling and mitochondrial dysfunction were upregulated whereas oxidative phosphorylation was downregulated in both tissues. We highlighted 13 genes commonly deregulated in both tissues and among them, CTSD showed the most robust diagnostic accuracy in discriminating mild and severe NAFLD. In 52 obese subjects and in a validation cohort of 432 histologically-characterized NAFLD patients, serum CTSD progressively increased from normal liver to severe NAFLD and it was associated with steatosis, necroinflammation, fibrosis, steatohepatitis (NASH) and NAS>5. The area under the curve (AUC) weighted for transaminases to foresee severe NAFLD versus mild and normal liver was 0.78 and 0.87, respectively.

**Conclusion:** CTSD may be a possible biomarker of severe NAFLD since its hepatic/adipose tissue expression as well as circulating levels correlated with liver damage thus allowing to discriminate advanced disease.

**WED-460**

Thermoacoustic assessment of fatty liver disease - an early clinical feasibility study

Jang Hwan Cho¹, Michael Thornton¹, Jing Gao², Colby Adamson², Idan Steinberg¹. ¹ENDRA Life Sciences inc, ANN ARBOR, United States, ²Rocky Vista University, Ultrasound Research medical center, Ivins, United States

**Background and aims:** Thermoacoustics (TA) is a non-invasive, non-ionizing, molecular-sensitive imaging technology based on the absorption of radio frequency waves combined with low-cost ultrasound. Unlike purely ultrasonic approaches (such as backscatter and attenuation) that are sensitive to changes in the speed of sound, and tissue density, that may be confounded by fibrosis, TA signals are similar to Magnetic Resonance Proton Density Fat Fraction (MRI-PDFF) as they both represent stoichiometric mixing of adipose and lean tissue and thus provide a high diagnostic value. The Thermo-Acoustic Enhanced Ultrasound (TAEUS) Fatty Liver Imaging Probe (FLIP) is a hand-held, point-of-care system that quantitatively assesses liver fat content. This work describes an early clinical feasibility study with TAEUS-FLIP and a comparison to MRI-PDFF for demonstrating the potential of TA for assessing fatty liver disease.

**Method:** 16 subjects with suspected Non-Alcoholic Fatty Liver Disease (NAFLD) were scanned at Rocky Vista University, Ultrasound Research medical center, USA. For each subject, after fasting for 6-8 hours, an anatomic B-mode ultrasound scan was obtained by a trained sonographer to determine the locations of the
liver capsule and overlying tissue (muscle, fat, and skin), followed by up to 10 consecutive FLIP scans over a 5–8 minute procedure. MRI-PDFF measurements were obtained to assess liver fat fraction. The median value of their individual FLIP scans was used to avoid outlier acquisitions. 3 subjects were excluded from the analysis based on FLIP measurements that were not concordant with the study subject’s muscle thickness obtained by B-mode ultrasound. Linear regression and unpaired t-test were used to compare the estimated FLIP metric with liver fat fraction as measured by MR-PDFF. In a 2nd study, a trained user of the FLIP system performed 12 separate exams, each consisting of 6–8 measurements per exam, to determine intra-operator variability.

**Results:** Figure 1 shows the median FLIP metric for each subject compared to MRI-PDFF. The two methods are strongly correlated, with a Pearson correlation coefficient of \( r = 0.79 \). Linear regression reveals that the FLIP metric of only 3 out of 13 subjects falls out of the 95% confidence interval, indicating a clear relation between the FLIP-derived measurements and MRI-PDFF values, with 85% of the subjects staged the same by both. To assess the FLIP method’s ability to discriminate early stages of NAFLD (S0 and S1) from later stages (S2 and S3), an unpaired t-test was performed on the FLIP metric with \( p < 0.02 \). In a second study involving 12 FLIP procedures, intra-operator variability was 9.4% (S.D. 4.5%).

**Conclusion:** This early feasibility liver fat fraction study compares TAEUS-FLIP to MRI-PDFF. It provides insight into the potential of TA methods to assess liver fat content, similar to MRI-PDFF, at the point of care, at a fraction of the cost.

**WED-461**

**BMP-SMAD pathway upregulation in hepatocytes delays NAFLD-NASH development**

Lauro Silvestri1,2, Mariateresa Pettinato3, Valeria Furiosis3, Letizia Bavuso Volpe4, Shuling Guo4, Antonella Nai2,3, Alessia Pagani2, 1IRCCS Ospedale San Raffaele, Regulation of Iron Metabolism Unit, Division of Genetics and Cell Biology, Milan, Italy, 2Università Vita-Salute San Raffaele, Italy, 3IRCCS Ospedale San Raffaele, Regulation of Iron Metabolism Unit, Division of Genetics and Cell Biology, Milan, Italy, 4Ionis Pharmaceutical, United States

**Background and aims:** Non-alcoholic Fatty Liver Disease (NAFLD) is characterized by liver fat accumulation and insulin resistance, and may progress to steatohepatitis (NASH), cirrhosis and hepatocellular carcinoma. Currently, the molecular players involved in its progression are poorly defined and no specific therapies are available. Lipid and iron metabolisms are interconnected since excess iron in hepatocytes favors NAFLD. Iron homeostasis is regulated by the hepatic hormone hepcidin, whose expression is increased by iron-mediated BMP-SMAD activation, and downregulated by the BMP-SMAD inhibitor Tmprss6. Tmprss6 KO mice show attenuated hepatosteatosis and insulin resistance in high-fat diet, independently of body iron, suggesting a role for the BMP-SMAD/hepcidin in lipid and glucose metabolisms. To deeply define the mechanism, we re-evaluated liver differentially expressed genes from Tmprss6-KO and control mice, demonstrating that increased BMP-SMAD/hepcidin upregulates Ppara and its target genes. Since PPARa activation improves NAFLD-NASH, we hypothesize that Tmprss6 targeting might be a potential therapeutic approach to this disorder.

**Method:** Wild-type male mice were kept a NAFLD-NASH-inducing diet (FPC) for 18 weeks. Antisense oligonucleotides (ASOs) against Tmprss6 (Tmprss6-ASO) or control-ASO were injected biweekly for 6 weeks, when hepatosteatosis was established. Histological and gene expression analysis was performed for phenotypic characterization.

**Results:** Liver Tmprss6 is downregulated and BMP-SMAD target genes (hepcidin/Id1) increased as expected. Tmprss6-ASO treatment counteracts FPC-induced hepatomegaly, improves hepatosteatosis and ameliorates lipid metabolisms, decreasing the expression of genes involved in lipid, storage and de novo lipidogenesis. Tmprss6-ASO treatment improves FPC-induced liver mitochondrial dysfunction, decreases the expression of pro-inflammatory cytokines and oxidative stress. In addition, Tmprss6 targeting prevents collagen deposition and fibrosis.

**Conclusion:** Tmprss6 downregulation, by activating the hepatocyte BMP-SMAD pathway, counteracts NASH development. Although the molecular mechanisms are still under investigation, our approach could be considered highly translatable to patients since Tmprss6-ASOs are currently in Phase 2 clinical trials for iron-loaded diseases due to impaired erythropoiesis. Our study highlights a new therapeutic application of this drug, worth to be tested in NAFLD-NASH patients.

**WED-462**

**Hepatocyte depletion of ERK5 impairs the response to lipotoxic oxidative stress resulting in defective insulin receptor signaling**

Alessio Menconi1, Giovanni Di Maira2, Giulia Lori1, Benedetta Piombanti1, Claudia Campani1, Maria Letizia Taddei1, Salvatore Petta2, Rosaria Pipitone2, Stefania Grimaudo2, Armando Curti1,1, Elisabetta Rovida1, Fabio Marra1, 1University of Florence, Italy, 2University of Palermo, Italy, 3Careggi, DMSC, Firenze, Italy

**Email:** fabio.marra@unifi.it

**Background and aims:** Insulin resistance is an early event in non-alcoholic fatty liver disease (NAFLD), but the molecular mechanisms underlying the reduced response to insulin are still elusive. The mitogen-activated protein kinase ERK5 has been implicated in the development of hepatic fibrosis and cancer. Aim of this study was to investigate the role of ERK5 in the regulation of hepatocyte sensitivity to insulin.

**Method:** A murine hepatocyte cell line (MMH) was silenced using lentiviral vectors encoding shRNA for the ERK5 gene. Mitochondrial depolarization was assayed using the TMRE staining protocol. OXPHOS was measured by Seahorse. Mice with hepatocyte-specific deletion of ERK5 (ERK5ΔOXPHOS) were fed with a high-fat diet (HFD) for 16 weeks. For Glucose and insulin tolerance tests were conducted injecting 1 g/kg BW glucose or 0.8 U/kg BW insulin, respectively, i.p.

**Results:** MMH stably silenced for ERK5 showed reduced Akt activation following insulin stimulation. When ERK5-silenced cells were exposed to palmitic acid and then stimulated with insulin, Akt activation was abrogated, and expression of the insulin receptor (IR) reduced. Additionally, ERK5 silencing induced phosphorylation and activation of JNK, resulting in phosphorylation of IRS-1 on inhibitory residues (S307). In parallel, an increase of mitochondrial ROS generation was observed in ERK5-depleted MMH. ERK5 is known
to induce a NRF2-dependent anti-oxidative stress response. Expression of the NRF2-target genes HMOX1 and NQO1 was reduced in ERK5-silenced MMH. Treatment with NAC, a free-radical scavenger, prevented the downregulation of the IR and the increase in IRS1 phosphorylation on S307. Measurement of the mitochondrial membrane potential indicated a strong depolarization in ERK5-silenced cells, together with an impairment of mitochondrial OXPHOS, associated with up-regulated expression of PGC-1alpha and TRIB3, a negative regulator of insulin signalling through inhibition of Akt. ERK5AHEp mice exhibited impaired glucose tolerance and reduced insulin sensitivity. Hepatocyte depletion of ERK5 in vivo was also associated with reduced expression of IR, and increased expression of PGC-1alpha and TRIB3. Conclusion: We have elucidated a new role of ERK5 in maintaining hepatocyte insulin sensitivity, via an antioxidant response involving IRS-1, PGC-1alpha, and TRIB3, and converging on Akt activation.

WED-463
Hepatic Apolipoprotein J facilitates metabolic disease progression by promoting mTOR-mediated suppression of autophagy
Duan Shuangdi1, Qin Nong1, Pi Jiayi1, Wang Hsin-Tzu1, Sun Hung-Yu1, 2
1Human University, China, 2National Cheng Kung University, Taiwan
Email: s5893149@gmail.com

Background and aims: Ectopic lipid accumulation increases vulnerability of the liver to promote liver injury and metabolic syndromes (MetS). Previously, our group had showed that Apolipoprotein J (ApoJ), a Golgi-resident molecular chaperone, participated in lipid homeostasis, which promoted MAFLD progression. Notably, accumulation of ApoJ in proximal tubule was found in mouse models of diabetic kidney disease. Pathologically, ApoJ interfered TFEB-autophagy axis to facilitate development of MetS, e.g. metabolic-associated fatty liver disease (MAFLD) and diabetic nephropathy (DN).

Method: The ApoJ-mTOR interaction was identified and validated by differential proteomic approach and co-immunoprecipitation assay. The function of ApoJ on mTOR-TFEB-autophagy axis was facilitated to develop MetS, e.g. metabolic-associated fatty liver disease (MAFLD) and diabetic nephropathy (DN).

Results: mTOR was demonstrated as a novel client protein for ApoJ, a Golgi-resident molecular chaperone, participated in pathogen- and nutrient-induced aberrant lipid accumulation. Herein, we demonstrated that ApoJ modulates mTOR-TFEB-autophagy axis to facilitate development of MetS, e.g. metabolic-associated fatty liver disease (MAFLD) and diabetic nephropathy (DN).

Conclusion: We have elucidated a new role of ERK5 in maintaining hepatocyte insulin sensitivity, via an antioxidant response involving IRS-1, PGC-1alpha, and TRIB3, and converging on Akt activation.

WED-464
Bridging the gap-how human microphysiological systems improve the translatability of NASH drug discovery
Ovidiu Novac1, Raul Silva1, Tomasz Kostrzewski1, 3CN Bio, Milton, United Kingdom
Email: Ovidiu.Novac@cn-bio.com

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is one of the most prominent forms of chronic liver disease worldwide, reflecting the epidemic of global obesity. Those with progressive variant of NAFLD, non-alcoholic steatohepatitis (NASH), are at significantly greater risk of multisystem morbidity and mortality. Traditionally, preclinical trials are mainly based on 2D and in vivo animal models but have failed constantly to predict human drug efficacy as they lack translatability and inadequately recreate the complexity and multifaceted nature of this human disease. Building more predictive, human-relevant models is crucial to successfully bringing efficient anti-NASH therapies to the market. Microphysiological systems (MPS) recapitulate key aspects of human organs’ phenotype and architecture. MPS models are currently undergoing rigorous validation studies so that in the future they may be fully adopted as standard preclinical assessment tools.

Method: Our in vitro NASH model uses a triple culture consisting of primary human hepatocytes, Kupffer and hepatic stellate cells, which are cultured together in 3D microtissue structures in a perfused MPS. The microtissues are cultured in medium containing free fatty acids for at least 2 weeks to induce a NASH-like phenotype.

Results: The PhysioMimix™ NASH model captures all key aspects of the human disease: intracellular hepatic fat accumulation, inflammation (secreted cytokines and chemokines such as IL-6, IL-8 and TNFα) and fibrosis (extracellular matrix components and profibrotic markers such fibronectin, and TIMP-1). Recently we validated our MPS NASH model using two anti-NASH compounds, Obeticholic acid and Elafibranor. Both compounds matched clinical findings by significantly reducing inflammatory and fibrosis markers. Here, we further expand the validation of our NASH model by measuring the effects of two more anti-NASH compounds that are currently in late-stage NASH/NALFD clinical trials. Selenium furthered showed no antifibrotic or anti-inflammatory effects in our MPS NASH model at clinically relevant dosage, matching results from phase III STELLAR trials, despite reduced fibrosis and inflammation being detected in alternative 3D spheroid models. Aramchol showed a significant reduction in fibrosis (matching data from ARMOIR Phase III study) and proved to be safe at highest tested concentration without altering liver microtissues’ functionality.

Conclusion: Overall, we demonstrate how this NASH liver MPS provides translatable insights into drug efficacy for NASH therapeutic and brings a promising, sensitive alternative for pre-clinical NASH screening to help fast-track decision making and access to the market.

WED-465
Human skin stem cell-derived hepatic cells with genetic predisposition for liver fat accumulation mimic susceptibility to develop metabolic dysfunction-associated fatty liver disease
Alexandra Gatzios1, Robim M Rodrigues1, Joery De Kock1, Matthias Rombaut1, Dinja De Win1, Vera Rogiers1, Joost Boeckmans1, Tamara Vanhaecke1, 1Vrije Universiteit Brussel, In vitro Toxicology and Dermato-cosmetology, Brussels, Belgium
Email: alexandra.gatzios@vub.be

Background and aims: Recently, a polygenic risk score was developed to predict hepatic fat content (PRS-HFC) based on single nucleotide polymorphisms (SNPs) in four genes, namely patatin-like phospholipase domain-containing protein 3 (PNPLA3) rs738409 C>G, transmembrane 6 superfamily member 2 (TM6SF2) rs58542926 C>T, glucokinase regulator (GCKR) rs1260326 C>T and membrane bound O-acyltransferase domain-containing 7 (MOBATE7) rs641738 C

Figure:

Conclusion: The present study highlighted the pathological role of hepatic ApoJ in lipid homeostasis and suggested ApoJ as a therapeutic target for MetS.
POSTER PRESENTATIONS

> T. Here, we aim to investigate the impact of the PRS-HFC on the metabolic effects induced by triggers related to metabolic dysfunction-associated fatty liver disease (MAFLD), employing human skin-derived precursors (hSKP) differentiated towards hepatic cells (hSKP-HPC).

Method: The PRS-HFC was determined for 79 hSKP cell lines established from different donors and they were classified in three risk categories (R1, R2 and R3). Five cell lines were selected per category and differentiated towards hSKP-HPCs. The cultures were incrementally exposed for 24 hours to environmental MAFLD triggers, including fatty acids/fructose (condition 1) + ethanol (condition 2) + lipopolysaccharide (LPS)/tumor necrosis factor alpha (TNFa) (condition 3). The neutral lipid load was quantified and the expression of genes related to inflammation, oxidative stress, and lipid processing and synthesis was measured.

Results: Minor allele frequencies of 0.31, 0.04, 0.38 and 0.41 were found for PNPLA3, TM6SF2, GCKR and MBOAT7, respectively, which is in line with frequencies reported for the general population. The triggers from condition 3 induced the neutral lipid load significantly in all risk categories. Yet, R3 hSKP-HPC cultures exhibited a 1.5- to 2-fold higher lipid load in every test condition compared to R1 and R2 cultures. In addition, in condition 3, the induction of interleukin 6 (IL6) was approximately twice as high in R3 cultures (77-fold) compared to the other categories (R1 29-fold and R2 55-fold), whereas C-C motif chemokine ligand 2 (CCL2) was increased equally (approximately 15-fold) over all three categories. Glutathione peroxidase 7 (GPX7), a marker of oxidative stress, was 1.3-fold higher in both R2 and R3 cultures compared to R1 hSKP-HPC cultures. In all test conditions, R3 donors appeared to have impaired mitochondrial beta oxidation, as indicated by a 2.5-fold lower expression of very long-chain acyl-coenzyme A dehydrogenase (ACADVL). Furthermore, PNPLA3 levels were at least 2-fold lower in R3 hSKP-HPC cultures for all tested conditions compared to both R1 and R2, suggesting deficient lipase activity in these donors.

Conclusion: With increasing PRS-HFC, hSKP-HPC cultures exhibit greater susceptibility to MAFLD-inducing triggers and therefore could represent a human- and disease-relevant in vitro model to investigate the impact of genetic predisposition in the pathogenesis of MAFLD.

WED-467
A new nuclear-erythroid-2-related factor 2 activator for the treatment of non-alcoholic steatohepatitis: evidence of metabolic and anti-fibroinflammatory effects in human precision cut liver slices
Adel Hammoutene1,2, Samira Lauouirem1, Nathalie Colnot2, Miguel Albuquerque2, Angélique Brzustowski1, Dominique Valla1, Nicolas Provost3, Philippe Délerville2, Valérie Paradis1,3, 1Université Paris Cité, Inserm, Centre de recherche sur l'inflammation, F-75018 Paris, France, France, Cardiovascular and Metabolic Diseases Research, Institut de Recherches Servier, Suresnes, France, France, 2Département de Pathologie, Hôpital Beaujon, Assistance Publique–Hôpitaux de Paris, Clichy, France, France Email: amsadel@hotmail.com

Background and aims: Oxidative stress triggers non-alcoholic steatohepatitis (NASH) and fibrosis. Previous animal studies demonstrated that the transcription factor NRF2, the master regulator of anti-oxidant response, protects against NASH and fibrosis. S217879, a next generation NRF2 activator has been shown to trigger NASJ resolution and to reduce established fibrosis in rodents. Our aim was to evaluate the therapeutic potential of S217879 in NASH using the relevant experimental 3D model of human precision cut liver slices (PCLS), and to compare its effects to those of a reference molecule, Elafibranor (PPARalpha/delta agonist).

Method: We treated PCLS from ten patients with various stages of metabolic-associated fatty liver disease (MAFLD, from simple steatosis to advanced NASH with cirrhosis) with S217879 (3 μM) or Elafibranor (10 μM) for two days. Safety and efficacy profile including impact on steatosis, liver injury, inflammation and fibrosis were assessed. Mechanisms involved in NASH pathophysiology, namely anti-oxidative stress response, autophagy and endoplasmic reticulum-stress, were also evaluated.

Results: Neither Elafibranor nor S217879 had toxic effects on human PCLS with MAFLD. PPARalpha/delta target genes (FDIR4 and FG2F1) and NRF2 target genes (NQO1 and HMOX1) were strongly upregulated in PCLS in response to Elafibranor and S217879, respectively...
0.05). Compared to untreated PCLS, Elafibranor and S217879-treated slices displayed lower triglycerides and reduced inflammation (IL-1beta, IL-6, CCL2) (p < 0.05). Additional inflammatory markers (CCLS, STING, ICAM-1, VCAM-1) were downregulated by S217879 (p < 0.05). S217879 but not Elafibranor lowered DNA damages (p < H2A.X, RAD51, XRCC1) and apoptosis (cleaved Caspase-3), and inhibited fibrogenesis markers expression (alpha-SMA, COL1A1, COL1A2) (p < 0.05). Such effects were mediated through an improvement of lipid metabolism, activated anti-oxidant response and enhanced autophagic flux, without effect on endoplasmic reticulum-stress.

Conclusion: This study highlights the therapeutic potential of a new NRF2 activator for NASH using patient-derived PCLS, and is a step towards the use of NRF2 activating strategies in clinical trials.

Figure:

**Conclusion:** These findings report an innovative mechanism to activate NRF2 that could be used as an alternative to conventional anti-inflammatory therapies and to protect the liver from NASH and fibrosis.

**WED-469**

Quantitative ultrasound for liver steatosis assessment: benefits of measurements over a large two-dimensional region of interest on the performance of image-brightness-based parameters

Baptiste Hériard-Dubreuil1, Adrien Besson1, Victor de Lédinghen2,3, Dan Dutartre4, François Manon4, Joëlle Abiven4, Anne-Laure de Araujo5, Rhizlane Houmadi6, Julie Dupuy2, Juliette Foucher2, Joel Gay3, Claude Cohen-Bacrie5, I-Scopics, Ultrasound RandD, Saint-Cannat, France, 4Bordeaux University Hospital, Hepatology Unit, Pessac, France, 3INSERM U1312, BRIC, Bordeaux University, Bordeaux, France, 5Inria Bordeaux Sud-Ouest, Bordeaux, France, 6E-Scopics, Saint-Cannat, France

Email: baptiste.heriard-dubreuil@i-scopics.com

**Background and aims:** Ultrasound (US) imaging is recommended as the first line non-invasive modality to screen for significant steatosis, using qualitative assessment of liver US brightness. Quantitative brightness-derived parameters, US attenuation (UA) and backscatter coefficient (BSC), are known to be related to liver steatosis as US propagation properties of tissues correlate with fat content. Fibroscan® (FS) uses US signals captured with a 1D single element probe to measure UA, called Controlled Attenuation Parameter (CAP). The CAP measurement workflow requires a continuous acquisition and accumulation of independent values of UA over time so as to sample a large area of the liver with the 1D-single beam interrogation. This may lead to long screening times. We studied the benefits of a large region of interest (ROI) for the computation of UA and BSC based on US data collected with a new ultrafast point of care device, Hepatoscope™.

**Method:** 60 adult patients referred to routine hepatology consultation for chronic liver disease, including a FS exam, were enrolled in this prospective study (NCT04782050). Four Hepatoscope consecutive liver exams were added to routine care, performed by 2 operators (1 expert and 1 novice), during which 10 consecutive sets of US per-channel raw-data were collected. UA and BSC values, alongside individual quality indicators, were computed using three different sizes of ROI (small, medium and large). Medians of BSC and UA available values with sufficient quality were considered. Data were analysed to determine the intra- and inter-operator reproducibility and the r² correlation with FS new CAP.

**Results:** As show in the figure, the overall inter-operator reproducibility of medians of UA and BSC increased significantly with the size of ROI, starting from good and very good for small ROIs (ICC-UA = 0.72 and ICC-BSC = 0.80) and reaching excellent for large ROIs (ICC-UA = 0.92 and ICC-BSC = 0.93). The same trend was observed for intra-operator repeatability, reaching excellent for both experts (ICC-UA = 0.93 and ICC-BSC = 0.94) and novices (ICC-UA = 0.91 and ICC-BSC = 0.93).
correlation between UA and BSC medians obtained with large ROIs and FS new CAP was good: $r^{2}_{UA} = 0.80$ and $r^{2}_{BSC} = 0.64$.

The use of large ROIs improved the robustness of brightness-derived parameters estimation such that only one single UA and BSC value was sufficient to yield very good inter-operator reproducibility (ICC$_{UA} = 0.84$ and ICC$_{BSC} = 0.87$), very good and excellent intra-operator repeatability for both experts (ICC$_{UA} = 0.86$ and ICC$_{BSC} = 0.93$) and novices (ICC$_{UA} = 0.84$ and ICC$_{BSC} = 0.90$), and still showed good correlation with FS new CAP: $r^{2}_{UA} = 0.54$ and $r^{2}_{BSC} = 0.62$.

**Conclusion:** UA and BSC measurements could be performed with the ultraportable point-of-care device Hepatoscope with very good intra- and inter-operator reproducibility. The performance of such measurements was directly linked to the size of the considered ROI, i.e., the volume of liver tissue that is being investigated. We found that using only one snapshot with a large ROI to estimate UA and BSC yielded excellent results, allowing low screening times for liver steatosis assessment. Future comparative studies with MRI-PDFF and histological scores will allow better assessment of the use of large ROIs UA and BSC estimation for steatosis staging.

**WED-470**

PNPLA3 I148M substitution exacerbate NAFLD under a long-term high fat diet

Huan Su$^1$, Madhuri Haque$^1$, Svea Becker$^1$, Karolina Edlund$^2$, Julia Düda$^2$, Qingbi Wang$^1$, Johanna Reißing$^1$, Hann-Ulrich Marschall$^1$, Lena Susanna Candels$^1$, Mohamed Ramadan Mohamed$^1$, Wilhelm Sjöland$^1$, Till Strowig$^1$, Jörg Rahnenführer$^1$, Jan C. Hengstler$^1$, Maximilian Hatting$^1$, Christian Trautwein$^1$, University Hospital RWTH Aachen, Aachen, Germany, Technical University Dortmund, Dortmund, Germany, Gothenburg University, Gothenburg, Sweden, Helmholtz Centre for Infection Research, Braunschweig, Germany

Email: hsu@ukaachen.de

**Background and aims:** Initiation and progression of non-alcoholic fatty liver disease (NAFLD) is dependent on different genetic risk factors. Here, PNPLA3 I148M mutation of the phospholipase patatin-like phospholipid domain containing protein 3 (PNPLA3) is associated with severe disease progression. However, the role of PNPLA3 in chronic liver disease was not completely understood. Our aim is to investigate how PNPLA3I148M mutation influences initiation and progression of chronic metabolic liver disease under high fat diet (HFD).

**Method:** Mice bearing wild-type Pnpla3 (Pnpla3$^{WT}$), or the human polymorphism PNPLA3 I148M (Pnpla3$^{I148M}$) were subjected to a HFD for 24 and 52 weeks. The HFD contains 40 kcal% fat, 20 kcal% fructose and 2% cholesterol diet. The mice were set to fast for 3 hours before sacrifice. A detailed analysis was performed including the basic histological features in mouse models of NASH induced by three different types of high-fat diets.

**Results:** Pnpla3I148M mice had more immune cells infiltration in the liver compared to Pnpla3WT animals only after 52 weeks HFD feeding. Moreover, Pnpla3I148M mice fed with HFD for 52 weeks have stronger fibrosis and hepatic stellate cells activation as well as increased ductular proliferation and higher BA stowl levels. Bacterial dysbiosis during HFD feeding were influenced by HFD feeding (36%) and the PNPLA3 I148M genotype (12%). DNA-sequencing analysis of liver tissue defined a Pnpla3I148M specific expression pattern, which defines Kupffer cell and monocytes-derived macrophages as significant drivers of disease progression in Pnpla3I148M animals.

**Conclusion:** The PNPLA3 I148M knockin model only develops a severe NASH liver phenotype after long-term feeding leading to obesity. Here significant differences were found compared to Pnpla3WT animals showing that Pnpla3I148M animals develop a specific phenotype triggered by bacterial dysbiosis and higher BA levels associated with a stronger Kupffer cell- and monocytes-derived inflammatory response leading to stronger fibrosis progression.

**WED-471**

A novel autophagy inducer attenuated non-alcoholic steatohepatitis by regulating the adneylate cyclase 6 in hepatocytes

Hyun Jin Jung$^1$, Ming Li Jin$^1$, Ju-hee Kang$^1$, Jung Ho Hwang$^1$, Min Woo Kim$^1$, Sumin Hur$^1$, Sun Kyoong Kim$^1$, Sung-Won Song$^3$, Jung Ju Kim$^1$, Hwan Mook Kim$^1$, Jae Hyun Kim$^1$, Ki Tak Nam$^1$, Gyoonne Han$^1$, Kwang Won Jeong$^1$, Seung Hyon Oh$^1$, Se Yong Park$^4$, College of Pharmacy, Gachon University, Korea, Rep. of South, Yongsei University College of Medicine, Korea, Rep. of South, Autophagy Sciences, Korea, Rep. of South, Yongsei University, Korea, Rep. of South, Seoul National University, College of Veterinary medicine, Seoul, Korea, Rep. of South

Email: eyeball@hanmail.net

**Background and aims:** Autophagy is a critical process that regulates cellular metabolic homeostasis and was recently shown to be associated with non-alcoholic steatohepatitis (NASH). However, although NASH is one of the most prevalent diseases, approved pharmaceutical treatments are lacking. Here, we report that the therapeutic effects of an autophagy inducer (A4368) on NASH involve adenylate cyclase 6 (AC6) regulation.

**Method:** A4368 was selected as an autophagy inducer from a focused library, and its effects were evaluated in vitro and in vivo. In vitro assays (kinase and enzyme-linked immunosorbent assays and immunoblotting) revealed that A4368 induced hepatic autophagy and decreased lipid accumulation and inflammatory and fibrogenic responses via AC6 regulation. Three different types of mouse models were used to investigate the therapeutic effects of A4368. NASH was induced by feeding mice a choline-deficient high-fat diet or western diet, and a Stetic animal model was developed.

**Results:** A4368 increased autophagic flux in hepatocytes but not in hepatic stellate cells or macrophages. It induced autophagy by directly binding to and inhibiting AC6, which resulted in accelerated clearance of lipid droplets in hepatocytes. A4368 significantly alleviated several parameters associated with NASH, including histological features in mouse models of NASH induced by three different types of high-fat diets.

**Conclusion:** In summary, the novel autophagy inducer A4368 could be a new therapeutic agent for NASH.
Background and aims: Protecting the liver against cellular stress upon exposure to either exogenous or endogenous insults is a pivotal process governed by various processes among which is the endoplasmic reticulum (ER) protein folding in addition to autophagy induction, conserving cell homeostasis and fine-tuning apoptotic responses. A growing body of evidence suggests a correlation between ER stress and autophagy towards preserving the homeostatic immune response in the liver. The modulation of ER stress via autophagy induction has gained much traction recently, however, its role in a non-alcohol related steatohepatitis (NASH) context was little explored. Interestingly, vitamin D3 impact on either ER stress or autophagy was underscored in multiple pathological settings. This study, therefore, sought to unravel the potential impact of calcitriol (CAL), the active form of vitamin D3, on the modulation of ER stress in an experimental NASH model, providing insights on the likely autophagy dependence.

Method: Male C57BL/6 mice were kept on a dietary high-fat diet (HFD) to induce NASH and were allocated to the following 4 groups: (I) Normal group that was fed a balanced diet, (II) Positive control group (HFD) that was kept on a HFD, (III) CAL-treated group that received CAL at a dose of 5 ng/gm/day, i.p., twice per week, and (IV) CAL+HCQ-treated group that received CAL and the autophagy inhibitor, hydroxychloroquine (HCQ) at a daily dose of 60 mg/kg/day, p.o. Treatment started after 8 weeks of induction for a duration of 4 weeks. By the end of the experiment, livers were collected for histopathological examination, determining NASH score, and further analyses. Vitamin D receptor (VDR) gene expression levels were determined using qRT-PCR. Hepatic levels of inositol-requiring enzyme-1a (IRE1a) and caspase-3 were determined using ELISA for the assessment of ER stress and apoptosis, respectively. Statistical analysis was performed using one-way ANOVA followed by Tukey Kramer post hoc test for multiple comparisons. Data are presented as means ± SD.

Results: Our findings demonstrated NASH amelioration and near-total hepatic VDR expression with CAL compared to the HFD untreated group. Regarding ER stress, IRE1a protein levels surged in the HFD untreated group compared to normal, an effect that was curtailed by CAL. Regarding liver fibrosis, the MVD of collagen 1 alpha 1, collagen 3 alpha 1 and alpha-smooth muscle actin were observed in efocipegtrutide-treated group. Furthermore, blood surrogate markers and hepatic fibrosis related gene expression level were analyzed.

Conclusion: The current study, therefore, suggests a potential autophagy-dependent impact of CAL on ER stress in NASH.

Figure: Effect of CAL on IRE1a protein levels in normal, HFD, CAL-treated, and CAL+HCQ-treated groups, as determined by ELISA. Statistical analysis was performed using One-way ANOVA followed by Tukey Kramer post hoc test for multiple comparisons. Data are presented as means ± SD.
**Conclusion:** Efocipegtrutide effectively improved liver fibrosis in CCl4-induced fibrosis mice. These results are consistent with previous study results in various NASH/fibrosis animal models, in which further reinforcing the robust anti-fibrotic effect of efocipegtrutide via simultaneous action of GCG, GIP, and GLP-1. Human study is ongoing to assess the clinical relevance of these findings.

**WED-474**
**A translational rat model to study metabolic associated fatty liver disease with fibrosis and portal hypertension**

Aurora Barberá1, Imma Raurell1,2, María Martínez-Gómez1, Mar Gil1, Juan Manuel Pericàs1,2, Joan Genesca1,2, María Martell1,2.

1Liver Diseases, Vall d’Hebron Institut de Recerca (VHIR), Liver Unit, Hospital Universitari Vall d’Hebron (HUVH), Vall d’Hebron Barcelona Hospital Campus; Universitat Autònoma de Barcelona (UAB), Barcelona, Spain, 2Centro de Investigación Biomédica en Red de Enfermedades Hepáticas y Digestivas (CIBERehd), Madrid, Spain

Email: maria.martell@vhir.org

**Background and aims:** The use of animal models is crucial to understand the underlying mechanisms in the onset and progression of metabolic associated fatty liver disease (MAFLD) and to develop novel therapeutic strategies. Moreover, the concept of MAFLD is not as restrictive as NAFLD and other potential causes of liver damage can coexist with metabolically-induced fatty liver and steatohepatitis (NAFLD), being alcohol consumption the most frequent liver injury in Southern European countries (MAFLD-OH). Although several animal models have been used in the field, there is an ongoing challenge to identify those models that best mimic human pathology to allow good translation of the obtained results into the clinics. We aimed to develop a dietary rat model that reproduces the full MAFLD phenotype observed in human disease, including features of the metabolic syndrome, steatohepatitis with liver fibrosis and portal hypertension.

**Method:** For model development, male Sprague-Dawley rats were fed 16 weeks with control diet (CD), high-fat high-cholesterol diet with glucose/fructose beverage (HFHC/GF) or the same diet plus 1–3% ethanol added to the GF drink (HFHC/GF-OH). Liver biopsies were performed on some individuals at 12 weeks to evaluate fibrosis. By the end of week 16, liver hemodynamics, histology and metabolic parameters were characterized.

**Results:** Sirius Red staining revealed that the rats from HFHC/GF and HFHC/GF-OH groups developed perisinusoidal fibrosis by week 12. The HFHC/GF and HFHC/GF-OH livers also showed severe steatosis and inflammatory infiltrates. The diet intervention did not induce significant increments in body weight at any time point. However, the liver to body weight ratio increased significantly more in the HFHC groups compared with the CD at 16 weeks. Portal pressure (PP) significantly increased in both HFHC/GF and HFHC/GF-OH groups compared to CD group (13.29 and 12.16 mmHg vs 8.74 mmHg, respectively). No significant differences in PP were found between HFHC groups. HFHC diet was associated with significant increases in fasting blood concentrations of AST, ALT, cholesterol, alkaline phosphatase, creatine kinase and albumin.

**Conclusion:** This translational animal model could become a suitable model for basic research of advanced stages of MAFLD and also for drug testing in this pathology.

Funded by Instituto de Salud Carlos III [PI18/00947, PI21/00691].

Figure: (abstract: WED-475).
Secretomics identifies IGFBP1 as a stress signaling marker in human models for NAFLD

Ruth Walker1, Maria Emilia Dueñas 1, Jeremy Palmer 2, José Luis Marin-Rubio3, Quentin Anstee4,5, Matthias Trost1, Olivier Govaere3,4,1Newcastle University, Biosciences Institute, Faculty of Medical Sciences, Newcastle Upon Tyne, United Kingdom, 2Newcastle University, Translational and Clinical Research Institute, Faculty of Medical Sciences, Newcastle Upon Tyne, United Kingdom, 3Newcastle upon Tyne Hospitals NHS Trust, Newcastle, 4NIHR Biomedical Research Centre, Biomedical Research Building, Newcastle Upon Tyne, United Kingdom, 5KU Leuven, Translational Cell and Tissue Research lab, Department of Imaging and Pathology, Leuven, Belgium

Email: r.h.walker2@newcastle.ac.uk

Background and aims: Lipid accumulation is a key part of the pathogenesis of non-alcoholic fatty liver disease (NAFLD) and has recently been associated with endoplasmic reticulum (ER) stress. In vitro lipid loading is often used as an experimental model for NAFLD, though an understanding of the metabolic changes and lipotoxicity is still lacking. This work explored the proteomic and secretomic differences induced by ER stress or lipid accumulation in cell models by using mass spectrometry (MS)-based approaches to gain an insight into the mechanism underlying NAFLD.

Method: Primary human hepatocyte cells were treated with saturated and unsaturated fatty acids including linoleic (LA), oleic (OA), and palmitic acid (PA) at 400 μM, or with the ER stress inducer thapsigargin (1 mM) for 24 hours. Secreted proteins in the culture media were isolated 3 hours before collection. Treated samples were screened by Matrix-assisted laser desorption/ionization-time-of-flight mass spectrometry (MALDI-TOF MS) to determine differences in the phenotypic profiles of metabolites and high molecular weight biomolecules, and proteins were identified by data-independent acquisition on an Orbitrap Fusion Lumos Tridrid MS (LC-MS/MS).

Results: Distinctive metabolite profiles were established for each condition by MALDI-TOF MS, allowing multiplexing and identification of biomarkers. LA and PA, especially, induced a comprehensive switch in metabolites, while substantial protein changes were observed upon PA and ER-stress treatment. LC-MS/MS proteomics analysis of the primary cells identified 170 differentially expressed proteins in the LA condition, 8 in the OA, 225 in the PA, and 966 in the ER-stress condition. Changes in the expression of NAFLD-relevant markers as p62 or GDF15 proved to be dependent on the treatment condition. Interestingly, ER-stress induction showed an increase in metabolic-related proteins, including perilipin-2 and glucoknase. A strong increase in Insulin-like growth factor-binding protein 1 (IGFBP1) expression was observed in LA, PA, and ER-stress treatments. The secretomic phenotype of primary human hepatocytes differed drastically depending on the underlying lipid or ER-stress challenge. The analysis characterized 21 differentially expressed proteins upon LA treatment, only 1 with OA, 1789 with PA, and 77 upon ER stress induction, when compared to their respective controls. The release of perilipin-2 was observed in each lipid treatment condition. PA and ER-stress treatments had an intersection of 42 proteins, many relating to metabolic processes such as retinol or steroid metabolism, with IGFBP1 being the top marker in both comparisons.

Conclusion: This study identified commonalities but also distinct secretomic and proteomic profiles of stress mediators in NAFLD.

WED-476

Serum exosomal mir-4668-5p in Non-alcoholic Fatty liver Disease (NAFLD) patients with significant liver fibrosis

Jong Eun Yeon1, Young-Sun Lee1, Eunjung Ko1, Yoonseok Lee1, Sun Young Yim2, Young Kui Jung3, Ji Hoon Kim1, Yeon Seok Seo3, Hyung Joon Yim3,1Korea University Medical College Guro Hospital, Internal Medicine, Seoul, Korea, Rep. of South, 2Korea University Medical College Anam Hospital, Korea, Rep. of South, 3Korea University Medical College Ansan Hospital, Korea, Rep. of South

Email: jeyyeon@hotmail.com

Background and aims: In worldwide, fatty liver disease in non-significant amount of alcoholic drinker (Non-alcoholic fatty liver disease (NAFLD)) are on the rise as obesity and diabetes increase. Among the histologic changes, degree of liver fibrosis is the most important factor for predicting long term outcomes. Although liver biopsy is the gold standard for diagnosis, serious complication and variability of sampling and interpretation made it difficulties in routine clinical practice. Aim of our study is to explore the clinical significance of serum exosomal miRNA in liver fibro-genesis of NAFLD patients.

Method: 47 biopsy-proven NAFLD patients were included. Exosome was isolated from serum samples and serum exosomal miRNA was analyzed with GeneChip mirRNA 4.0 array (Affymetrix, U.S.A). Also, we analyzed the expression of miRNA in liver tissues of the same patient who had been tested for serum exosomal miRNA. To define the role of miRNA in liver fibrogenesis, human hepatic stellate cell was transfected with miRNA of interests. Serum and liver samples from mice feed with high fat high fructose (HFHF) diet for 24 weeks were analyzed for comparison with human.

Results: NAFLD patients with advance fibrosis group (Gr1) were older, having more metabolic syndrome, lower platelet counts, prolonged PT INR compared to that of non-significant fibrosis group (Gr2). A total of 86 serum exosomal miRNA were significantly changed between Gr1 and Gr2. Of which 42- and 44-miRNA showed significantly higher or lower expression in Gr1 compared to Gr2. Of them, MiR4668-5p was selected because of it were one of the highest altered miRNA in Gr1 compare to Gr2. When human hepatic stellate cell (LX2 cell) was transfected with 4668-5p mimics or inhibitors, miRNA of TGF-β, α-SMA and collagen1A1 expression were significantly elevated and reduced after each transfection. In mice feed with HFHF diets, miRNAs involved in lipid uptake, transport, and oxidation were altered, TGF-b1 and a-SMA and coll1A1 expression were altered in HHFF group.

Conclusion: Serum exosomal miRNAs were significantly altered in NAFLD patients with advanced fibrosis. Among them, serum exosomal miRNA-4668-5p has significant role in liver fibrosis. Although additional researches are required, serum exosomal miRNA may has a diagnostic value or therapeutic target of liver fibrosis in NAFLD patients.

Rilpivirine as an anti-inflammatory agent in non-alcoholic fatty liver disease: evidence from human hepatocytes, hepatic stellate cells and blood cells

Isabel Fuster-Martínez1,2, Ángela B. Moragrega1,2, Aleksandra Grujevska1,2, Ana Benedicto1,2, Joan Tosca1,2, Cristina Montón3, Elena Muñoz4, Dimitri Dorcaratto4, Juan V. Esplugues1,2,5, Nadeza Apostolova1,2,5, Ana Blas-García1,5,6

1University of Valencia, Department of Pharmacology, Valencia, Spain, 2FISABIO-University Hospital Dr. Peset, Valencia, Spain, 3Hospital Clinic Universitari de Valencia, Department of Digestive Medicine, Valencia, Spain, 4Hospital Cliníc Universitari de Valencia, Department of Surgery, Liver, Biliary, and Pancreatic Unit, Biomedical Research Institute INCLIVA, Valencia, Spain, 5Biomedical Research Networking Center in Hepatic and Digestive Diseases (CIBERehd), Spain, 6University of Valencia, Department of Physiology, Valencia, Spain

Email: ana.blas@uv.es
Background and aims: Drug repurposing is emerging as an attractive approach to identify compounds with potential applications in non-alcoholic fatty liver disease (NAFLD). Rilpivirine (RPV), an antiretroviral used to treat HIV infection, has been described as an anti-fibrotic, anti-inflammatory and anti-steatotic drug in several in vivo studies. We aimed to characterize the mechanisms underlying its anti-inflammatory effects, focusing on its specific actions on blood and hepatic cells.

Method: The effects of RPV were evaluated both in vitro (human hepatic cell lines, primary hepatic stellate cells -HSC- and monocyte-derived macrophages -MDM-, both from healthy donors) and ex vivo (peripheral blood mononuclear cells -PBMC- isolated from patients with chronic liver disease). To reproduce NAFLD conditions, cells were incubated for different periods of time with RPV in the absence or presence of fatty acids and/or pro-inflammatory (LPS) or fibrogenic cytokines (TGF beta) in the medium. The molecular routes involved were studied using transcriptomic analysis and standard molecular biology techniques (RT-PCR, Western Blot and ELISA).

Results: RPV reduced the phosphorylation and the nuclear translocation of p65, as well as its pro-inflammatory target genes IL1B, IL18, CASP1, TNFA and CXCL8 in fatty acid-overloaded hepatocytes. Similar effects were observed in activated HSC and LPS-treated MDM, in which RPV also inhibited the NLRP3-inflammasome pathway, decreasing NLRP3 protein expression, Caspase-1 activation and IL1B gene expression. RNA sequencing transcriptomic analysis and gene set enrichment analysis in activated HSC demonstrated that RPV downregulated GO processes associated with response to cellular stress, including the positive regulation of stress-activated MAPK cascade. In line with these results, analysis of stress-activated protein kinases by Western Blot showed a clear inhibition of the JNK-mediated pathway induced by this drug in these cells as well as in FA-overloaded hepatocytes and MDM. RPV also significantly decreased the synthesis and release of the chemoattractant CCL2 in HSC and MDM, downregulating leukocyte chemotaxis and migration. Finally, ex vivo experiments with PBMC demonstrated that RPV exerted an anti-inflammatory effect by enhancing the expression of STAT3-mediated pathways and downregulating the activation of STAT1 and its target genes.

Conclusion: The antiretroviral drug RPV exerts anti-inflammatory actions on injured hepatocytes, activated HSC, macrophages and PBMC. The findings point to a beneficial role of RPV in NAFLD.

WED-506 Characterization of portal inflammation and hepatic fibrosis in non-alcoholic fatty liver disease
Annie Masters1, James M Estep1,2, Lakshmi Alaparthi3, Gary Bratthauer3, Aybike Birerdinc1,2, Fanny Monge3, Cassandra Sharp3, Daisong Tan4, Hala Abdelaal3, Zachary Goodman3, Zobair Younossi1,2,3, 1George Mason University, School of Systems Biology, United States, 2Inova Health System, Beatty Liver and Obesity Research Program, Department of Medicine, United States, 3Inova Health System, Center for Liver Disease, Department of Medicine, United States, 4Inova Health System, Center for Liver Disease, Department of Medicine, Falls Church, United States
Email: zobair.younossi@inova.org

Background and aims: The relationship between inflammation and the progression of hepatic fibrosis in the context of non-alcoholic...
fatty liver disease (NAFLD) has not been formally characterized. The aim of this pilot study is to histologically quantify lymphocytic effector cell populations and Kupffer cell/macrophage populations in the liver biopsy of NAFLD patients with various stages of fibrosis.

Method: Liver needle biopsy samples from patients with NAFLD and a range of NASH CRN scores (N = 65) were immunohistochemically stained on a Discovery Ultra (Roche) in multiplex CD8 (Yellow); cytotoxic T-cells, CD68 (Green; Kupffer cells/macrophages), and CD38 (Purple; plasma cells). Stained biopsies were scanned using an Aperio AT2 (Leica Microsystems) and analyzed using HALO’S Multiplex IHC module. Cells were segmented using a combination of the nuclear/cytoplasmic staining and each cell is individually measured for nuclear/or cytoplasmic Frequency of stained cell types by NASH CRN score was assessed by descriptive statistics and Mann-Whitney analysis.

Results: Of the biopsies analyzed in this pilot study (N = 65), 10 subjects were categorized as NASH CRN stage 1, 14 stage 2, 33 stage 3 which was split into 3a (mild bridging, N = 16) and 3b (marked bridging, N = 17) inspired by the Ishak scoring system, and 8 were stage 4. The relative frequency of effector lymphocytes increased with NASH CRN stage (p = 0.03). Pairwise analysis revealed a significant increase in cytotoxic T-cells between NASH CRN stages 3a and 3b (p = 0.0003), as well as an overall increase in both plasma cells and cytotoxic T-cells when comparing stages 3b and above to stages 1 through 3a (p = 0.047, and p = 0.0007, respectively) (Figure). Conclusion: Progression to advanced fibrosis in NAFLD is characterized by an increase in effector B and T cell types. In this pilot study, our method has been effectively used to objectively quantify inflammatory cell types as they relate to hepatic fibrosis in NAFLD patients. This quantification method can be used in future studies to assess the contribution region specific immune cell infiltration to the progression of fibrosis in NASH.

WED-507
KLB deficiency in hepatic stellate cells (HSCs) promotes inflammation, oxidative stress and a pro-fibrotic phenotype

Giada Tria1, Erika Paolini2, Miriam Longo1, Nadia Panera2, Roberto Picotti2, Anna Alisi2, Marica Meroni3, Paola Dongiovanni1.
1Fondazione IRCCS Cà Granda Ospedale Maggiore Policlinico, Milan, Italy; General Medicine and Metabolic Diseases; Milan, Italy, 2Bambino Gesù Children’s Hospital-IRCCS, Research Unit of Molecular Genetics of Complex Phenotypes, Italy

Email: paola.dongiovanni@policlinico.mi.it

Background and aims: β-Klotho (KLB) gene encodes the hepatic co-receptor of fibroblast growth factor receptor 4 (FGFR4). We previously reported that the rs17618244 G > A gene variant dampened KLB hepatic and plasma levels, leading to inflammation, ballooning and fibrosis both in pediatric and adult patients with non-alcoholic fatty liver disease (NAFLD). Hepatic stellate cells (HSCs) are directly involved in the fibrotic processes, playing a crucial role in the switching to severe forms of NAFLD. Aim of this study was to generate a cell line of hepatic stellate cells (HSCs), responsible for hepatic fibrosis, which are deleted for KLB, and to investigate the impact of its deficiency on their pro-fibrotic phenotype, inflammation and oxidative stress.

Method: We stably silenced KLB gene in LX2 cells (referred to as HSCs KLB−/−) by Crispr-Cas9 technology. We previously showed an elevated proliferative rate, more rapid would healing and higher invasiveness compared to wild-type counterpart (p < 0.05).

Conclusion: Progression to advanced fibrosis in NAFLD is characterized by an increase in effector B and T cell types. In this pilot study, our method has been effectively used to objectively quantify inflammatory cell types as they relate to hepatic fibrosis in NAFLD patients. This quantification method can be used in future studies to assess the contribution region specific immune cell infiltration to the progression of fibrosis in NASH.

Figure: Oil Red O (ORO) staining (upper panel) and αSMA IHC (lower panel) on LX2 control (Cas9 positive) and silenced for KLB gene in 1000x magnification.

WED-508
A functional investigation of NASH-associated gene polymorphisms in human liver tissue

Amy Shepherd1, Jack Leslie1, Fiona Oakley1, Derek Mann1, Jelena Mann1, 1Biosciences Institute, Newcastle Fibrosis Research Group, 4th Floor, William Leech Building, Biosciences Institute, Newcastle University, Medical School, Newcastle upon Tyne, United Kingdom

Email: jelena.mann@newcastle.ac.uk

Background and aims: Development of NAFLD has a multifactorial etiology that includes a strong genetic component. A number of single nucleotide polymorphisms (snps) have been identified within genes involved in regulation of hepatic fat metabolism; these snps have been shown in population studies to be associated with differential long-term disease outcome. We have established precision cut liver slices (PCLS) that maintain the architectural integrity, functionality and metabolic activities of the tissue over an extended period, which for the first time allows in vitro modelling of liver disease using genotypically diverse human donor tissue.

Method: PCLS were generated from 44 liver donors and tissue genotyped using the primers for: MBOAT7 rs641738 C > T, GCKR rs1260326 (P446L) and PNPLA3 rs738409 C > G (I148M). PCLS were exposed to profibrogenic stimuli or to lipid loading to examine the effect of the snps on induction of fibrosis, lipid accumulation and inflammation in the human liver tissue. PCLS media was sampled longitudinally and assayed for Collagen1a1 and IL6 while tissue harvested at the end of experiments was assayed for triglyceride content and stained with Picrosirius Red to measure fibrosis induction.

Results: Presence of MBOAT7 rs641738 C > T, GCKR rs1260326 (P446L) and PNPLA3 rs738409 C > G (I148M) snps on one or both
alleles caused an increase in triglyceride accumulation in the lipid loaded donor tissue, which was in some patients associated with increase in inflammatory markers but not always associated with increase in fibrogenesis. For some snps, the increase in donor age or gender had an effect on triglyceride accumulation in PCLS.

**Conclusion:** Human PCLS modelling of liver fibrosis and lipid loading has, for the first time, provided experimental evidence of the effect that MBOAT7 rs641738 C > T, GCKR rs1260326 (P446L) and PNPLA3 rs738409 C > G (I148M) snps exert on liver tissue responses to profibrogenic and lipid mediated stimuli. This provides new mechanistic insights into disease processes and provides an unrivalled platform for study of genotype and phenotype in aged tissue.

**WED-509**

**Effect of housing temperature on non-alcoholic fatty liver disease development in C57BL/6N mice**

Olga Horakova1, Gabriella Sistilli1, Veronika Kalendova1, Tomas Cajka2, Carolin Lackner3, Martin Rossmeisl1. 1Institute of Physiology of the Czech Academy of Sciences, Laboratory of Adipose Tissue Biology, Prague, Czech Republic, 2Institute of Physiology of the Czech Academy of Sciences, Laboratory of Translational Metabolism, Prague, Czech Republic, 3Medical University of Graz, Institute of Pathology, Graz, Austria

**Email:** olga.horakova@fgu.ca.s.cz

**Background and aims:** Non-alcoholic fatty liver disease (NAFLD) is associated with obesity and metabolic syndrome. NAFLD can progress to more severe stages, such as steatohepatitis. Recently, thermo-neutral housing (TN) was found to promote human-like NAFLD in high-fat diet (HFD)-fed C57BL/6J mice, characterized by obesity and increased pro-inflammatory liver responses. Given the known differences in the development of steatohepatitis between substrains of C57BL/6 mice, we aimed to determine how TN affects NAFLD pathogenesis in another frequently used strain, i.e. C57BL/6N.

**Method:** Male C57BL/6N mice were fed standard diet or HFD (lipsids ~60 energy%) for 24 weeks starting at 11 weeks of age. Mice were housed in either standard (22°C) or TN (30°C) environment. At week 21, tail blood was collected from overnight fasted mice to measure glycemia and plasma levels of metabolites and hormones. Metabolipidomic profiling of liver samples (~20 mg) was performed using an untargeted workflow combining lipidome, metabolome and exposure (LIHEX) and partial least squares discriminant analysis (PLS-DA). Histopathological analysis of hepatic steatosis, inflammation and fibrosis was also performed.

**Results:** Weight gain and hepatic steatosis were increased in HFD-fed mice, regardless of ambient temperature. No difference was observed in histological scores of liver inflammation and fibrosis, which were generally low and did not correspond to increased tissue expression of inflammatory and tissue remodeling markers in HFD-fed mice, showing only marginal increase due to TN. Although the results of liver metabololipidomic profiling in HFD-fed mice supported the involvement of autophagy-related metabolites in HFD-induced NAFLD, they did not reveal a substantial effect of TN. Conversely, in standard–diet–fed mice, TN increased weight gain, overall adiposity, adipocyte hypertrophy, hepatic steatosis, and NAFLD activity score. This was accompanied by increased de novo lipogenesis and marked changes in the hepatic metabolome characterized by a complex decrease of various phospholipid species and metabolites involved in the urea cycle and oxidative stress defense.

**Conclusion:** In conclusion, TN appears to exacerbate NAFLD phenotype depending on C57BL/6 substrain and diet.
plasma concentrations of eight SCFAs by gas chromatography-tandem mass spectrometry (GC-MS/MS). Data were analysed by logistic regression models adjusted for age and sex.

**Results:** The mean BMI in healthy controls and patients with NAFLD was 23.6 (SD 2.67) and 34.7 (SD 6.73) kg/m², respectively. Plasma concentrations of formate (p = 0.004), propionate (p = 0.02), valerate (p = 0.02), and alpha methyl-butyrate (p = 0.01) were increased, while acetate was decreased (p = 0.0001) in NAFLD patients compared with healthy controls. Among NAFLD patients, plasma concentrations of propionate (p = 0.02), butyrate (p = 0.03), valerate (p = 0.03), and alpha methyl-butyrate (p = 0.02) were increased in patients with significant fibrosis (F2-F4). See figure 1 for odds ratios and 95% CI.

**Conclusion:** SCFAs differed between patients with NAFLD and healthy controls and between patients with significant and non-significant fibrosis. In particular, we found higher plasma concentrations of propionate, valerate, and alpha methyl-butyrate in patients with NAFLD and increased fibrosis severity. The implications of our observations are yet unknown and warrant further investigation.

**WED-512**

**Artificial neural networks predict via label-free imaging analysis cellular injury in a human steatohepatitis model**

Julian Weiss1, Milad Rezvani2,3,4, 1Charité Campus Virchow Clinic, Department of Pediatrics, Division of Gastroenterology, Nephrology and Metabolic Medicine, Berlin, Germany, 2Berlin Institute of Health, Clinician Scientist Program, Berlin, Germany, 3Berlin Institute of Health, Center for Regenerative Therapies, Berlin, Germany, 4Cincinnati Children’s Hospital Medical Center, Division of Gastroenterology, Hepatology and Nutrition, Cincinnati, United States

**Background and aims:** Drug screenings on human cellular injury models can be time-consuming and are often limited to detecting specific protein markers. An unbiased imaging algorithm that utilizes high-throughput microscopy of unprocessed cells to predict cellular injury would expand the capabilities of such screens. Artificial neural networks (ANNs) in imaging analysis have become a powerful tool for identifying phenotypic nuances at scale. We hypothesized that ANN-guided, label-free brightfield imaging analysis could predict hepatocellular injury. For proof of principle, we established a screening pipeline involving a non-alcoholic fatty liver disease (NAFLD) model with hepatocytes from human pluripotent stem cells (iHeps) exposed to different grades of subcellular injury.

**Method:** We modeled different severities of NAFLD-related subcellular injuries by exposing iHeps to free fatty acids or combining the same with extrahepatic signaling molecules relevant to NAFLD (Resistin, Myostatin; “augmented injury”). To model steatohepatitis (a more advanced form of NAFLD), we co-cultured iHeps with human peripheral blood mononuclear cells (PBMCs) using a transwell system. We experimentally evaluated injury severity by measuring hallmarks of NAFLD, namely steatosis, mitochondrial function (assessed by mitochondrial membrane potential), and endoplasmic reticulum (ER) stress. Using unstained brightfield images of the monoculture conditions, we trained ANNs to distinguish cells from different hepatocyte injuries and let them define respective “injury scores.” The trained ANNs then computed injury scores for cells from wells that were left out during the training process and were projected to score iHeps in the steatohepatitis condition that was not used to train the model.

**Results:** Our results demonstrate that in all injury conditions, iHeps displayed similar levels of steatosis and a significantly increased ER stress response upon exposure to free fatty acids. The augmented injury compromised mitochondrial function. The steatohepatitis condition exacerbated mitochondrial dysfunction further. The ANNs could identify all injury conditions from untreated cells with extremely high accuracy (p < 0.001). Of note, the ANNs could also distinguish cells from the different injury conditions, scoring cells of the augmented NAFLD model with higher injury scores than cells that underwent basic free fatty acid injury (p < 0.01). The projection of ANN to the steatohepatitis conditions revealed higher injury scores, which was consistent with our experimental data. The injury scores correlated highly with mitochondrial dysfunction (R = −0.45, p = 3.310–6). Thereby, ANNs predicted subcellular stress responses upon varying degrees of cellular injury.

**Conclusion:** Here, we describe how ANN-based image analysis allows label-free prediction of cellular injury in a human NAFLD model. ANNs could distinguish conditions ranging from steatosis to subcellular toxicity and returned injury scores that we could correlate with impaired mitochondrial function. In sum, combining human liver disease models and ANNs can identify cellular stress or its relief, enabling large-scale drug screenings to identify novel treatments for liver diseases quickly.

**WED-513**

**IFI16 expression and its genotype variant are associated with NAFLD progression**

Doyoon Kim1,2, Masaud Shah1, JungMo Kim2, Yang-Hyun Baek4, Jin Sook Jeong2, Sangyoung Han3, Yong Sun Lee2, Gaeul Park2, Yeon-Su Lee3, Hyun Goo Woo1,2,3, 1Ajou University School of Medicine, Physiology, Korea, Rep. of South, 2Ajou University, Biomedical Science, Graduate School, Korea, Rep. of South, 3Ajou University, Ajou Translational Omics Center (ATOC), Research Institute for Innovative Medicine, Korea, Rep. of South, 4Dong-A University College of Medicine, Liver Center, Internal Medicine, Korea, Rep. of South, 6Dong-A University Medical Center, Pathology, Korea, Rep. of South, 7National Cancer Center, Department of Cancer Biomedical Science, Graduate School of Cancer Science and Policy, Korea, Rep. of South, 8National Cancer Center, Division of Rare Cancer, Research Institute, Korea, Rep. of South

**Email:** hg@ajou.ac.kr

**Background and aims:** Non-alcoholic fatty liver disease (NAFLD) is a broad and continuous spectrum of liver diseases ranging from fatty liver to steatohepatitis. The study is aimed to obtain an integrative insight into genomic and transcriptomic alterations during NAFLD progression.

**Method:** We performed RNA-Seq profiling (n = 146) and whole exome sequencing (WES) from the biopsied tissues of NAFLD patients (n = 132).

**Results:** We identified three transcriptomic subtypes of NAFLD (G1-G3), demonstrating their associations with distinct pathologic features and genetic variations. In particular, single nucleotide variations (SNVs) of IFI16 (rs69490) were closely associated with its transcriptional levels and the molecular subtypes. This finding could
validated candidate genes were selected based on several stringent criteria, harvested, primary NGS analysis performed, and abundance of each followed by induction of shRNA expression by Dox administration and fed western diet and fructose-supplemented water for 8 weeks mice liver using hydrodynamic-tail vein (HDTV) injections. Mice were UltramiR) was cloned into transposon-based doxycycline (Dox)-inducible vector, divided into 32 pools and delivered into C57BL/6 mice liver using hydrodynamic-tail vein (HDTV) injections. Mice were fed western diet and fructose-supplemented water for 8 weeks followed by induction of shRNA expression by Dox administration and continued diet feeding for additional 16 weeks. Animal livers were harvested, primary NGS analysis performed, and abundance of each shRNA determined using differential expression analysis method. Top candidate genes were selected based on several stringent criteria, validated in-vitro and re.injected into fumarylacetoacetate hydrolase (FAH) knockout animals to test for liver repopulation and liver regeneration after partial hepatectomy. Additionally, mouse model of chronic liver disease, Non-Alcoholic Steatohepatitis (NASH) was identified using the blood samples of the pair-matched patients (n = 94), indicating the clinical utility of the rs69490 in predicting NAFLD progression. In addition, cell type analysis revealed that IFI16 expression is largely due to increased macrophage infiltration during the molecular progression of NAFLD. We also report that structural conformation by the al alteration of IFI16 rs69450 enhances its DNA binding affinity, which may aggravate subsequent inflammatory responses.

**Conclusion:** We suggest that IFI16 polymorphism and expression levels are associated with the aggressive progression of NAFLD through macrophage activation.

**Method:** A genome-wide mouse shRNA library (shERWOOD-UltrimIR) was cloned into transposon-based doxycycline (Dox)-inducible vector, divided into 32 pools and delivered into C57BL/6 mice liver using hydrodynamic-tail vein (HDTV) injections. Mice were fed western diet and fructose-supplemented water for 8 weeks followed by induction of shRNA expression by Dox administration and continued diet feeding for additional 16 weeks. Animal livers were harvested, primary NGS analysis performed, and abundance of each shRNA determined using differential expression analysis method. Top candidate genes were selected based on several stringent criteria, validated in-vitro and re-injected into fumarylacetoacetate hydrolase (FAH) knockout animals to test for liver repopulation and liver regeneration after partial hepatectomy. Additionally, mouse model of chronic liver disease, Non-Alcoholic Steatohepatitis (NASH) was employed to test for chronic liver pathologies, results from an interplay of intra- and extrahepatic mechanisms. Disease drivers likely include signals from white adipose tissue (WAT) and gut. However, the temporal dynamics of disease development remain poorly understood.

**Method:** High-fat-diet (HFD)-fed Ldlr-/-.Leiden mice were compared to chow-fed controls. At t = 0, 8, 16, 28 and 38 w mice were euthanized, and liver, WAT depots and gut were analyzed biochemically, histologically and by lipidomics and transcriptomics together with circulating factors to investigate the sequence of pathogenic events and organ cross-talk during NAFLD development.

**Results:** HFD-induced obesity was associated with an increase in visceral fat mass, plasma lipids and hyperinsulinemia at 8 weeks, along with an increase in liver steatosis and circulating biomarkers indicative of liver damage (ALT, AST, CK18-M30, TIMP1). Liver steatosis was mainly attributable to increased triacylglycerols and to a lesser extent free-fatty acids, cholesteryl esters and diacylglycerols. In parallel, regulators involved in lipid catabolism (e.g., ACOX1) were deactivated and in lipid synthesis (e.g., SREBF1) activated by HFD. Subsequently, hepatocyte hypertrophy, oxidative stress (4-HNE) and hepatic inflammation developed. Hepatic collagen accumulated at t = 16w and became particularly prominent after 28–38 weeks. Epididymal WAT adipocytes were maximally hypertrophic from t = 8w, which coincided with inflammation development in this depot.

**Conclusion:** Knockdown of a novel gene about which very little is known except that it is a protein coding gene and enables RNA binding activity accelerates cell migration and proliferation, followed by enhanced clonal expansion using FAH knockout mouse model. Furthermore, increased liver regeneration and a significant reduction in fibrosis score was observed compared to control animals, confirming an attenuation of NASH related liver fibrosis.
Mesenteric and subcutaneous WAT hypertrophy developed slower and did not appear to reach a maximum within the period studied, with minimal inflammation. In the gut, HFD significantly increased permeability, induced a major shift in microbiota composition (ileum and colon) from $t = 8w$ and associated with circulating gut-derived metabolite changes (short-chain fatty acids and bile acids).
supplemented with liquid fructose.

**Method:** HSCs were differentiated from three human pluripotent stem cell (PSC) lines (H1, WTC-11 and WTSI013-A). At the end of the differentiation protocol, the PSC-derived HSCs were treated with cholesterol, 25-HC or 26-HC both alone and in combination with the potent pro-fibrotic inducer TGF-beta 1 for 48 hours. Changes in HSC phenotype were assessed by RT-qPCR and imaging of intracellular vitamin A storage.

**Results:** PSC-derived HSCs displayed an increase in LXR target gene ABCA1 expression upon treatment with both cholesterol and oxysterols, confirming successful stimulation of the intended pathway. The fibrosis-associated gene ACTA2 was downregulated in HSCs in the presence of 25-HC and 26-HC. Expression of CCL2, encoding a chemokine crucial for monocyte recruitment, was reduced after treatment with 26-HC. Yet, the presence of cholesterol, 25-HC and 26-HC had no effect on the response of the HSCs to TGF-beta 1, which was evident by increased expression of ACTA2, COL1α1 and CCL2. These results connect HSCs to existing literature that implicates oxysterols in the attenuation of early-stage NAFLD; however, without affecting more advanced NAFLD as modeled by pro-fibrotic stimulation with TGF-beta 1.

**Conclusion:** Collectively, the results implicate cholesterol metabolites 25-HC and 26-HC as modulators of the HSC activation status and suggest that PSC-derived HSCs can be suitable for in vitro models of NAFLD.

**WED-518**

**Opposite correlations between hepatic β-oxidation activity and triglyceride levels in male and female rats after a high-fat diet supplemented with liquid fructose**

Roger Bentanachs1,2, Laia Blanco1, Maria Montesinos1, Aleix Sala-Vila1, Tolanda Lázaro1, Juan Carlos Laguna1,2,4, Núria Roglans1,2,4, Marta Alegret1,2,4 1University of Barcelona, School of Pharmacy and Food Sciences, Pharmacology, Toxicology and Therapeutic Chemistry, Spain, 2Institute of Biomedicine of the University of Barcelona, Spain, 3Hospital del Mar Medical Research Institute (IMIM), Cardiovascular Risk and Nutrition, Spain, 4CIBER de Fisiopatología de la Obesidad y Nutrición, Instituto de Salud Carlos III, Spain

**Email:** alegret@ub.edu

**Background and aims:** We previously reported that the administration of a high-fat diet supplemented with 10% w/v fructose in drinking water (HFHF diet) results in hypertriglyceridemia and a moderate increase in hepatic triacylglycerol (TAG) levels in males, while females showed less hypertriglyceridemia but more than doubled their liver TAG content. Moreover, hepatic β-oxidation activity was reduced in female rats, whereas males showed a significant increase (Bentanachs et al. 8th MetNet International Annual Meeting). Our aim is to study the mechanisms involved in the sexual dimorphic response to this diet.

**Method:** Two-month-old male (n = 16) and female (n = 16) Sprague Dawley rats were randomly assigned to two groups (n = 8 in each) and fed ad libitum for 3 months. The control groups were fed regular chow diet (2018 Teklad Global, 18% of provided calories as fat), whereas the high-fat-high-fructose groups (HFHF) were fed an HFD (Teklad Custom Diet TD180456, 46.9% of energy as fat, of which 21% w/w was cocoa butter) and had free access to a 10% w/v fructose solution as the drinking beverage. Total liver TAG was determined by a colorimetric method, and then hepatic TAG were isolated by solid-phase extraction and fatty acid methyl esters from this fraction were determined by gas chromatography. Hepatic diacylglycerols (DAG) and ceramides (Cer) were determined by liquid chromatography-tandem mass spectrometry. β-oxidation activity was determined by the method of Lazarow (Methods Enzymol. 1981, 72, 315). Correlation analysis between plasma/hepatic TAG and β-oxidation activity was performed using GraphPad prism software (v. 9.0.0).

**Results:** The fatty acid composition of the hepatic TAG in male rats was significantly altered by the HFHF diet, with significant increases of several saturated (C14:0, C16:0, C18:0) and monounsaturated fatty acids (C16:1 n-7, C18:1 n-9). The opposite was observed for many polyunsaturated fatty acids (C18:2 n-6, C20:4 n-6, C20:5 n-3). Several DAG species were increased by the diet (DAG-C16:0, DAG-C18:0, DAG-C18:1 and DAG-C18:0/18:2). No significant changes were observed for ceramide levels in the livers of male rats. These changes in lipid species were qualitatively similar to those observed in female rats in response to the same diet (Velázquez et al., Mol. Nutr. Food Res 2022, 2101115). However, correlation analysis showed striking differences: liver β-oxidation activity in females inversely correlated with plasma TAG levels (Spearman’s r = −0.60, p = 0.022) and total hepatic TAG levels (Spearman’s r = −0.64, p = 0.012); in male rats, liver β-oxidation activity correlated with both plasma (Pearson’s r = 0.78, p = 0.0007) and hepatic TAG (Spearman’s r = 0.66, p = 0.08).

**Conclusion:** The sexual dimorphism observed in rats in response to a HFHF diet cannot be explained by qualitative changes in the liver lipidome. Only in female rats, the decrease in liver β-oxidation activity significantly contributes to increase the hepatic and plasma TAG, whereas in males these correlations are direct. This work was supported by grants PID2020-112870RB-I00, funded by MCIN/AEI/10.13039/510100011033 and 2021SGR-00345.

**WED-519**

**Prophylactic and therapeutic hepatoprotective effects of lanifibranor in the CDA-AHFD mouse model of advanced NASH with progressive fibrosis**

Jacob Nehr-Meldgaard1, Ditte Denker Thorbek1, Denise Orö1, Henrik B. Hansen1, Michael Feigh1, Cubra, Harsholm, Denmark

Email: jnm@cubra.dk

**Background and aims:** The pan peroxisome proliferator-activated receptor (PPAR-α/δ/Y) agonist has recently been reported to improve liver histological outcomes in patients with non-alcoholic steatohepatitis (NASH) and fibrosis (NATIVE study; Francque et al, NEJM, 2021). Lanifibranor is currently in phase-3 clinical trial (NATIVE3) for the treatment of NASH. The present study aimed to evaluate prophylactic vs. therapeutic lanifibranor intervention in the non-obese choline-deficient L-amino-acid defined high-fat diet (CDA-AHFD) mouse model of advanced NASH with progressive fibrosis.

**Method:** C57BL/6J mice were fed chow or CDA-AHFD (45 kcal% fat, 0.1% methionine, 1% cholesterol, 28 kcal% fructose) for 3 or 6 weeks prior to treatment start (i.e. before or after onset of fibrosis, respectively). Animals were randomized into treatment groups based on body weight. A baseline group (n = 12) was terminated at study start (3 and 6 weeks), CDA-AHFD fed mice (n = 12 per group) received treatment (PO) with vehicle or lanifibranor (30 mg/kg) for 8 or 9 weeks. Chow-fed mice (n = 8) served as normal controls. Terminal end points included plasma biomarkers metalloproteinase inhibitor 1 (TIMP-1) and amino terminal peptide of type III procollagen (PIIINP), liver biochemistry, NAFLD Activity Score (NAS), fibrosis stage and quantitative liver histology.

**Results:** Prophylactic and therapeutic lanifibranor interventions reduced body weight, liver weight and concomitantly reduced levels of liver triglycerides and total cholesterol content. Furthermore, prophylactic and therapeutic lanifibranor intervention significantly improved NAS, mainly driven by reduced steatosis and lobular inflammation scores. These effects were supported by quantitative liver histology, demonstrating reduced levels of liver fat accumulation (%-area of lipids, number of lipid-laden hepatocytes) and inflammation (%-area of galectin-3, number of inflammatory foci). Prophylactic treatment with lanifibranor improved fibrosis stage, while no effect on fibrosis stage was observed with therapeutic
Both Wt and Light-deficient mice were fed a control or a high fat high cholesterol diet (HFHC) for 16 weeks. At the end of the study period, mice were euthanized, and the liver was harvested for analysis. Results: Compared with control diet-fed mice, all mice fed with HFHC diet displayed increased hepatic collagen content and NAS score, although collagen was significantly lower in Light-deficient mice. Hepatic leukocyte determinations demonstrated significantly reduced anti-inflammatory F4/80+ Cd206c+ macrophages in HFHC diet-fed mice, compared with control diet-treated mice regardless of their genotype. Notably, NKT17 subpopulation was significantly increased in Wt mice fed the HFHC diet compared with Wt mice fed control diet, but this increase was not observed in HFHC diet-fed Light-deficient mice compared with their control diet-fed counterparts.

Conclusion: Our results suggest that Light-deficiency in HFHC diet-fed mice reduces hepatic NKT17 subpopulation content and suggest a possible role of Light in NKT subpopulation differentiation in the context of NAFLD.

Funding: PI19-00169, PI22-00062.

WED-521 Evaluation of genetic risk score of a dysmetabolic and obese population of Southern Italy

Benedetta Maria Motta1, Mario Masarone2, Pietro Torre2, Pietro Calabrese3, Marco Aquino2, Federica Belladonna3, Vincenzo Pilone3, Marcello Persico3. 1University of Salerno, Department of Medicine, Surgery and Dentistry, “Scuola Medica Salernitana”, Italy, 2University of Salerno, Dipartimento di Medicina, Chirurgia e Odontoiatria “Scuola Medica Salernitana”, Baronissi, Italy Email: bmotta@unisa.it

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is the leading cause of liver diseases, ranging from simple steatosis to non-alcoholic steatohepatitis, and the susceptibility to develop NAFLD is highly variable and influenced by environmental and genetic factors. The gold standard for diagnosis and staging of NAFLD is liver biopsy, however, it is an invasive procedure, subject to sampling errors and inter-observer variability. Several non-invasive methods aim at diagnosing hepatic steatosis and predicting significant/advanced fibrosis. GWAS studies identified genetic risk factors, and genetic risk scores (GRS) were developed for risk stratification. NAFLD susceptibility is associated with four genetic variants: PNPLA3 rs738409, TM6SF2 rs58542926, rs641738 close to MBOAT7 locus, GCKR rs1260326. Our aim was to evaluate how these variants are distributed in an obese and dysmetabolic population of Southern Italy and how our polygenic risk score (PRS) correlates with liver steatosis and biochemical phenotypes.

Figure 1. Characterization of dysmetabolic and obese population. A) PNPLA3 and GCKR variants distribution. Chi-Square test. B) Biochemical parameters stratified by GRS. One-way ANOVA test.
Conshohocken, United States, 3UC San Diego School of Medicine, San Diego, United States, 4Pinnacle Clinical Research, San Antonio, United States

Method: We enrolled 205 patients attending our Hepatology Clinic and Surgery department, which were genotyped for rs738409, rs585-42526, rs641738, rs1260326 by TaqMan 5′-nuclease assays. We calculated a weighted PRS by multiplying the effect size (beta-coefficient) on steatosis by respective risk alleles and summing the products. Anthropometric data, FibroScan measurements, and blood test results were collected.

Results: In our population, we observed a higher MAF of PNPLA3 and GCKR variants compared to the ones reported in European population of 1000Genomes Project (p < 0.0001). The rs738409 G allele frequency is 34.1% vs. 23%. The rs1260326 T allele frequency is 53.2% vs. 41%. In a sub-cohort of 98 patients, we recorded Fibroscan parameters and biochemical data and evaluated the effect of the 4 variants together by PRS. PRS increased proportionally with ALT levels (p = 0.02), AST (p = 0.04), total cholesterol, triglycerides, and CAP (p = NS). PRS is higher in subjects with a CAP value of 275 dB/m, considered a cut-off for moderate/severe steatosis in general population; moreover, considering a CAP value >295 dB/m PRS is significantly higher in these subjects (p = 0.03).

Conclusion: This study shows that in our population, PNPLA3 and GCKR risk alleles frequency are higher, and that the polygenic risk score correlates with biochemical and FibroScan parameters, identifying the most dysmetabolic subjects.

WED-522 Characterizing the histologic implications of resmetirom-induced liver volume reduction using artificial intelligence-powered digital pathology
Pratik Mistry1, Adam Stanford-Moore1, Robert Egger1, Jonathan Glickman1, Brian Baker1, Nidhi Chandra1, Dinkar Juyal1, Archit Khosla1, Michael Drage1, Murray Resnick1, Katy Wack1, Jim Hennan2, Rohit Loomba1, Stephen Harrison3, Rebecca Taub2, Janani Iyer1, 1PathAI Boston, United States, 2Madrigal Pharmaceuticals, Conshohocken, United States, 3UC San Diego School of Medicine, San Diego, United States, 4Pinnacle Clinical Research, San Antonio, United States

Background and aims: In non-alcoholic steatohepatitis (NASH) clinical trials, liver biopsies are evaluated for histologic evidence of NASH/fibrosis at screening and drug effect at study completion. An emerging hypothesis suggests drug-induced fat and/or liver volume (LV) reduction may complicate histologic interpretation and thus impact trial outcomes. Here, we train artificial intelligence (AI) models to characterize cell types present in NASH and identify morphologic correlates of LV reduction in biopsies from the Phase 2 trial of resmetirom for treatment of NASH.

Method: An AI cell classification model was trained using annotations provided by hepatopathologists on whole slide images (WSIs) of NASH HandE tissue sections from trials and diagnostic samples. Model performance accuracy was confirmed via agreement between model predictions for each cell type and consensus across five hepatopathologists on whole slide images (WSIs) of NASH HandE tissue sections from trials and diagnostic samples. Model performance accuracy was confirmed via agreement between model predictions for each cell type and consensus across five hepatopathologists on whole slide images (WSIs) of NASH HandE tissue sections from trials and diagnostic samples.

Results: AI quantification revealed a statistically significant increase in overall cell density in resmetirom- versus placebo-treated patients (p = 0.037), where increasing cell density was directly associated with decreasing LV (A). Moreover, change in the count proportion of hepatocytes exhibiting steatosis was positively associated with LV change (IVC), while the count proportion of normal hepatocytes was negatively associated with IVC (B). By contrast, changes in the abundance and density of immune cells in the portal tract versus lobule had little to no correlation with IVC (D). AI quantification of fibrosis subcategories revealed that adjusting for the presence of steatosis affected quantification of perisinusoidal and periportal fibrosis specifically, with greater drug-induced changes observed in these fibrosis subcategories relative to others (median change from baseline in proportionate area of F1 + F2 fibrosis = 27% versus 13% with versus without adjustment, respectively).

Conclusion: These results suggest LVC is reflected in the abundance and densities of steatotic and normal hepatocytes, consistent with a model in which disintegration of large triglyceride-filled vesicles results in macroscopic LV reduction. These findings motivate further investigation into the morphologic biomarkers of LVC in NASH clinical trials and how these changes should be adjusted for when evaluating drug effect, particularly in fibrosis.

WED-523 Unraveling the individual contributions of the PPAR isotypes to the pan-PPAR agonist Lanifibranor-induced improvements of the vascular alterations and liver histology in a rat model of early NALFD
Shivani Chotkoe1, Yao Liu1, Guillaume Wettstein2, Jean Louis Junien2, Luisa Vonghia1−3, Hannah Ceuleers1, Joris De Man1, Benedicte De Winter1−3, Wilhelmus Kwanten1−3, Sven Francque1−3, 1University of Antwerp, Laboratory of experimental medicine and pediatrics, Antwerpen, Belgium, 2Inventiva, Daix, France, 3Antwerp university hospital, Gastroenterology and hepatology, Edegem, Belgium

Background and aims: The pan-peroxisome proliferator-activated receptor agonist Lanifibranor completely normalized the intrahepatic vascular resistance (IHVR), the related endothelial dysfunction, and liver histology in a rat model of early NALFD. We studied the underlying mechanism by exploring the mono-PPAR agonists Fenofibrate (PPAR-alpha agonist), GW501516 (PPAR-delta agonist) and Rosiglitazone (PPAR-gamma agonist) using a rat model of early NALFD.

Method: Male Wistar rats (n = 8 per group) were fed a methionine-choline-deficient diet (MCD) or control diet (CD) for 4 weeks simultaneously with either vehicle, 30 mg/kg Fenofibrate, 10 mg/kg GW501516, or 5 mg/kg Rosiglitazone treatment via oral gavage daily. In vivo blood pressure of portal vein was measured, followed by in situ ex vivo liver perfusion in the same animal to assess baseline transhepatic pressure gradient (THPG) at different flows (10-50 ml/min). Liver histology staining was performed using the steatosis-activity-fibrosis score and for morphometric steatosis quantification.
Results: In vehicle-treated animals, livers of MCD rats showed severe, grade 3 steatosis, without inflammation or fibrosis, compared to normal livers in CD rats. MCD rats showed a significantly increased portal pressure in vivo compared to CD rats (5.64 ± 0.63 vs. 3.52 ± 0.24 mmHg, p < 0.0001) and THPG ex vivo was increased at every perfusion flow velocity (e.g., at 30 ml/min: 8.78 ± 0.35 vs. 6.73 ± 0.28 mmHg) with p < 0.001. Fenofibrate, GW501516 and Rosiglitazone significantly decreased portal pressure in vivo (from 5.64 ± 0.63 to 4.37 ± 0.20; 4.34 ± 0.16; 4.43 ± 0.27 mmHg, respectively) with p < 0.0001 in MCD rats. THPG ex vivo was significantly reduced by Fenofibrate (e.g., at 30 ml/min: from 8.78 ± 0.35 to 6.63 ± 0.41 mmHg) with p < 0.001, by GW501516 (e.g., at 30 ml/min: from 8.78 ± 0.35 to 7.61 ± 0.34 mmHg) with p < 0.01, and by Rosiglitazone (e.g., at 30 ml/min: from 8.78 ± 0.35 to 7.95 ± 0.28 mmHg) with p = 0.043. Histology showed that Lanifibranor caused amelioration of steatosis in MCD rats with 19.7 ± 4.8% (p = 0.0001) decrease in steatosis, whereas Fenofibrate improved the degree of steatosis in MCD rats comparable to CD rats. GW501516 only weakly decreased steatosis with 11.72 ± 5.28%. Rosiglitazone caused only minimal histological improvement of steatosis (decrease of 7.15 ± 6.73%) in MCD rats.

Conclusion: The mono-PPAR agonists reduce the increased portal pressure and related functional vascular intrahepatic alterations associated with early NAFLD. However, with Lanifibranor all improvements in vascular function were more pronounced than with each specific agonist. Together with the impact on histology, these data suggest that there is an additive effect of combined PPAR agonism compared to mono-agonism leading to an improvement of the vascular alterations in early NAFLD.

WED-524

GTX-011 improves fibrosis and hepatic stellate cells phenotype in human precision cut liver slices

María Andres-Rozas1, Zoe Boyer-Diaz2, Eugenia Ruiz-Canovas2, Sergi Guixe-Munte3, Peo Aristu1, Juanjo Lozano3, Raúl Pastor3, Noemi García-Delgado2, Jaume Mercade4, Jaime Bosch3,4, Jordi Gracia-Sancho1,3,4,1 Barcelona Liver Bioservices, Spain, 2GAT Therapeutics, Spain, 3IDIBAPS-Hospital Clinic Barcelona-CIBEREHD, Liver Vascular Biology Lab, Spain, 4Inselspital-University of Bern, Switzerland

Email: jgracia@recercaclinic.cat

Background and aims: GTX-011 is a first-in-class drug with anti-inflammatory and anti-fibrotic properties mediated by the inhibition of the TGFβ pathway. Previously, we demonstrated its beneficial effects on portal hypertension and hepatic fibrosis in a preclinical model of non-alcoholic steatohepatitis (NASH) by means of hepatic stellate cells (HSC) de-activation and endothelial cells re-differentiation. The aim of this study was to assess the effects of GTX-011m, the active metabolite of GTX-011, in Precision-Cut Liver Slices (PCLS) from human liver tissues, a 3D human liver model that preserves the structure and cellular composition of the liver, constituting an intermediate step between pre-clinical and clinical research.

Method: PCLS were obtained from human hepatic resections and cultured with GTX-011m 1 μM and 10 μM or vehicle (DMSO 0.1%) for 24 hours. Changes in gene expression were evaluated by mRNA-seq (n = 6/group). Furthermore, gene deconvolution analysis was performed, combining our bulk RNAseq with previously published single-cell data, in order to better understand the changes in the phenotype of each liver cell type in response to treatment.

Results: PCLS treated with GTX-011m 1 μM and 10 μM revealed a total of 723 and 866 differentially expressed genes (p < 0.05, f.c.>1.5), respectively, of which 345 were commonly modified in both concentrations. Transcriptomic analysis manifested that treatment with GTX-011m promoted HSC de-activation and inhibition of profibrogenic pathways. Specifically, HSC activation and proliferation markers alpha-smooth muscle actin (α-sma) and desmin were down-regulated, together with higher expression of remodelling extracellular matrix enzymes (matrix metalloproteinases 1, 3, 10 and 14), and lower expression of their inhibitors (tissue metalloproteinase inhibitors 3 and 4). Lastly, a reduction in collagen expression (collagen 6, 14) was observed. On the other hand, gene deconvolution analysis confirmed the effects of GTX-011m on HSC, decreasing their cell population and promoting their de-activation compared to vehicle, with no effects on other cell types proportion (see Figure). These effects were associated with the activation of apoptotic pathways defined by the up-regulation of tumor necrosis factor-related apoptosis-inducing ligand (TRAIL), fas, fas-ligand, caspases 3, 8, 9 and 10 and BAX/BAK, as well as reduction of HSC activation markers (SRY-box transcription factor 9 (sox9) and desmin).

Figure: Conclusion: This study shows for the first time the antifibrotic effects of GTX-011 in human liver tissue, confirming our previous results obtained in a preclinical model of NASH and encouraging its clinical evaluation as a possible new treatment for this disease.

WED-525

Beneficial effect of extravirgin olive oil on hepatic fatty acid accumulation and fibrogenesis: oleocanthalic acid as a promising compound for the treatment of NAFLD and NASH

Martina Colognesi1, Ilaria Zanotto1, Daniela Gabbia1, Yahima Frion-Herrera1, Maria Carrara1, Alice Rossi1, Martina Diigiacomo2, Doretta Cuffaro2, Marco Macchia2, Sara De Martin1,1 University of Padova, Department of Pharmaceutical and Pharmacological Sciences, Padova, Italy, 2University of Pisa, Department of Pharmacy, Pisa, Italy

Email: sara.demartin@unipd.it

Background and aims: Extravirgin olive oil (EVOO) is one of the major components of the Mediterranean diet, and its consumption has been correlated with beneficial effects on human health. EVOO gained a renewed interest for its ability to influence pathways involved in inflammation and oxidative stress. Recent preclinical studies stressed the importance of the EVOO phenolic oleocanthal (OC) in the modulation of these processes, and further established its possible role as an antifibrotic agent by counteracting NADPH oxidases upregulation, and reducing the expression of proinflammatory cytokines and metalloproteinases. Recently, the mono-oxidized derivative of OC oleocanthalic acid (OcA) was isolated from aged EVOO, but its biological activities are still controversial. In the light of these considerations, we evaluated OcA direct effect on lipid accumulation and fibrogenesis in 2D and 3D in vitro models of NASH.

Method: In this study, OcA modulation of fatty acid (FA) uptake was assessed in different in vitro models. Firstly, HepG2 cells were treated for 24 hours with a mixture of palmitic and oleic acid (PA/OA 1:1, 0.1 mM) to obtain 3D spheroids simulating NASH-like microenvironment. Both models underwent a 24 h treatment with different concentrations of OcA (0.5 μM, 1 μM, 2 μM, and 5 μM), and intracellular neutral lipids were stained with Bodipy or Nile red stain. Subsequently, OcA modulation of lipid accumulation was evaluated in cocultures of HepG2 treated with PA/OA for 24 hours and THP-1-derived M1 proinflammatory macrophages, simulating the NASH-like microenvironment but with a lower oxidative stress. These data suggest that there is an additive effect of combined PPAR agonism compared to mono-agonism leading to an improvement of the vascular alterations in early NAFLD.
Lastly, the antifibrotic effect of OcA was evaluated in two different in vitro models, i.e., in LX2 cells activated either by a 24 hours treatment with TGF-beta1 (2 ng/ml) or by cocultures with HepG2 and THP-1 derived M0 macrophages. To assess OcA effect on fibrogenesis, the intracellular expression of alphaSMA, a well-known marker of LX2 activation, was evaluated by immunocytochemistry coupled to confocal microscopy.

**Results:** OcA-treated HepG2 cells incubated with the PA/OA mix reported a significant, dose-dependent, reduction of FAs uptake after treatment compared to control. In accordance with these results, OcA reduced the FAs overload in the coculture of HepG2 and M1-like macrophages compared PA/OA-treated cells (p < 0.0001), and in the 3D spheroids coculture of HepG2 and LX2 cells treated for 24 hours with PA/OA mix (p < 0.01), providing evidences of its positive effect on the intracellular accumulation of lipids. Concerning fibrogenesis modulation, LX2 activation was significantly decreased after 24 hours of OcA treatment (p < 0.0001), in both fibrogenesis models.

**Conclusion:** This study provides preliminary in vitro evidence of the beneficial effect of OcA on NASH onset, since it significantly reduced the accumulation of FAs and prevent HSC activation in a panel of in vitro models of NASH, acting on the two main mechanisms involved in NASH development.

**WED-526**

**Novel image analysis and immunohistochemistry advances to accompany pathologist driven non-alcoholic fatty liver disease diagnosis**

Maroua Tliba1, Manon Motte1, Christophe Sattonnet2, Viviana Lamberti1, Elena Baranova1, Marie Gérus-Durand1, Renaud Burrer1, Amanda Finan1, Cerba Research, France; =Diag, France Email: afinan@cerbaresearch.com

**Background and aims:** The prevalence of non-alcoholic fatty liver disease (NAFLD) is roughly 30% worldwide, a percentage that has rapidly increased over the past decade. There exist two types of NAFLD, non-alcoholic fatty liver (NAFL) and non-alcoholic steatohepatitis (NASH). Both subtypes are associated with lipid accumulation in the liver, the latter being more severe with inflammatory cell infiltration, fibrosis and subsequent hepatocyte damage and impaired organ function. The current gold standard for NAFLD diagnosis is liver biopsies evaluated by experienced pathologists who assign scores for several features (fibrosis, steatosis, inflammation and ballooning). However, documented inter-pathologist variability in scoring and the semi-quantitative nature of the scoring system itself highlight the need for new methods to ensure the unbiased, consistent assessment of disease. Cerba Research has developed tools that could be implemented to solve the variability in NAFLD diagnosis.

**Method:** A digital pathology approach involving 30 NASH needle core biopsies stained with hematoxylin and eosin (HandE) and Masson’s Trichrome was developed. A pathologist evaluated the classic diagnostic parameters on these matched stains for each liver sample to serve as the gold standard. The imaging team of Cerba Research developed in parallel an application on Visiopharm® software to quantify fibrosis and steatosis on Masson’s Trichrome stained slides with help from the pathologist’s annotations. Supplementary chromogenic multiplex immunohistochemistry panels were also developed at Cerba Research to assist in the analysis of the liver contexture.

**Results:** The development of the Masson’s Trichrome application and the correlation with the pathologist will be presented. The evolution of an HandE application using Deep Learning will also be shown. Two multiplex panels were designed. The first includes CD45 for inflammation analysis, CD138 as a plasma cells marker, and adipophilin that allows for visualization of lipid droplets associated with metabolic dysregulation in the hepatocytes. The second panel allows for the detection of cytokeratin 8 and 18, the loss of which allows for a facilitated identification of ballooned hepatocytes that may increase the accuracy of distinguishing NASH from NAFL. Example images and quantification of the markers will be presented.

**Conclusion:** The approaches presented could provide a toolbox for clinical pathologists to aid in a more accurate and quantifiable classification of NAFLD as either NAFL or NASH.

**WED-527**

**Evaluating the hepatic efficacy and cardiometabolic profile of PNPLA3, TM6SF2, and other therapeutic targets for NAFLD: a drug-target Mendelian randomization analysis**

Daniel Rosoff1, Lucas Mavromatis1, Andrew Bell1, Ali Hamandi1, Lauren Park1, Jeeseun Jung1, Josephin Wagner1, David Ray2, Falk Lohoff1. National Institutes of Health, National Institute on Alcohol Abuse and Alcoholism, Bethesda, United States; 2University of Oxford, Oxford Centre for Diabetes, Endocrinology and Metabolism, Oxford, United Kingdom Email: daniel.rosoff@linacre.ox.ac.uk

**Background and aims:** The prevalence of non-alcoholic fatty liver disease (NAFLD) is roughly 30% worldwide, a percentage that has rapidly increased over the past decade. There exist two types of NAFLD, non-alcoholic fatty liver (NAFL) and non-alcoholic steatohepatitis (NASH). Both subtypes are associated with lipid accumulation in the liver, the latter being more severe with inflammatory cell infiltration, fibrosis and subsequent hepatocyte damage and impaired organ function. The current gold standard for NAFLD diagnosis is liver biopsies evaluated by experienced pathologists who assign scores for several features (fibrosis, steatosis, inflammation and ballooning). However, documented inter-pathologist variability in scoring and the semi-quantitative nature of the scoring system itself highlight the need for new methods to ensure the unbiased, consistent assessment of disease. Cerba Research has developed tools that could be implemented to solve the variability in NAFLD diagnosis.

**Method:** A digital pathology approach involving 30 NASH needle core biopsies stained with hematoxylin and eosin (HandE) and Masson’s Trichrome was developed. A pathologist evaluated the classic diagnostic parameters on these matched stains for each liver sample to serve as the gold standard. The imaging team of Cerba Research developed in parallel an application on Visiopharm® software to quantify fibrosis and steatosis on Masson’s Trichrome stained slides with help from the pathologist’s annotations. Supplementary chromogenic multiplex immunohistochemistry panels were also developed at Cerba Research to assist in the analysis of the liver contexture.

**Results:** The development of the Masson’s Trichrome application and the correlation with the pathologist will be presented. The evolution of an HandE application using Deep Learning will also be shown. Two multiplex panels were designed. The first includes CD45 for inflammation analysis, CD138 as a plasma cells marker, and adipophilin that allows for visualization of lipid droplets associated with metabolic dysregulation in the hepatocytes. The second panel allows for the detection of cytokeratin 8 and 18, the loss of which allows for a facilitated identification of ballooned hepatocytes that may increase the accuracy of distinguishing NASH from NAFL. Example images and quantification of the markers will be presented.

**Conclusion:** The approaches presented could provide a toolbox for clinical pathologists to aid in a more accurate and quantifiable classification of NAFLD as either NAFL or NASH.

**Figure:** (abstract: WED-527).
Background and aims: While Non-alcoholic fatty liver disease (NAFLD) is the most prevalent cause of end-stage liver disease worldwide, including cirrhosis, and has been linked with increased risk for type 2 diabetes (T2D) and cardiovascular disease (CVD), there are currently no approved therapies. Previous studies have shown that NAFLD heredity is derived primarily from genes involved in hepatic lipid metabolism, i.e., PNPLA3, TM6SF2, GCKR, and MBOAT7, targeting these genes may be an important approach for developing NAFLD therapeutics. However, whether lowering liver fat via these targets impacts T2D, and CVDs remains unknown.

Method: Here, we used drug-target Mendelian randomization (MR) and data from large genome-wide association studies to investigate whether genetic variants within these genes that mimic the pharmacological reduction liver fat content (measured via magnetic resonance imaging) impact NAFLD, T2D, CVDs.

Results: Variants corresponding to a hepatic fat content reduction via these genes were each associated with a lower risk of NAFLD: PNPLA3 OR = 0.30, P value = 2.03 × 10^{-7}; TM6SF2 OR = 0.52, P value = 5.47 × 10^{-7}; and GCKR OR = 0.18, P value = 5.98 × 10^{-6}). Reduced liver fat content via PNPLA3, TM6SF2 variants were also associated with reduced cirrhosis risk (e.g., PNPLA3 OR = 0.18, P value = 3.13 × 10^{-7}). Genetically-proxied PNPLA3 inhibition was also protective against the risk for T2D (OR = 0.844, P value = 4.28 × 10^{-8}). PNPLA3 variants were linked with a slight increased risk for CVDs (e.g., coronary artery disease (CAD) OR = 1.11, P value = 2.52 × 10^{-7}). PNPLA3 associations were robust to sensitivity analyses using PNPLA3 instruments comprised of only the I148M variant and additional PNPLA3 instruments derived from circulating alanine aminotransferase levels. MR estimates were broadly consistent across complementary MR methods, which strengthens causal inference.

Conclusion: These findings extend existing literature highlighting these genes as therapeutic targets for NAFLD, suggest protective effects for T2D, and replicate previous studies linking liver fat and cardiometabolic diseases, including the impact of PNPLA3 variants on heart disease.

WED-528
High-fat diet exacerbates lipopolysaccharide-induced liver injury in obese KK-Ay mice
Satoshi Sakuma1, Kazuyoshi Kon2, Akira Uchiyama1, Hiroo Fukada1, Toshifumi Sato2, Shunheki Yamashina1, Kenichi Ikejima1, Juntendo University School of Medicine, Department of Gastroenterology, Japan, 2Juntendo University School of Medicine, Department of Gastroenterology, Tokyo, Japan
Email: kazukon@juntendo.ac.jp

Background and aims: Cytokine storm is the primary event for fatal multiple organ damage during systemic infections such as sepsis. Although obesity is an etiological risk factor for cytokine storm, the mechanisms underlying the exacerbation remains unclear. Therefore, the aim of this study was to investigate the role of obesity and high-fat diet (HFD) load in exacerbation of cytokine storm and liver damage following lipopolysaccharide (LPS) challenge using obese diabetic KK-Ay mice.

Method: Male KK-Ay mice were fed a diet containing high-fat (HFD; D12492, Research Diets, Inc.) or control (D12450J) for 4 weeks. Wild C57Bl/6J mice (BL6) was used as a control strain. Mice were sacrificed at 1–24 hr after intraperitoneal injection of LPS 5 mg/kg BW or saline. Serum AST and ALT levels were determined by an enzymatic method. Hepatic expression levels of cytokine mRNA were measured by RT-PCR. Apoptotic cell death in the liver specimen was detected by TUNEL staining.

Results: Following HFD feeding for 4 weeks, BL6 controls and KK-Ay mice gained body weight nearly 15% and 40% over basal values, respectively. KK-Ay mice fed an HFD showed prominent hepatic steatosis after HFD feeding, whereas BL6 mice developed trivial steatosis even after HFD feeding. Indeed, liver weight increased greatly in HFD-fed KK-Ay from 2.44 ± 0.08 g to 3.41 ± 0.11 g, whereas the values only increased from 0.77 ± 0.05 g to 0.91 ± 0.02 g in BL6 fed an HFD. After a single intraperitoneal injection of LPS of 5 mg/kg, all BL6 mice fed a control diet survived for 24 hr, indicating that this dose was sublethal. HFD-fed BL6 died within 24 hr after injection of LPS nearly 20%, which was not statistically significant. In sharp contrast, the mortality rate 24 hr after LPS injection reached 86% in HFD-fed KK-Ay mice, which was significantly higher than 16% of control diet-fed KK-Ay mice given LPS (p = 0.029). Serum AST and ALT levels 12 h after LPS in HFD-fed KK-Ay mice increased to 492 ± 112 IU/L and 673 ± 191 IU/L, which were obviously higher than those in HFD-fed BL6 reaching 247 ± 35 IU/L and 193 ± 58 IU/L, respectively. Indeed, HFD-fed KK-Ay mice showed marked apoptotic cell expression after LPS administration. Further, hepatic expression levels of TNFα mRNA 1 hr after LPS challenge were almost doubled in HFD-fed KK-Ay mice as compared to control diet-fed KK-Ay mice. Moreover, the induction levels of inflammasome-associated IL1β mRNA in the liver was also significantly higher in HFD-fed KK-Ay mice 1–3 h after LPS than those in control diet-fed KK-Ay mice.

Conclusion: These findings clearly indicate that KK-Ay mice, which develop obesity and severe fatty liver following HFD-feeding, are obviously vulnerable to LPS, showing higher mortality and severer liver injury. The underlying mechanisms most likely involve sensitization of hepatic macrophages and inflammasome-related reactions against LPS, as well as increased sensitivity to proapoptotic cell death in hepatocytes. It is therefore concluded that metabolic dysfunction-associated fatty liver appears to be an important risk factor of exacerbation in multiple organ failure including severe liver damage under condition of cytokine storm.

WED-529
Exploring transcriptome profiles to combat non-alcoholic fatty liver disease
Eva Kocar1, Tadeja Rezen1, Pablo J Giraudi2, Silvia Palmisano3,4, Claudio Tiribelli2, Natalia Rosso5, Damjana Rozman1, 1Faculty of Medicine, Institute of biochemistry and molecular genetics, Centre for functional genomics and bio-chips, Ljubljana, Slovenia, 2Fondazione Italiana Fegato Onlus, Area Science Park Basovizza, Trieste, Italy, 3University of Trieste, Department of Medical, Surgical and Health Sciences, Trieste, Italy, 4Cattinara Hospital, Surgical Clinic Unit, Trieste, Italy
Email: damjana.rozman@mf.uni.it
cohort of patients was performed in Orange. Patients' medical data and clinical parameters were also included in the statistical analysis. 

Results: Several known and unknown gene candidates with FDR ≤ 0.05 were differentially expressed when comparing different fibrosis stages in the discovery cohort of patients, including ITGBL1, ANKRD29, PTGDS, and LUM. Differential expression of some genes was successfully validated by RT-qPCR in a discovery and a validation cohort of patients. In addition, source of variation analysis revealed the influence of several clinical parameters on gene expression in a discovery cohort of patients. Interestingly, BMI, fatty acids, and age had a greater impact on gene expression than fibrosis stage itself. The latter may be one of the reasons for the low number of differentially expressed genes. Correlation of gene expression with fibrosis stage in a discovery cohort of patients showed ITGBL1 as the best candidate gene with a positive correlation of +0.66. Reactome and KEGG enrichment analysis revealed significant changes (FDR ≤ 0.05) in metabolic pathways comparing early stages (S0, S1) and later fibrosis stages (S3/S4) in a discovery cohort of patients.

Conclusion: Our study revealed several differentially expressed candidate genes that could differentiate between different fibrosis stages and thus contribute to better patient stratification and appropriate treatment. Genes that can be observed in serum samples by their transcripts or proteins (e.g. ITGBL1, LUM) are particularly relevant as potential blood biomarkers.

WED-530
Effects of HSD17B13-targeting siRNA-R0737072 on Liver Fibrosis and Steatosis in a mouse model of NASH
Li Ming Gan1, Shuquan Zheng2, Junshi Liang2, Di Li2, Hongyan Zhang2, Zicai Liang2, Shan Gao2. 1Ribocure Pharmaceuticals AB, Sweden, 2RiboLife Science Co., Ltd, China
Email: ganlm@ribolia.com

Background and aims: HSD17B13 has been reported to correlate with NASH development. A siRNA targeting HSD17B13 (R0737072) is designed, GalNAc conjugated, and demonstrated good activity both in cell lines and mouse livers. The purpose of this study was to evaluate the potential therapeutic effects of R0737072 on liver steatosis and fibrosis in a mouse model of human non-alcoholic steatohepatitis (NASH).

Method: A NASH mouse model was induced by western diet and a fructose drinking protocol. After a period of 56 days’ dietary challenge, a single dose of R0737072 was administrated subcutaneously into the NASH mice, and liver tissues were analyzed at D15, D29, and the end of the study (D43), with regard to HSD mRNA expression, as well as degree of hepatic fibrosis and steatosis, using Picro Sirus Red and hematoxylin staining, respectively.

Results: 1. Single dose of R0737072 resulted in robust and durable knockdown of HSD17B13 mRNA in NASH mice. Compared with the PBS group, the inhibitory rates of R0737072 on HSD17B13 mRNA expression were maintained at 98.53%, 89.85%, and 74.20% on D15, D29, and D43, respectively (Figure 1E). 2. R0737072 resulted in improvement of liver steatosis and fibrosis in the NASH mouse model. Following the dietary challenge, the NASH mouse model displayed signs of liver steatosis and fibrosis over time, which peaked at D15 and plateaued thereafter. At the end of the experiment on D43 post administration, a clearer reduction of damage of both fibrosis and steatosis was seen, Single sc dose of R0737072 resulted in significantly improved fibrosis IPP score at D15 and D43 compared to placebo. (Figure 1A–D and F).

Conclusion: R0737072 demonstrated durable and potent inhibitory effects on HSD17B13 mRNA expression, and is capable of halting worsening of steatosis and fibrosis in a mouse model of NASH.

WED-531
Discovery biomarker to optimize obeticholic acid treatment for non-alcoholic fatty liver disease
Eileen Yoon1, Dae Won Jun1, Huiyul Park2, Sang Bong Ahn1, Hyo Young Lee3, Hyunwoo Oh4, Joo Hyun Oh5, Joo Hyun Sohn1, Jihyun An1, Jang Han Jung6, Eun Chul Jang6, Sung Eun Kim7. 1Hanyang University, College of Medicine, Korea, Rep. of South, 2Myoungji Hospital, Hanyang University College of Medicine, Korea, Rep. of South, 3Nowon Eulji Medical Center, Eulji University School of Medicine, Korea, Rep. of South, 4Uijeongbu Eulji Medical Center, Eulji University College of Medicine, Korea, Rep. of South, 5Dongtan Sacred Heart Hospital of Hallym University Medical Center, Korea, Rep. of South, 6Soonchunhyang University College of Medicine, Korea, Rep. of South

Figure: (abstract: WED-530).
Background and aims: Though obeticholic acid (OCA) is a promising drug for non-alcoholic fatty liver disease (NAFLD), the response rate of OCA is limited. This study aimed to develop a biomarker to optimize OCA treatment for NAFLD.

Method: C57BL/6N mice males were fed on a western diet for 24 weeks. Pre-study liver biopsy performed at 12 weeks, and stratified according to disease severity. Next, the mice were administered with OCA (5 mg/kg/day) or vehicle for additional eight weeks. Hepatic transcriptome, metabolome and intestinal microbiome analyses compared according to OCA treatment responder and non-responder using pre-study and end of study samples. LX-2 cells transfected with short-interfering RNA against CYP7B1 (siCYP7B1) and/or treated with OCA to evaluate the role of CYP7B1 in NAFLD.

Results: Resolution rate of steatohepatitis in the OCA and vehicle groups were 36.8% and 0%, respectively. The hepatic transcriptome and bile acid metabolite profile analyses revealed that the alternative bile acid synthesis pathway (Cyp7b1 and muricholic acid) in the OCA-responder group were upregulated compared with those in the OCA-non-responder group. Intestinal microbiome analysis also revealed that the abundances of Bacteroidaceae, Parabacteroides, and Bacteroides, which were positively correlated with the alternative bile acid synthesis pathway, were higher in the OCA-responder group than in the non-responder group. Pre-study hepatic mRNA levels of Cyp8b1 (classic pathway) were downregulated in the OCA-responder group. The OCA response rate increased up to 80% in cases with a hepatic Cyp7b1/Cyp8b1 ratio ≥ 5.0. CYP7B1 expression was regulated by glucose concentration, and anti-fibrotic effect of OCA showed in inflammatory cells infiltration. Furthermore, treatment with CAL resulted in surged ileal immunoreactivity to tight junction protein claudin-1 which was partially negated in the CAL+HQ treated group (Fig. 1). On the other hand, occludin showed augmented expression in NASH ileums which further increased upon treatment with CAL but did not significantly alter with HQ addition.

Conclusion: The upregulated alternative bile acid synthesis pathway or high hepatic CYP7B1 can be a potential biomarker for predicting OCA response.

WED-532
Unravelling an autophagy-dependent role of vitamin D in preserving gut integrity in experimental NASH
Andrew Hakeem, Basma Alaa, Olfa Hammam, Mahmoud Khattab, Aiman El-Khatib, Yasmeen Attia, Faculty of Pharmacy, The British University in Egypt, Department of Pharmacology, Cairo, Egypt, Theodor Bilharz Research Institute, Department of Pathology, Egypt, Faculty of Pharmacy, Cairo University, Department of Pharmacology and Toxicology, Cairo, Egypt

Background and aims: The widespread prevalence of non-alcoholic fatty liver disease (NAFLD) exacts a heavy toll on global economy posing an unmuted medical need. Clinical data suggest a putative role for gut barrier integrity as a critical determinant of NAFLD progression towards non-alcoholic steatohepatitis (NASH) in a large subset of patients. Calcitriol (CAL), a vitamin D receptor (VDR) agonist, was previously shown to restore intestinal homeostasis under various pathological contexts. However, its effect on gut barrier integrity and the possible molecular underpinnings mediating its gut-protective effects in a NASH setting is little explored. Induced autophagy was previously linked to barrier maintenance in response to intestinal insults. VDR signaling has been shown to promote the activation of autophagy directly and indirectly. The current study was therefore set out to investigate the potential impact of CAL in modulating intestinal tight junction protein expression in NASH and whether these effects could potentially be mediated in an autophagy-dependent manner.

Method: A dietary NASH model was adopted in the current study using male C57BL/6 mice that were divided into four groups: (1) Normal standard chow-fed group; (2) high-fat diet (HFD)-fed NASH group; (3) CAL group, which received CAL (5 mg/gm/day, i.p., twice weekly); and (4) CAL+HQ group, which received CAL and the autophagy inhibitor hydroxychloroquine (HQ; 60 mg/kg/day, p.o., daily). Treatments were initiated at week 12 and mice were sacrificed at the end of week 16. Hepatic and ileal tissues were harvested and preserved in 10% formalin for histopathological analysis. Tight junction proteins, claudin-1 and occludin, were estimated in ileal sections using immunohistochemistry to assess barrier integrity.

Results: Hematoxylin and eosin (H&E)-stained liver sections of HFD-fed mice showed macro- and microvesicular steatosis, hepatocyte ballooning, and increased portal lymphocytic infiltrates, insults reminiscent of NASH that were mitigated upon treatment with CAL. Meanwhile, H&E-stained ileal sections of NASH mice revealed atrophic mucosa with moderate inflammatory cells infiltration as well as partial loss of goblet cells. These histological derangements were ameliorated in CAL-treated mice with ileal sections showing preserved villous architecture, near normal goblet cells, and mild infiltration in mucosal and submucosal villous cores. Addition of HQ largely abolished CAL mediated improvement primarily manifesting in inflammatory cells infiltration. Furthermore, treatment with CAL resulted in surged ileal immunoreactivity to tight junction protein claudin-1 which was partially negated in the CAL+HQ treated group (Fig. 1). On the other hand, occludin showed augmented expression in NASH ileums which further increased upon treatment with CAL but did not significantly alter with HQ addition.

Conclusion: The current study findings suggest that CAL confers gut-protective effects in NASH. These effects were mediated, at least in part, by modulating different tight junction proteins expression that is autophagy dependent.

WED-533
Selective modulation of mitochondrial complex I ameliorates steatosis and hepatic inflammation in MCD-diet fed rats
Laura Giuseppe Di Pasqua, Oriana Bosco, Marta Cagna, Peng Sun, Stefan Günther Kauschke, Mariapia Vairetti, Anna Cleta Croce, Andrea Ferrigno, University of Pavia, Department of Internal Medicine and Therapeutics, Pavia, Italy, Boehringer Ingelheim Pharma GmbH and Co. KG, Department of CardioMetabolic Diseases Research, Germany, Institute of Molecular Genetics-Italian National Research Council (CNR), Pavia, Italy

Email: lauragiuseppin.dipasqua01@universitadipavia.it
Background and aims: NAFLD is one of the most common liver diseases worldwide. Inflammation and ROS production play a key role in the pathology progression. ROS scavengers are currently employed to sustain natural antioxidant defense, however no specific pharmacological target has been identified yet. Recently, it has been demonstrated that metformin targets mitochondrial complex I, making it a new interesting target. NAFLD is strictly related with mitochondrial dysfunction: lipid accumulation increases beta-oxidation, causing an overproduction of reducing equivalents and ROS. Aim of this work was to investigate if the selective modulation of mitochondrial complex I, the main ROS producer in mitochondria, could play a role in decreasing hepatic lipid accumulation and NAFLD progression.

Method: male Wistar rats fed by a Methionine and Choline deficient (MCD) diet or Control diet for 6 weeks were orally administered, starting from the fourth week with complex I modulator (CIM, Boerihinger Ingelheim) 10 mg/Kg/day or vehicle for 3 weeks. Lipid peroxidation and ROS were assayed by TBARS and DCHF-DA methods. ATP content and NAD (P)H bound/free ratio were measured. Hepatic Nitrate and Nitrite concentration was established and total lipid content was measured using Nile Red dye. The area of lipid droplets and the rate of inflammatory cells infiltration was calculated on H&E stained liver sections.

Results: TBARS increased in MCD-treated rats compared with Control rats, without changes after CIM administration. MCD groups showed a ROS content increase, but a significant reduction in CIM-treated Controls was detected, compared with vehicle-treated Controls. ATP content decreased in CIM-treated controls, but no significant differences were appreciated in MCD treated groups. The same trend was observed for NAD (P)H bound/free ratio. Nitrate and Nitrite were reduced in CIM-treated MCD rats compared with vehicle-treated Controls. Total lipid content was significantly reduced in CIM-treated MCD rats compared with vehicle-treated MCD rats. A significant decrease in lipid droplet areas was observed in MCD rats treated with CIM, compared with untreated MCD rats. A significant reduction in inflammatory cell infiltration was observed in MCD rats treated with CIM. Lastly, a significant reduction in AST and ALT was observed in CIM-treated control rats, compared with untreated control rats.

Conclusion: our work demonstrated that the complex I modulator administration could be a promising strategy in the reduction of lipid accumulation and inflammatory process in our model of steatosis. At the best of our knowledge, although further investigation is needed to clarify the mechanisms underlying this process, this is the first attempt to demonstrate a possible role of complex I modulator in reducing lipid accumulation and NAFLD progression in a model of benign steatosis.

WED-534
Inhibition of NLRP3 inflammasome activation by MK571, a multidrug resistance-associated protein (MRP) inhibitor
Oh Seung Seok¹, Jeongwoo Park¹, Keon Wook Kang¹. ¹Seoul Nat. University, Korea, Rep. of South
Email: kwkang@snu.ac.kr

Background and aims: The NLR family pyrin domain containing 3 (NLRP3) inflammasome is an intracellular multiprotein complex involved in the production of mature interleukin 1-beta (IL-1β), and has been known to induce metabolic inflammation such as non-alcoholic steatohepatitis (NASH). Multidrug resistance-associated protein 4 and 5 (MRP4 and MRP5, also known as Abcc4 and Abcc5) functionally control intracellular levels of glutathione and cAMP via regulating their efflux amounts. Here, we tried to reveal the role of MRP4 and MRP5 in NLRP3 inflammasome activation during liver injury.

Method: To assess the function of MRP4 and MRP5, MK571, a selective inhibitor of MRP transporter family, was used. Protein and mRNA expression of MRP family was assessed in primary hepatocytes, kupffer cells, hepatic stellates cells and bone marrow-derived macrophages (BMDMs). For determining in vivo protective effect of MK571 on NLRP3 inflammasome-mediated liver injury, LPS/galactosamine-induced fulminant hepatitis model was used.

Figure: (abstract: WED-534).
Results: Protein levels of MRP4 were increased in kupffer cells from acetaminophen-injected mice. cAMP accumulation by MK571-mediated MRP4 inhibition concentration-dependently suppressed NLRP3 inflammasome via either transcriptional control of nuclear factor-κB or ubiquitination of NLRP3 protein. In lipopolysaccharide/D-galactosamine-induced acute hepatitis mouse model, oral administration of MK571 suppressed the increases in several inflammatory marker proteins and serum IL-1β.

Conclusion: These findings indicate that the MRP4 and 5 as energy-dependent transporters for the cyclic nucleotide, are involved in the regulation of NLRP3 inflammasome during liver injury.

WED-535
A formulation of palmitoylethanolamide and phenolic compounds improves NAFLD-associated hepatic lipid dysmetabolism and oxidative stress in ob/ob mice
Stefania Melini1, Claudio Pirozzi1, Adriano Lama1, Filomena Del Piano2, Federica Comella1, Nicola Opollo1, Chiara Annunziata2, Giuseppina Mattace Raso1, Rosaria Meli1.
1University of Naples Federico II, Pharmacy, Italy, 2University of Naples Federico II, Department of Veterinary Medicine and Animal Production, Italy
Email: stefania.melini@unina.it

Background and aims: Gluco-and lipotoxicity, as well as insulin resistance, play a key role in the development of NAFLD associated with metabolic disorders characterizing obesity (Petersen et. Al 2017). The excess of free fatty acids (FFA) facilitates the generation of lipotoxic metabolites contributing to the development of hepatic oxidative stress and inflammation (Hong et al 2021) which leads to insulin resistance and glucose intolerance (Tangvarasittichai et al. 2015). The N-acylethanolamine palmitoylethanolamide (PEA) and some phenolic compounds from olive leaves, such as rutin and hydroxytyrosol (HT), have shown different metabolic, anti-inflammatory and antioxidant effects (Annunziata et al. 2020, Pirozzi et al. 2016, Li et al 2022). This study evaluates the possible beneficial activity of a formulation containing PEA co-micronized with rutin and associated with HT in counteracting hepatic damage and metabolic alterations occurring in a mouse model of high-fat diet (HFD)-induced obesity.

Method: Male C57Bl/6j mice were divided into 3 groups: a control group receiving standard chow diet; mice fed with HFD for 19 weeks; a HFD group administered NORM3 (PEA 10 mg/kg/die-Rutin 2 mg/kg/die, HT 0, 5 mg/kg/die per os) from week 12 up to week 19. Biochemical and molecular analysis were performed by ELISA assay and Western blot and Real-Time PCR analysis, respectively.

Results: The treatment with NORM3 reduced body weight and fat mass of obese mice compared with untreated HFD group. The protective effect of NORM3 was confirmed by the decrease of serum hepatic and metabolic parameters, (i.e transaminases, triglycerides, and cholesterol). Moreover, NORM3 improved glucose homeostasis altered by HFD reducing fasting glycaemia and gluconeogenesis process, as shown by PTT. Consistently, NORM3 induced the activation of PI3K/AKT pathway, leading to the restoration of insulin signaling. AKT can also activate glycogen synthase kinase (GSK)3beta, which may promote the activity of antioxidant mediators. NORM3 demonstrated a significant antioxidant effect reducing the production of ROS and malondialdehyde levels as well as increasing the hepatic transcription of nuclear factor erythroid (NRF2) and its downstream antioxidant genes. We also demonstrated the effect of NORM3 on the hepatic inflammation induced by lipid overnutrition. NORM3 treatment reduced the protein expression of NFκB as well as the transcription of Il1b and Ccl2. Finally, since FFA accumulation is another hallmark in NAFLD and obesity, we investigated the effect of NORM3 on hepatic lipid dysmetabolism induced by HFD. The administration of NORM3 counteracted lipogenesis, reducing the hepatic mRNAs of fatty acid synthase (Fasn) and increasing PPAR-alpha, as a key upstream target of fatty acid oxidation.

Conclusion: Taken together, our findings identify NORM3 as a potential hepatoprotective approach in dampening the hepatic dysmetabolism and associated oxidative stress in NAFLD and obesity.

WED-536
Deletion of no-sensitive guanylyl cyclase protects from metabolic obesity but not from fibrosis in murine non-alcoholic fatty liver disease
Muhammad Ashfaq-Khan1, Jan-Luca Wasser1, Andreas Friebe1.
1Universität Würzburg, Germany
Email: m.ashfaq_k_biotech@yahoo.com

Background and aims: Non-alcoholic fatty liver disease (NAFLD) comprises bland steatosis that progresses to its more aggressive form, non-alcoholic steatohepatitis (NASH), which can finally develop into hepatocellular carcinoma in a subset of patients. The underlying mechanisms and the endogenous drivers of the development of NAFLD/NASH have not yet been fully elucidated. Recently, a stimulator of NO-sensitive guanylyl cyclase (NO-GC), the receptor for the signaling molecule nitric oxide (NO), was shown to inhibit fibrosis, inflammation and steatosis in rodent models of NASH. In our current study, we have characterized the role of NO-GC in an experimental model of NAFLD/NASH.

Method: 8–10-week old male mice carrying a global deletion of NO-GC and their wildtype siblings (C57BL/6j background) were fed a Western diet (21% fat, 0.2% cholesterol and 42 g/l fructose) for 16 weeks. Thereafter, mice were sacrificed, and liver tissues were fixed in paraformaldehyde for histological analysis.

Results: NO-GC knock mice had significantly lowered liver (p = 0.0048) and body weights (p =0.00019) compared to wildtype control. In addition, epidydymal, mesenteric and inguinal fat was strongly decreased in NO-GC KO mice compared to controls. Moreover, Western diet-fed wildtype mice showed highly elevated blood glucose levels in the intra-peritoneal glucose tolerance test after 120 min (341 ± 104 mg/dl) whereas levels in NO-GC KO were normal (156 ± 25 mg/dl). In line with this, steatosis was not observed in the livers of NO-GC KO mice whereas wildtype livers showed a steatosis score of 3 (≥66%). Despite the lack of peripheral and hepatic obesity in the NO-GC KO mice, the extent of fibrosis was similar in both genotypes.

Conclusion: Deletion of NO-GC protects from peripheral and hepatic obesity but not from fibrosis upon feeding a Western diet. Our results indicate that hepatic fibrosis may result from Western diet independent of the development of steatosis.

WED-537
Empagliflozin improves non-alcoholic fatty liver disease in a new translational mouse model even without impact on weight loss
Katharina Luise Hupa-Breier1, Janine Dywicki2, Björn Harteble1, Noyan Fathi3, Heinrich Wiedemer1, Matthias Hardtke-Wolenski1, 2, Elmar Jaeckel1, 3, 1Hannover Medical School, Germany, 2University Duisburg-Essen, Germany, 3University of Toronto, Canada
Email: hupa.katharina@mhl-hannover.de

Background and aims: Non-alcoholic steatohepatitis (NASH) is currently one of the most common causes of chronic liver disease with the metabolic syndrome as the main risk factor. However, current mice models only partially represent the human phenotype of the metabolic syndrome. Beside weight loss and lifestyle intervention, treatment options are very rare. Due to their insulin-independent mechanism leading to weight loss and improvement of hyperglycemia, SGLT-2 inhibitors seem to be a promising therapy in the field of NAFLD. The aim of this study was to investigate the effect of SGLT-2 inhibitor empagliflozin in a new dietary mice model for NAFLD with a polygenic background for the metabolic syndrome.

Method: TALIYHO/Ingl (TH) mice received 16 weeks of high-fat/high-carbohydrate (HF-HC) diet with a surplus of cholesterol. After 12 weeks of HF–HC, mice were additionally treated with empagliflozin (Fig1).
Results: After 16 weeks of HF–HC treatment, TH mice developed obesity, hyperglycemia and histological proven NAFLD (median NAS = 5). Treatment with empagliflozin led to a significant improvement of hyperglycemia, but had interestingly no effect on body weight in this mice model. Nevertheless, empagliflozin significantly improved both histological onset of NAFLD (median NAS = 3, p = 0.0312) and fibrosis (p = 0.0017). Detailed analysis demonstrated that empagliflozin significantly decreased intrahepatic B (p < 0.0001) and T cells (p = 0.0031) and in particular diminished proinflammatory CD8+ (p = 0.0028) as well as CD4+ (p = 0.0051) cells. In addition, empagliflozin attenuated intrahepatic infiltration of proinflammatory macrophages (p = 0.039). Furthermore, empagliflozin revealed anti-inflammatory potential by gene-downregulation of TNF and nitric oxide synthase and improvement of catalase and superoxidismutase (SOD), which are both involved in oxidative stress.

Conclusion: This is the first study testing empagliflozin in a new mouse model for NAFLD with a polygenic background for the human NAFLD phenotype. Importantly, empagliflozin improves the histological outcome of NAFLD even without any impact on weight loss and thereby reveals anti-inflammatory potentials. As these results might have important impact on the treatment of NAFLD, further studies are needed for confirmation.

WED-538 The effects of lipopolysaccharides on inducing non-alcoholic fatty liver disease in human precision-cut liver slices
Mei Li1, Ke Luo1, Vincent de Meijer2, Anika Nagelkerke1, Peter Olinga1, Yana Geng3. 1University of Groningen, Netherlands, 2University Medical Center Groningen, Netherlands

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is one of the most common chronic liver diseases, ranging from simple non-alcoholic fatty liver (NAFL) to non-alcoholic steatohepatitis (NASH), which may ultimately progress to cirrhosis, and eventually hepatocellular carcinoma (HCC), Preclinical studies suggested that lipopolysaccharides (LPS) from the gut microbiota contribute to the pathogenesis of NAFLD. However, the interplay between LPS and human NAFLD remains less clear. In our lab, we successfully developed an ex vivo NAFLD model from NAFL to fibrosis in precision-cut liver slices (PCLS). In this study, we aimed to assess the effects of LPS on NAFLD-PCLS in terms of inflammation, fibrosis and oncogenic signaling which would provide a potential model to investigate the development of human and animal NAFLD.

Method: PCLS used in this study were derived from liver biopsy material after transplant procedures. They were cultured in GFIPO Method: PCLS used in this study were derived from leftover liver tissue. After incubation, PCLS were collected to assess viability and fat accumulation by oil red O staining and ex vivo pathogenesis of NAFLD. However, the interplay between LPS and human NAFLD remains less clear. In our lab, we successfully developed an ex vivo NAFLD model from NAFL to fibrosis in precision-cut liver slices (PCLS). In this study, we aimed to assess the effects of LPS on NAFLD-PCLS in terms of inflammation, fibrosis and oncogenic signaling which would provide a potential model to investigate the development of human and animal NAFLD.

Results: NAFLD-PCLS remaining viable for up to 96 h of incubation whilst being treated with LPS. TG content was increased significantly in GFIPO compared with WEGG group (p < 0.0001), but LPS had no significant influence on fat accumulation. mRNA expression of the inflammatory biomarkers IL6, IL1β, and TNFα was upregulated by LPS in GFIPO or WEGG, whereas TNFα only showed a trend towards upregulation. COL1A1, ACTA2 and TIMP-1 showed an increasing trend as well, suggesting the contribution of LPS to fibrogenesis. To evaluate the early onset of HCC, we measured gene expression related to cell proliferation and angiogenesis. The upregulation in proliferation biomarkers (MKI67, PCNA) only occurred under the incubation of GFIPO, regardless of whether LPS was present, suggesting that LPS may have no effect on hepatocyte proliferation in PCLS. CD34 and VEGFA expression showed a similar trend as was seen for cell proliferation with LPS having a moderate impact on angiogenesis.

Conclusion: LPS mainly caused the development of liver inflammation, and may trigger fibrogenesis. Cell proliferation and angiogenesis were induced in non-alcoholic fatty liver disease in PCLS, with LPS having limited effect. This ex vivo model of human PCLS could be used to investigate the interplay between LPS and NASH, with inflammation and fibrosis being the primary factors affected.

WED-539 Oral antibiotic treatment protects mice against the development of diet-induced non-alcoholic fatty liver disease but not against diet-induced intestinal barrier dysfunction
Annette Brandt1, Katja Carrmann1, Angelica Hernández-Arriagá2, Anja Baumann1, Raphaela Stalmer1, Anélie Camarinha-Silva1, Ina Bergheim1. 1University of Vienna, Austria, 2University of Hohenheim, Germany

Background and aims: Alterations in intestinal barrier function and an elevated translocation of bacterial endotoxin and induction of toll-like receptor 4 (TLR4)-dependent signaling cascades in the liver are discussed as major factors in development of non-alcoholic fatty liver disease (NAFLD). To date, molecular mechanisms underlying these alterations are not yet fully understood. Here the effects of an oral treatment with an antibiotic mixture on intestinal barrier function in a model of diet-induced NAFLD was assessed.

Method: For 7 weeks, male C57BL/6j mice were pair-fed either a liquid standard diet (control, C) or a liquid high-fat and high-fructose diet (FFr) ± an antibiotic mixture (ampicillin, vancomycin, metronidazole, gentamycin, AB). Markers of liver damage and intestinal barrier function were examined and intestinal microbiota composition was determined. Moreover, everted gut tissue sacs from naïve male C57BL/6j mice were treated with fructose ± antibiotics or ± the inducible NO synthase (iNOS) inhibitor aminoguanidine ex vivo.

Results: The addition of AB to the diet almost completely abolished the development of NAFLD, e.g. macrovesicular steatosis and inflammation. However, antibiotic treatment had no effect on fructose-induced permeability in everted gut tissue sac, while the iNOS inhibitor aminoguanidine affected the development of intestinal permeability ex vivo.

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is chronic and progressive liver disease with high prevalence of 30% of the general population. As global prevalence of NAFLD is increasing, it has become a major public health problem and major cause of chronic liver disease. Non-alcoholic steatohepatitis (NASH) with chronic inflammation and fibrosis being the primary factors affected.
hepatic fibrosis has poor prognosis compared with non-alcoholic fatty liver (NAFL) or NASH without hepatic fibrosis. Micro RNA (miR) is a non-coding RNA with about 20 nucleotides, and it can bind to the target mRNA, resulting in epigenetic reprogramming. Recently, many studies found that miRNA could be used as therapeutic targets and novel biomarkers for diagnosis and evaluation of severity in various diseases including NAFLD.

**Method:** Circulating miRNAs were analysed in sera from 24 patients with biopsy-proven NAFLD using small RNA sequencing. We treated palmitic acid to various cell lines to induce lipotoxicity, and checked miRNA4449 expression in supernatant and cells. We identified merlin, an important inhibitory regulator of YAP-TAZ signaling, as the target of miR-4449 by TargetScan (targetscan.org). We confirmed in human liver tissue whether the expression level of merlin changes depending on the presence of fibrosis, and tested the interaction with miR-4449 in vivo.

**Results:** Among 24 NAFLD patients, 15 patients were NAFL or NASH without fibrosis, whereas 9 patients were NASH with fibrosis. 31 miRNAs showed significant difference in expression level between two groups and miR-4449 was the most prominent among miRNAs that showed higher expression level in NASH with fibrosis compared to NAFL or NASH without fibrosis. Expression of miR-4449 increased in most supernatant and pellets from various cell lines when lipotoxicity was induced (Figure 1). Therefore, hepatocytes are major source of miR-4449 during lipotoxicity and miR-4449 can be excreted to extracellular milieu. mRNA sequencing and quantitative PCR were performed on human liver tissue. Three patients were simple steatosis or NASH without fibrosis and three patients were NASH with fibrosis. Merlin showed significantly decreased in group without fibrosis, whereas miR-4449 mimics and inhibitors were treated to Hep 3B cell lines, miR4449 mimic suppress merlin expression, whereas miR-4449 inhibitor increase expression of merlin (Figure 3).

**Conclusion:** miR-4449 might be used for novel therapeutic target of NASH-fibrosis.

**WED-541**

**The role of chronic ER stress and calcium signalling in NASH associated carcinogenesis**

Muhammad Umair Latif1, Sercan Mercan1, Ivan Bogeski2, Volker Ellenrieder*. 1University Medical Center Goettingen, Department of Gastroenterology and Gastrointestinal Oncology, Goettingen, Germany, 2University Medical center Goettingen, Molecular Physiology, Institute of Cardiovascular Physiology, Goettingen, Germany

Email: umair.latif@med.uni-goettingen.de

**Background and aims:** The worldwide incidence of non-alcoholic fatty liver disease (NAFLD) continues to increase rapidly. It has become one of the most prevalent causes of progressive liver inflammation and a significant number of patients are at risk of developing cirrhosis and hepatocellular carcinoma (HCC). A better understanding of the processes leading to the development and progression of NASH and subsequent cancer development is essential to develop preventive strategies. We aim to investigate the role of ER-stress-induced NFATc1 activation in NASH associated carcinogenesis and define the underlying oncogenic mechanisms.

**Method:** We will perform comprehensive biochemical, molecular and functional analysis using in-vitro and in-vivo models, to scrutinize the impact of CRAC-NFATc1 activation in HCC. This study will certainly contribute to a better understanding of NASH-associated carcinogenesis and help to establish new strategies to prevent disease acceleration.

**Results:** NFATc1 is aberrantly activated in human NAFLD and advanced HCC. High NFATc1 activation correlates with the extent of liver damage and NASH incidence. We have demonstrated an important function of the Ca2+-responsive NFATc1 signaling and transcription pathway in mediating chronic ER-stress responses and subsequent manifestation of NASH. In numerous cancers, NFATc1 orchestrates cell adaptation mechanisms and converts stress signals into gene signatures involved in tumor initiation and progression.

**Conclusion:** Persistent ER-stress leads to increased Ca2+-dependent NFATc1 activation in hepatocytes via activation of Ca2+-release-activated Ca2+ channels (CRAC). We propose that CRAC-NFATc1 activation drives NASH-associated HCC development and formation of a tumor permissive immune microenvironment via transcriptional regulation of oncogenic gene signatures and interfering with CRAC-NFATc1 signaling has potential to prevent NASH acceleration and tumor formation.
WED-542
A N-acylenethanolamines mixture counteracts hepatic dysmetabolism induced in high-fat diet-fed obese mice
Claudio Pirozzi1, Stefania Melini2, Nicola Opallo1, Adriano Lama2, Filomena Del Piano1, Federica Comella1, Giuseppina Mattace Raso1, Rosaria Meli2
1University of Naples Federico II, Pharmacy, Naples, Italy, 2University of Naples Federico II, Pharmacy, Naples, Italy
Background and aims: Obesity is a multisystem disease characterized by the increased risk of many co-morbidities including hyperlipidemia, hyperglycemia, diabetes, metabolic syndrome and Non-Alcoholic Fatty Liver Disease (NAFLD) (Perumpail et al. 2017; James et al. 2008). NAFLD is the hepatic manifestation of metabolic syndrome due to the fat accumulation leading to hepatocyte death, inflammation, and fibrosis (Sharma et al. 2021). Several studies have shown metabolic and anti-inflammatory effects of specific N-acylenethanolamine (NAE)s such as palmitoylethanolamide (PEA) and oleoylthanolamide (OEA) (Annunziata et al. 2022; Annunziata et al. 2020; Lama et al. 2020). The aim of this study is to evaluate the possible beneficial effects of a patented derivative of olive oil, consisting in a mixture of NAEs, named Olaliamid® (OLA) on hepatic glucose e lipid dysmetabolism induced by high-fat diet (HFD) in obese mice.
Method: Male C57BL/6j mice were randomly divided into 3 groups; control group (STD) receiving standard chow diet; mice fed with HFD for 19 weeks (HFD); HFD group treated with OLA (OLA, PEA, and OEA in the same ratio as that of the fatty acids naturally found in the oil) from week 12 to week 19. Body weight of all groups were monitored throughout the experimental period. Oral glucose tolerance test (OGTT) was performed at the 7th week of treatment and then the animals were sacrificed and livers were collected for the following molecular determinations.
Results: First, we found that OLA markedly reduced body weight and fat mass, measured by impedenziometric analysis. During OGTT, OLA treatment reduced hyperglycemia due to lipid overnutrition at different time point, suggesting an improvement of tissue insulin sensitivity. Consistently, OLA restored HFD-altered insulin signaling pathway in the liver of obese mice, inducing the phosphorylation of insulin receptor and the activation of PI3K/AKT pathway. Notably, we demonstrated that OLA treatment counteracted the alterations of hepatic lipid homeostasis by HFD, normalizing the phosphorylation of AMPK, and the protein expression of carnitine palmitoyltransferase (CPT)1, a rate-limiting enzyme of fatty acid oxidation. OLA also reduced the mRNA expression of a key marker of steatosis, such as cluster of differentiation (CD)36, and different genes involved in the regulation of lipid metabolism (i.e. peroxisome proliferator-activated receptor gamma, its coactivator PGC1alpha, fatty acid synthase, and SREBP1). Finally, regarding the strict relationship between insulin resistance and hepatic inflammation in obesity, we showed an anti-inflammatory effect of OLA in reducing the expression of different pro-inflammatory cytokines and enzyme, altered in HFD-fed obese mice.
Conclusion: Taken together, our results indicate a therapeutic potential of OLA in countering and limiting the hepatic glucose and lipotoxicity and the metabolic impairment associated with obesity and its co-morbidities.
WED-543
Preclinical efficacy and clinical translatability of resmetirom in the GAN diet-induced obese and biopsy-confirmed mouse model of NASH
Michael Feigh1, Jacob Nørh-Meldgaard1, Susanne Pors1, Henrik B. Hansen1, Gubra, Hørsholm, Denmark
Background and aims: Resmetirom, a selective THR-β agonist, has in a recent phase-3 clinical trial (MAESTRO-NASH) in NASH patients with liver fibrosis, demonstrated significantly higher rate of NASH resolution and improvement in fibrosis stage as compared to placebo. The present study aimed to (i) evaluate the metabolic, biochemical and histopathological effects of resmetirom treatment in the Gubra Amylin NASH (GAN) diet-induced obese (DOI) mouse model of fibrosing NASH; and (ii) compare primary histopathological end point analysis to the MAESTRO-NASH trial.
Method: Male C57BL/6j mice were fed the GAN diet high in fat, fructose and cholesterol for 38 weeks prior to study start. A liver biopsy was sampled 4 weeks prior to study start. Only animals with biopsy-confirmed NAFLD Activity Score (NAS ≥ 5) and fibrosis stage ≥F1 were included and stratified into treatment groups. Mice were administered (PO, QD) vehicle (n = 16) or resmetirom (3 mg/kg, n = 15) for 12 weeks. Vehicle-dosed chow-fed C57BL/6j mice (n = 10) served as normal controls. Histopathological pre-to-post individual assessment of NAS and fibrosis stage was performed and evaluated against primary end points applied in the corresponding MAESTRO-NASH trial (resolution of NASH with no worsening of liver fibrosis; ≥1-stage fibrosis improvement without worsening of NASH). Other terminal end points in GAN DOI-NASH mice included quantitative liver histology, blood and liver biochemistry.
Results: Resmetirom was weight-neutral, improved hepatomegaly, plasma alanine transaminase and plasma/liver lipid levels compared to vehicle-dosed GAN DOI-NASH mice. The efficacy of resmetirom on primary clinical end points in GAN DOI-NASH mice was comparable to corresponding clinical phase-3 trial outcomes. Accordingly, resmetirom treatment demonstrated ≥2 point significant improvement in NAS and 1-point significant improvement in Fibrosis Stage. The benefits on liver histology were further supported by reduced quantitative histological markers of steatosis (% area of lipid, % lipid-laden hepatocytes, lipid droplet density and size) and fibrosis (% area of IFS). Conclusion: Resmetirom treatment improved metabolic, biochemical and liver histological markers of steatosis and fibrosis in biopsy-confirmed GAN DOI-NASH mice. Therapeutic efficacy of resmetirom on primary clinical histopathological end points were recapitulated in GAN DOI-NASH mice. These findings further validate clinical translatability of the GAN DOI-NASH mouse model, highlighting its utility in preclinical drug development.
WED-544
Loss of gut barrier integrity in non-alcoholic fatty liver disease is associated with severe vibriosis
Punnag Saha1,2, Dipro Bose1, Subhajit Roy1, Anna Mae Diehl3, Saurabh Chatterjee4
1University of California, United States, 2University of California Irvine, Environmental and Occupational Health, Irvine, United States, 3Duke University, Medicine, United States, 4University of California, Medicine, United States
Background and aims: Non-alcoholic Fatty Liver Disease (NAFLD) is now considered as a pandemic and is a huge public health challenge. Rising obesity and type 2 Diabetes incidences have led a spurt of NAFLD cases worldwide with 25% of cases progressing to an inflammatory phenotype also termed as non-alcoholic steatohepatitis. Parallely, climate change stressors, global warming and sea level rise has led to increase in cases of non-cholera vibriosis in coastal areas across the globe. Vibriosis often has poor outcomes in patients with underlying chronic liver disease. Vibrio Vulnificus and Vibrio Paraohaemolyticus are mostly responsible for the vibriosis cases. We tested the hypothesis that underlying NAFLD can have severe inflammatory surge in patients with poor outcomes and sepsis-like symptoms.
Method: We used a murine model (C57BL6/j mice) of NAFLD that were fed with high fructose-high cholesterol diet for 12 weeks. We used a clinical strain of VV (VV) to induce vibriosis. Mice were euthanized and gut and liver pathology were evaluated.
Results: Results showed that NAFLD mice had an increased loss of gut barrier integrity with significantly higher levels of claudin-2 and a concomitant decrease in Occludin, both crucial proteins for maintaining tight junctions. Serum endotoxin and IL1beta levels were significantly increased in mice with NAFLD when compared to lean controls. Mice with NAFLD had an elevated IgA and decreased levels of Reg3γ, a colonization resistance marker associated with gut barrier integrity. NAFLD mice also had higher intestinal permeability when assessed by FITC-dextran. NAFLD mice had higher CD68+ Kupffer cell activation and parallel higher α-SMA+ stellate cell activation when challenged with 10^8 CFU of Vibrio Vulnificus compared to controls infected with VV. Histopathology showed severe leukocyte infiltration and necrosis in liver lobules in NAFLD mice infected with VV when compared to matched controls. Serum CRP levels were significantly higher in NAFLD+VV group when compared to controls suggesting sepsicaemia and liver damage.

Conclusion: In conclusion we show a novel outcome of Non-cholera Vibriosis in NAFLD that is primarily associated with increased gut-barrier integrity loss and provides a Vibriosis risk assessment of patients with NAFLD.

WED-545
A guinea pig model of pediatric non-alcoholic steatohepatitis
Kamilla Pedersen1, Jens Lykkesfeldt1, Pernille Tveden-Nyborg1
1University of Copenhagen, Department of Veterinary and Animal Sciences, Frederiksberg C, Denmark
Email: ptn@sund.ku.dk

Background and aims: Paediatric non-alcoholic fatty liver disease (NAFLD) affects 5–10% of children/adolescents; progressing to non-alcoholic steatohepatitis (NASH) in 25–50% of cases. Importantly, paediatric NASH differs from NASH in adults, e.g. displaying increased histological variation and disease severity, and leads to significant liver damage. However, studies in children are scarce and translational animal models few, leaving putative disease characteristics and associated mechanisms largely undisclosed. Driven by an adverse diet and life-style that promotes inflammation and a state of oxidative stress, NASH progression may be exacerbated by a low vitamin C (VitC) intake. In addition, low VitC levels have been linked to several lifestyle-associated co-morbidities in humans, including NAFLD. The aim of this study was to explore a juvenile guinea pig model of NASH and investigate if a poor VitC status affects disease progression.

Method: Sixty-two male, one to two weeks old guinea pigs were block-randomized based on weight into four diet groups receiving either: Control High-VitC (n = 16), Control Low-VitC (n = 16), High-Fat High-VitC (n = 15), or High-Fat Low-VitC (n = 15). High-VitC diets contained 1500 mg VitC/kg feed while Low-VitC diets contained 50 mg VitC/kg feed.

Results: Irrespective of VitC deficiency, a high-fat diet promoted advanced NASH and reduced hepatic health, based on the calculated NAS index (median = 6; p < 0.0001) and elevated alanine aminotransferase levels (p < 0.001) compared to controls. Comparing histopathological findings to previous studies in adult guinea pigs on the high-fat diet (n = 28), the juvenile NASH guinea pigs (high-fat diet, n = 30) displayed decreased steatosis but increased inflammation score (p < 0.0001 and p < 0.05, respectively). The median fibrosis score was grade 2 for both juvenile and adult NASH guinea pigs, but contrary to adults, the degree of steatosis did not correlate with fibrosis grade in the juvenile NASH guinea pigs. A low intake of VitC increased plasma cholesterol in high-fat fed guinea pigs (p < 0.05) and also appeared to increase inflammation.
WED-546

Pemafibrate abrogates lipid liver accretion in a dietary model of fatty liver in rat

Roger Bentanachs,1,2 Laia Blanco,1 Maria Montesinos,1 Marta Alegret,1,2,3 Núria Roglans,1,2,3 Juan Carlos Laguna,1,2,3

1University of Barcelona, School of Pharmacy and Food Science, Pharmacology, Toxicology and Therapeutic Chemistry, Spain. 2Institute of Biomedicine of the University of Barcelona, Spain. 3CIBER de Fisiopatología de la Obesidad y Nutrición, Instituto de Salud Carlos III, Spain

Email: jclagunae@ub.edu

Background and aims: Nowadays, there is not an approved drug therapy for the prevention/treatment of NAFLD. From a repurposing perspective, we aimed to investigate the effect of pemafibrate, mirabegron, and their combination in a dietary model of NAFLD, the high-fat high-fructose fed rat (HFHFr) (Velázquez et al., Mol. Nutr. Food Res 2022, 2101115).

Method: Female Sprague-Dawley rats were randomly distributed into 5 groups (n = 8): (1) control (CT); standard rodent chow; (2) high-fat diet with 10% w/v fructose in drinking water (HFHFr); (3) HFHFr plus pemafibrate at 1 mg/Kg/day (PemA); (4) HFHFr plus mirabegron at 10 mg/Kg/day (MBG); (5) HFHFr plus pemafibrate and mirabegron at 0.5 and 5 mg/Kg/day, respectively (P+M). Rats were fed the HFHFr diet for three months, while groups 3, 4, and 5 received high fat diet supplemented with the corresponding drug for the last month. Plasma and hepatic triglycerides (TG) and cholesterol (Cho) levels, the master regulator of mitobiogenesis, which was effectively involved in mitochondrial and peroxisomal fatty acid beta-oxidation, respectively, were markedly increased in pemafibrate-treated rats (PemA and P+M groups). Mirabegron administrated did not significantly modify any of the studied parameters.

Results: As shown in the table, neither dietary nor drug-treatment interventions modified the total amount of ingested calories and final body weight. Only pemafibrate-treated rats (PemA and P+M groups) showed an increase in the ratio of liver/body weight. Only pemafibrate-treated rats (PemA and P+M groups) showed a significant increase in liver lipids (both TG and Cho). No drug treatment was able to restore liver lipids (TG and Cho) to CT values. These changes were associated to liver hypertrophy and increased expression of liver markers of fatty acid beta-oxidation, pointing to a peroxisome proliferator activated receptor alpha-activation related effect. At this moment, we are searching possible molecular mechanisms involved in the lack of hypotriglyceridemic effect of pemafibrate. This work was supported by grants PID2020-112870RB-I00, funded by MCIN/AEI/10.13039/501100011033 and 2021SGR-00345.

Table: 

<table>
<thead>
<tr>
<th></th>
<th>CT</th>
<th>HFHFr</th>
<th>PemA</th>
<th>MBG</th>
<th>P+M</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUC Kcal solid/</td>
<td>0</td>
<td>7280 ± 1768</td>
<td>7821 ± 1068</td>
<td>7323 ± 1374</td>
<td>7180 ± 920</td>
</tr>
<tr>
<td>cage/90 days</td>
<td></td>
<td>(x0.72)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUC Kcal solid/</td>
<td>6686 ± 198</td>
<td>4919 ± 1580</td>
<td>4530 ± 389</td>
<td>4951 ± 353</td>
<td>4958 ± 692</td>
</tr>
<tr>
<td>cage/90 days</td>
<td>(x0.72)</td>
<td></td>
<td>(x0.72)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUC total Kcal/</td>
<td>6686 ± 198</td>
<td>12199 ± 263***</td>
<td>12351 ± 892</td>
<td>12274 ± 1159</td>
<td>12147 ± 436</td>
</tr>
<tr>
<td>cage/90 days</td>
<td>(x1.78)</td>
<td></td>
<td>(x1.78)</td>
<td>(x1.78)</td>
<td></td>
</tr>
<tr>
<td>Final body weight</td>
<td>248 ± 13</td>
<td>257 ± 21</td>
<td>268 ± 14</td>
<td>260 ± 13</td>
<td>273 ± 6</td>
</tr>
<tr>
<td>(g)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% liver/body</td>
<td>3.1 ± 0.2</td>
<td>3.7 ± 0.4***</td>
<td>5.6 ± 0.5**</td>
<td>3.6 ± 0.5***</td>
<td>5.1 ± 0.5***</td>
</tr>
<tr>
<td>weight</td>
<td></td>
<td>(x1.19)</td>
<td>(x1.81)</td>
<td>(x1.64)</td>
<td></td>
</tr>
<tr>
<td>TG liver (mg/g</td>
<td>47 ± 11</td>
<td>129 ± 69***</td>
<td>62 ± 15 (x0.48)</td>
<td>129 ± 70</td>
<td>50 ± 13 (x0.30)</td>
</tr>
<tr>
<td>prot)</td>
<td></td>
<td>(x2.74)</td>
<td></td>
<td>(x2.74)</td>
<td></td>
</tr>
<tr>
<td>Cho liver (mg/g</td>
<td>36 ± 4</td>
<td>43 ± 8</td>
<td>32 ± 6 (x0.74)</td>
<td>34 ± 8</td>
<td>29 ± 3 (x0.67)</td>
</tr>
<tr>
<td>prot)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TG blood (mg/dl)</td>
<td>101 ± 21</td>
<td>138 ± 28**</td>
<td>182 ± 38</td>
<td>149 ± 31</td>
<td>148 ± 30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(x1.37)</td>
<td></td>
<td>(x1.37)</td>
<td></td>
</tr>
<tr>
<td>cpt I mRNA (a.u)</td>
<td>100 ± 56</td>
<td>104 ± 62</td>
<td>362 ± 186***</td>
<td>137 ± 84</td>
<td>300 ± 81***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>aco mRNA (a.u)</td>
<td>100 ± 30</td>
<td>97 ± 9</td>
<td>761 ± 322</td>
<td>107 ± 13</td>
<td>633 ± 185</td>
</tr>
</tbody>
</table>

*p > 0.05, ***p > 0.01 vs CT; **p > 0.05, ***p > 0.01 vs CT
recovering the OXPHOS capacity and Krebs cycle which were impaired in KO cells. Finally, lactate levels decreased after the upregulation of MBOAT7 and/or TM6SF2 wild-type genes together with the glycolytic extracellular acidification rate, thereby inhibiting the switch to anaerobic glycolysis which was promoted in KO cells to trigger tumorigenesis.

**Conclusion:** Genetics impacts on mitochondrial maladaptation during NAFLD and the overexpression of MBOAT7 and/or TM6SF2 wild-type genes in KO HepG2 cells re-balances the mitochondrial lifecycle and turnover, thus ensuring the organelles’ function and possibly reversing hepatocellular damage.

**WED-548**

**Development of a 2D nonalcohol-related steatohepatitis (NASH) model**

Esther Arnaiz Gonzalez¹, Tahmid Choudhury¹, Ana Miar¹, Kenny Moore¹, Yuan-Yu Lin², Tess Lu², Quin Wills¹. ¹Ochre Bio, Oxford, United Kingdom, ²Ochre Bio, Taipei, Taiwan

**Background and aims:** One of the metabolic functions of the liver is to store excess energy (from sugars or fats) as lipid droplets. However, over time accumulation of lipids within hepatocytes can trigger pathological complications including immune activation and fibrosis resulting in nonalcohol-related steatohepatitis (NASH). Due to the silent nature of liver disease, diagnosis is usually performed at late stages (fibrosis and cirrhosis), when the only option for the patient is a transplant. Currently, there are no clinical therapies for NASH, and the research strategies for NASH often rely on complex 3D models such as spheroids, specific microfluidic devices or precision cut slices (PCLS), which are not suitable for the high throughput screening of new therapeutic targets. To overcome this limitation, we have developed an in vitro 2D NASH model using human primary cells, which maintains hepatic function, responds to dietary overload and fibrotic inducers in ways that resemble the stages of NASH and is modifiable with siRNA or drug intervention.

**Method:** Primary human hepatocytes are cultured alongside growth arrested 3T3-J2 mouse fibroblasts, human stellate cells and human peripheral blood mononuclear-derived cells. After cell adhesion, the media is changed to either lean or fat inducing co-culture media. Fibrosis induction is initiated on day 7 and the cells can be maintained to day 12, or longer if desired.

**Results:** Using LPS to demonstrate immunological function of the co-culture, we observe an increase in IL6 and MCP1. This can also be observed using our nutritional overload conditions which results in heavily lipid loaded hepatocytes and an inflammatory signature. Upon stimulation of the cultures with fibrosis inducers (PDGFββ and TGFβ) fibrotic markers were significantly upregulated and secreted, resulting in hepatocytes coated in collagen and known biomarkers of NASH (e.g. TIMP1) being released. These effects were diminished using an inhibitor of TGFβ signaling and phenocopy those from more complex models such as PCLS.

**Conclusion:** Our 2D primary cell NASH model provides a useful tool to study different stages of the disease and to easily screen for both new targets and therapies.

**WED-549**

**Programmed cell death 1 genetic variant and liver damage in non-alcoholic fatty liver disease**

Grazia Pennisi¹, Rosaria Maria Pipitone¹, Francesco Malvestiti², Őveis Jamiälahmadi³, Paola Dongiovanni², Giorgio Bertolazzi², Jussi Pihlajamaki⁵, Hannele Yki-Järvinen⁶, Umberto Vespasiani Gentilucci⁷, Federica Tavaglione⁷, Samantha Maurotti³, Cristina Bianco⁹, Gabriele Di Maria⁹, Marco Enea¹⁰, Anna Ludovica Fracanzani³, Vesa Kärjä³, Giulia Lupo³, Ville Mannistö¹¹, Marica Meroni¹¹, Roberto Picciotti¹¹, Sami Qadri¹¹, Rossella Zito¹⁰, Antonio Craxi¹, Vito Di Marco¹, Calogero Camma¹, Claudio Tripodo¹, Luca Valenti¹, Stefano Romeo³, Salvatore Petta¹, Stefania Grimaudo¹, Calogero Camma¹, Luca Valenti², Stefano Romeo³, Salvatore Petta¹, Stefania Grimaudo¹. ¹Policlinico Paolo Giaccone Palermo, Section of Gastroenterology and Hepatology, Italy, ²Department of Pathophysiology and Transplantation, University of Palermo School of Medicine, Palermo, Italy, ³Department of Molecular and Clinical Medicine, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden, ⁴Tumor Immunology Unit, University of Palermo School of Medicine, Palermo, Italy, ⁵Department of Clinical Nutrition, Institute of Public Health
Background and aims: Programmed cell death 1/programmed cell death-ligand 1 (PD-1/PDL-1) axis has been reported to modulate liver inflammation and progression to hepatocellular carcinoma (HCC) in patients with non-alcoholic fatty liver disease (NAFLD). Here, we examined whether the PDCD1 variation associates with NAFLD severity in individuals with liver biopsy.

Method: We examined the impact of PDCD1 gene variants on HCC, as robust severe liver disease phenotype in UK Biobank participants. The strongest genetic association with the rs13023138 G > C variation was subsequently tested for association with liver damage in 2,889 individuals who underwent liver biopsy for suspected non-alcoholic steatohepatitis (NASH). Hepatic transcriptome was examined by RNASeq in a subset of NAFLD individuals (n = 121). Transcriptomic and deconvolution analyses were performed to identify biological pathways modulated by the risk allele.

Results: The rs13023138 C > G showed the most robust association with HCC in UK Biobank (p = 5.28E-4, OR = 1.32, 95% CI [1.1, 1.5]). In the liver biopsy cohort, rs13023138 G allele was independently associated with severe steatosis (OR 1.17, 95% CI 1.02–1.34; p = 0.01), NASH (OR 1.22, 95% CI 1.09–1.37; p < 0.001) and advanced fibrosis (OR 1.26, 95% CI 1.06–1.50; p = 0.07). At deconvolution analysis, rs13023138 G > C allele was linked to higher hepatic representation of M1 macrophages, paralleled by upregulation of pathways related to inflammation and higher expression of CXCR6.

Conclusion: The PDCD1 rs13023138 G allele was associated with HCC development in general population and with liver disease severity in patients at high risk of HNAS.

WED-551 Cholesterol-free ketogenic diet feeding improves experimental non-alcoholic fatty liver disease (NAFLD)

Alessia Provera1, Ramavath Naresh Naik2, Laila Lavania Gadipudi1, Cristina Vecchio1, Marina Caputo1, Alessandro Antonioli1, Simone Reano1, Nicoletta Filigheddu1, Marcello Manfredi3, Luca Simone Cocolin4, Ilario Ferrocino4, Emanuele Albano1, Flavia Pradom1,2, Salvatore Sutti1, University of East Piedmont, Dept. of Health Sciences, Italy, Washington University in St. Louis, Dept. of Pediatrics, Endocrinology, and Diabetes, United States, University of East Piedmont, Dept. of Translational Medicine, Italy, University of Turin, Dept. of Agricultural, Forestry and Food Science, Italy, University of East Piedmont, SCDU Endocrinology, Italy

Email: alessia.provera@unipio.it

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is now recognized as the most common liver disease worldwide. Despite continuous advances in the understanding of the disease pathogenesis and identifying therapeutic targets, up to now, there is not an approved therapy for NAFLD. Lifestyle changes, including diet, are, so far, the most effective interventions in NAFLD, even though there is not a definitive agreement on the most suitable dietary regimen. In recent years, low carbohydrates ketogenic diets (KDs) have been increasingly used for weight loss. However, the efficacy of KDs in improving NAFLD is controversial due to contradictory data obtained in animal experiments. In this study, we investigated the capacity of a cholesterol-free KD to improve NAFLD in mice.

Method: NAFLD was induced in C57BL/6 mice by feeding with a cholesterol-enriched Western Diet (WD) for up to 16 weeks, followed by switching animals to KD or standard diet (SD) for additional eight weeks.

Results: We observed that KD administration increased by three folds ketone bodies production and significantly reduced liver weights. Moreover, liver proteomic analysis and functional tests evidenced an improved glucose and lipid metabolism along with insulin resistance.
in KD fed mice. These metabolic effects were associated with an amelioration in transaminase release and in the histological severity of steatosis and necro-inflammation. Mice receiving KD also showed a lowering in the hepatic expression of pro-inflammatory/pro-fibrogenic markers such as CCL2, IL-12, CD11b, α1-procollagen, TGF-β1, osteopontin and galectin-3, which were accompanied by a significant reduction in hepatic monocyte-derived macrophage infiltration and collagen fibres deposition as assessed by the Sirius-red staining. The improvement in liver damage and fibrosis likely relies on the capacity of KD of improving NAFLD associated dysbiosis leading to a recovery in gut bacterial flora similar to that of healthy mice.

**Conclusion:** Altogether, these results indicate that a cholesterol-free ketogenic diet is effective in improving metabolic derangements and steatohepatitis, and it might represent a potential therapeutic strategy for NAFLD.

### WED-552

**Metabolic effects of n-3 fatty acids administered as Calanus oil to transgenic mice lacking functional peroxisome proliferator-activated receptor alpha**

Martin Rossmesl1, Veronika Kalandova1, Olga Horakova1, 1Institute of Physiology of the Czech Academy of Sciences, Laboratory of Adipose Tissue Biology, Prague 4, Czech Republic

**Email:** martin.rossmesl@fgu.cas.cz

**Background and aims:** Polyunsaturated fatty acids of n-3 series, specifically eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), exert hypolipidemic and anti-inflammatory effects. They act as endogenous ligands of the transcription factor peroxisome proliferator-activated receptor alpha (PPARalpha), which primarily regulates genes involved in lipid metabolism in the liver. We aimed to determine to what extent the metabolic effects of Calanus oil, an alternative source of EPA and DHA bound to wax esters, depend on the presence of functional PPARalpha.

**Method:** Twelve-week-old male 129S1/SvJmj mice, including wild-type (WT) and PPARalpha-deficient (KO) mice, were either maintained on a low-fat standard chow or given a high-fat corn oil-based diet (cHF; 32% lipids by weight) for 8 weeks (n = 8). To supplement EPA and DHA, 15% of dietary lipids in the cHF diet was replaced by Calanus oil (cHF+CO diet; 6 mg EPA+DHA/g diet). Tissue lipid content quantification, gene expression analysis (quantitative PCR) and metabolomic profiling (LC-MS) were performed in liver samples. Glucose production and its suppression by insulin were evaluated in cultured hepatocytes isolated from different groups of mice. One-way ANOVA was used to determine statistical significance (p < 0.05 was considered significant).

**Results:** Administration of cHF increased liver fat accumulation in WT mice by 2.6-fold, whereas in KO mice by 6.9-fold, resulting in a 3-fold increase in liver fat content in KO animals (cHF; WT, 82 ± 4 vs. KO, 256 ± 13 mg/g tissue). As expected, cHF-fed KO mice showed reduced expression of genes involved in beta-oxidation, as well as lower levels of acylcarnitines and coenzyme Q levels, as detected by metabolomic analysis. Interestingly, administration of cHF+CO was associated with a reduction in hepatic steatosis in the KO group, whereas it had no effect on liver fat content in WT mice (cHF+CO; WT, 84 ± 8 vs. KO, 174 ± 13 mg/g tissue). Altered composition of various triacylglycerol and phospholipid species was found in cHF+CO-fed mice compared to their cHF-fed counterparts, but regardless of genotype. Furthermore, hepatocytes isolated from KO (but not WT) mice fed cHF showed impaired glucagon-stimulated glucose production and its suppression by insulin, a phenotype that was not restored in hepatocytes isolated from KO animals fed cHF+CO.

**Conclusion:** Chronic administration of Calanus oil can alter the liver lipid profile independently of the presence of functional PPARalpha. However, its beneficial effects on hepatic steatosis can only occur under conditions of greatly increased lipid accumulation in the liver, probably due to some indirect mechanisms induced by Calanus oil outside the liver.

### WED-553

**Semaglutide has beneficial effects on non-alcoholic steatohepatitis in Ldlr−/−.Leiden mice**

José A. Inía1,2,3, Geurt Stokman3, Martine C. Morrison3, Nicole Worron3, Lars Verschure4,5, Martien P. M. Caspers4,5, Aswin L. Menke3, Mathieu Petitjean6, Louis Petitjean6, Li Chen6, J. Wouter Jukema1,2,7, Hans Princen3, Anita M. van den Hoek3,4, 1Leiden University Medical Center (LUMC), Cardiology, Leiden, Netherlands, 2Leiden University Medical Center (LUMC), Einhoven Laboratory for Experimental Vascular Medicine, Leiden, Netherlands, 3TNO, Metabolic Health Research, Leiden, Netherlands, 4TNO, Microbiology and Systems Biology, Leiden, Netherlands, 5The Netherlands Organization for Applied Scientific Research (TNO), Department of Microbiology and Systems Biology, Leiden, Netherlands, 6PharmaNest, Princeton, United States, 7Netherlands Heart Institute, Utrecht, Netherlands

**Email:** jose.inia@tno.nl

**Background and aims:** Semaglutide, a glucagon-like peptide-1 receptor agonist, is an antidiabetic medication that has recently been approved for treatment of obesity as well. Semaglutide is also postulated to be a promising candidate for treatment of non-alcoholic steatohepatitis (NASH). Here, we evaluated the effects of semaglutide in a translational diet-induced model with advanced NASH and fibrosis.

**Method:** Ldlr−/−.Leiden mice received a fast food diet (FFD) for 25 weeks, followed by another 12 weeks on FFD with daily subcutaneously injections of semaglutide or vehicle (control). Plasma parameters were evaluated, livers and hearts were examined and hepatic transcriptome analysis was performed.

**Results:** In the liver, semaglutide significantly reduced macrovesicular steatosis (−74%, p < 0.001), inflammation (−73%, p < 0.001) and completely abolished microvesicular steatosis (−100%, p < 0.001). Histological and biochemical assessment of hepatic fibrosis showed no significant effects of semaglutide. However, digital pathology revealed significant improvements in the degree of collagen fiber reticulation (−12%, p < 0.001). Semaglutide did not affect atherosclerosis relative to controls. Additionally, we compared the transcriptome profile of FFD-fed Ldlr−/−.Leiden mice with a human gene set that differentiates human NASH patients with severe fibrosis from those with mild fibrosis. In FFD-fed Ldlr−/−.Leiden control mice, this gene set was upregulated as well, while semaglutide predominantly reversed this gene expression.

**Conclusion:** Using a translational model with advanced NASH, we demonstrated that semaglutide is a promising candidate with particular potential for treatment of hepatic steatosis and inflammation, while for reversal of advanced fibrosis, combinations with other NASH agents may be necessary.

### WED-554

**Utilization of multicellular liver-on-chip to study non-alcohol-related fatty liver disease**

Victoria Palasantzas1, Isabel Tamargo2, Gwen Weijer2, Alfredo Rios-Ocampo3, Sebo Withoff2, Johan Jonker3, Jing Fu3, 1University Medical Centre Groningen, Department of Genetics and Pediatrics, Netherlands, 2University Medical Centre Groningen, Department of Genetic Medicine, 3University Medical Centre Groningen, Department of Pediatrics, Netherlands

**Email:** v.e.j.palasantzas@umcg.nl

**Background and aims:** Non-alcoholic fatty liver disease (NAFLD) is the most prevalent liver disease, affecting nearly one-third of the global population. To study NAFLD, current experimental models e.g., animals and 2D cell cultures, pose various limitations including species-specific differences and lack of complexity. Here, I employ an innovative, human-based organ-on-chip system to overcome these limitations and explore lifestyle -based NAFLD interventions. Overcoming the limitations of current liver model systems with the liver-on-chip, I aim to study the effect of medicinal-implied nutrients (‘nutriceuticals’) to prevent or reverse NAFLD and the underlying molecular mechanism.
Method: We have recently established a hepatocyte-on-chip model utilizing healthy control-derived human induced pluripotent stem cells (hiPSC) and a human hepatocyte cell line in our lab. Here, I present data on the development and characterization of a NAFLD-on-chip. Characterization of the NAFLD-on-chip includes steatohepatitis readouts e.g. lipid accumulation and detection of very-low-density lipoprotein and inflammatory cytokine excretion.

Results: Preliminary data reveals that the hepatocyte-on-a-chip models available in our lab exhibit important features of normal human hepatocyte physiology (e.g. expression of transport proteins and albumin production) and features often not observed in ‘static’ cell culturing models (e.g. lipoprotein excretion). Additionally, we identified the conditions to induce NAFLD in vitro for our further studies on nutriceuticals.

Conclusion: We provide the first indications for the liver-on-chip model as a physiologically relevant model for complex diseases like NAFLD and how to study such a disease in our platform. Future perspectives include adding liver resident macrophages (‘Kupffer cells’) to recapitulate the inflammatory cross-talk present in NAFLD. Ultimately, we aim to use this model to assess NAFLD therapeutics as well as assess the impact of patient specific mutations on NAFLD.

WED-555

Improvement of NAFLD by Totum-448: effects in the liver, adipose tissue and gut in western-diet fed hamsters

Vivien Chavanelle, Yolanda Otero, Marie Vallier, Doriane Ripoche, Cédric Langhi, Florian Le Joubioux, Thierry Maugard, Valérie Hervieu, Sébastien Peltier, Pascal Sirvent, Clement Besqueut-Rougerie, Gael Ennequin, Valbiotis, France, LIENS, France, Hospices Civils de Lyon, France, Clermont Auvergne University, AME2P, Clermont-Ferrand, France

Background and aims: The concerning rise in NAFLD prevalence worldwide urgently calls for therapeutic solutions. We have previously demonstrated the beneficial effects of Totum-448 (T448), a novel patented polyphenol-rich combination of 5 plant extracts and choline, on liver steatosis, inflammation, and fibrosis in a diet-induced hamster model of NAFLD. This new work sheds some light on the action of T448 on the liver-gut-adipose tissue axis to unveil some of the mechanisms that could be involved in the preventive effects of the product on NAFLD progression.

Method: Male golden Syrian hamsters were fed a western-diet (WD, high fat, mostly saturated, high cholesterol, N = 12), or a WD supplemented with T448 5% w/w (WD-T448, n = 12) for 12 weeks. A group of hamsters was fed a normal diet (ND, N = 6) and used as control. Body weight and composition (MRI) was monitored all throughout the study. NAFLD-associated features were assessed by RT-PCR or through biochemical and histological biomarkers in serum, liver, adipose tissue pads, ileum, colon, and caecal content.

Results: Despite slightly higher body weight and fat mass, T448-supplemented hamsters displayed improved circulating lipid profile (lower triglycerides, TG, total cholesterol, TC, free fatty acids, FFA and phospholipids, PL). Liver weight was significantly reduced by T448 supplementation as well as hepatic lipid content (TG, TC, FFA, and PL). This improvement of steatosis was confirmed by histological analyses of Oil-Red-O-stained sections and was associated with concomitant reduction of hepatic expression of inflammatory and fibrotic gene markers. Interestingly, consistent with the slight increase in total fat mass, the weights of epidymal, perirenal, inguinal, and mesenteric fat pads were higher in T448-supplemented animals. In caecal content, T448 elicited a reduction of lipopolysaccharides (LPS) levels and subsequent serum LPS, which was associated with down-regulated inflammatory gene markers in the ileum. Additionally, faecal TC was found elevated in T448 supplemented hamsters.

Conclusion: This new work confirms the effects of T448 in improving circulating lipids and liver steatosis, inflammation, and fibrosis, some major hallmarks of NAFLD progression, in WD-fed hamsters. The reduction of ectopic fat accumulation in the liver was accompanied by an increased fat storage capacity in the different adipose tissue pads and LPS levels were reduced, both in caecal content and serum, suggesting improved metabolic endotoxemia.
liver disease, which can progress to cirrhosis or reverse to milder disease with better prognosis. Second harmonic generation/two photon excitation fluorescence (SHG/TPEF) microscopy of unstained liver sections with artificial intelligence (AI) provides sensitive and reproducible quantitation of liver fibrosis. Using this novel approach, the present study aims to gain in-depth understanding of changes in liver fibrosis and individual septa parameters over time in a homogenous, well-characterised group of patients with NASH F3 fibrosis stage.

**Method:** Paired liver biopsies from 57 patients [placebo, n = 17] or tropifexor (TXR) [n = 40], all with bridging fibrosis (F3 stage) according to the CRN scoring system at baseline (BL), who participated in the FLIGHT-FXR clinical trial (NCT02855164), were included in this study. Unstained liver sections from BL and end-of-treatment (EOT) were examined using SHG/TPEF microscopy. Changes in liver fibrosis overall and in five different zones of liver lobules were quantitatively assessed by qFibrosis-a cumulative index based on measuring 184 collagen features on a continuous scale. Radar maps were developed as a novel approach for assessing fibrosis changes in liver lobules. In addition, septa morphology—progressive or regressive septa and 12 individual septa parameters were analysed at BL and EOT biopsies.

**Results:** SHG revealed fibrosis progression or regression (BL to EOT) in 14/17 (82%) of patients receiving placebo, in contrast the CRN scoring where changes were detected in 6/17 (35%) patients while the majority 11/17 (65%) were adjudged as “no change.” Radar maps of qFibrosis readouts illustrated fibrosis dynamics in 5 areas of liver lobule (Figure A). Quantitation of 12 septa parameters objectively demonstrated significant differences between regressive and progressive septa (Figure B). Regressive changes in individual septa parameters (BL and EOT) were significantly greater in the TXR-treated patients, than in the placebo group, in particular-septa area, septa width, fiber interactions and aggregated septa, which were present both in the “no change” and the “regression” subgroups, as defined by the CRN scoring. qFibrosis readouts at BL were able to predict the outcomes-fibrosis regression vs non-progression.

**Conclusion:** SHG/TPEF microscopy with AI provides greater granularity and precision in assessing fibrosis dynamics in NASH patients with bridging fibrosis and reveal worsening or improvement undetectable by conventional microscopy, enhancing the understanding of pathogenesis and treatment response. These results support the use of digital approaches for quantitative fibrosis assessment, in the natural history and treatment of NASH and other liver diseases.

**TOP-077**  
**Safety, tolerability, and preliminary efficacy of ascending doses of Human Allogeneic Liver-derived Progenitor Cells (HepaStem®) in patients with cirrhotic and pre-cirrhotic non-alcoholic steatohepatitis (NASH)**  
Sven Francque1, Christophe Moreno2, Faouzi Saliba3, Victor Vargas4, Luis Ibañez5, German Soriano6, Jordi Genov7, Krum Katzarov8, Ewa Jancewiska8, Elena Laura Iliescu10, Anja Geerts11, Noelia Gordillo12, Yelena Vainilovich12, Mustapha Najimi12, Virginie Barthel12, Frederic Lin12, Etienne Sokal12,13, 1Antwerp University Hospital, UZA, Division of Gastroenterology and Hepatology, Edegem, Belgium; 2CUB Hôpital Erasme, Université Libre de Bruxelles, Department of Gastroenterology, Hepatopancreatology and Digestive Oncology, Brussels, Belgium; 3Paul Brousse Hospital, France; 4Hospital Vall d’Hebron, Universitat Autònoma, Barcelona, Spain; 5Hospital General Universitario Gregorio Marañon, Spain; 6Hospital de la Santa Creu i Sant Pau, Spain; 7University Multiprofile Hospital for Active Treatment “Tsaritsa Yoana-ISUL”, Bulgaria; 8Multiprofile hospital for active treatment (MHAH), Bulgaria; 9ID Clinic, Poland; 10Fundeni Clinical Institute, Bucharest, Romania; 11UZ Gent, Belgium; 12Cellaion, Belgium; 13University Hospital Saint-Luc, Belgium

**Background and aims:** Inflammation plays a major role in the progression of non-alcoholic steatohepatitis (NASH). As previously demonstrated, Human Allogeneic Liver-derived Progenitor Cells (HepaStem®) have immunomodulatory effects and the capacity to modulate liver tissue inflammation. No anti-NASH treatments have been approved yet.

**Method:** In the HEP201 (PANASH) study, adult patients from 6 European countries with either F3 or F4 NASH (SAF fibrosis score) received a single or 3 repeated weekly infusions of either 0.5 or 1.0 × 10^6 cells of HepaStem/kg body weight and were followed up for 6 months post infusion. No formal statistical analyses were performed as the number of patients was small.

**Results:** Twenty-three patients were included: mean age 56.5y, 14 T2D; 18 obese, 5 overweight; 11 had F3 and 12 F4, all compensated liver disease. The number of patients was small.

**SHG assessment of liver fibrosis changes in patients with NASH F3 stage**

![Figure: (abstract: WED-076).](image-url)
except for 2 early decompensated (total bilirubin >2 mg/dL). Safety. Up to 3 infusions at the highest dose were safe and well tolerated. No death or dose-limiting toxicity was detected. No adverse event (AE) led to study discontinuation. The majority (91.7%) of the AEs were non-serious and considered not study drug-related. Of the 4 serious AEs, 2 were considered by the Investigator as possibly related: a mild ischaemic stroke (in a context of pre-existing hypertension, T2D and carotid plaques) and a resected dysplastic liver nodule (which was present before study participation). Both events resolved without sequelae. Most coagulation parameters did not change, except for some transient increase in D-dimers 24 h after infusion. Plasminogen activator inhibitor-1 levels tended to slightly decrease 24 hours after infusion. Three patients (13.0%) developed de novo anti-HLA Class I or II donor-specific antibodies transitorily on D28 and/or M3. Efficacy. Serum levels of ALT and AST, which were mildly elevated at baseline, tended to normalize by M6, particularly in F3 patients. Bilirubin, as well as triglyceride levels, gradually decreased over time, particularly in patients with higher values at baseline. Adiponectin levels were increased in most patients (70%) on D28. No change was noted in glycaemic or anthropometric parameters. MELD score, which was low at baseline, further decreased slightly by M6. Serum levels of inflammatory parameters (CRP, IFN-gamma, and TNF-alpha), which were low at baseline, did not change over a period of 6 months, except for IL-6 which tended to decrease by D28, particularly in patients with higher levels at baseline. Regarding fibrosis, APRI and FIB-4 scores tended to decrease by M6, particularly in F3 patients. No decompensation of cirrhosis was reported.

Conclusion: This first dose-finding, safety, and preliminary efficacy study of HepaStem in adult NASH patients with F3 or cirrhosis confirmed previous safety findings. Preliminary indicators of efficacy on liver health, metabolic and inflammation markers support further study of HepaStem’s potential to prevent progression towards cirrhosis and decompensation.

TOP-091 Non-invasive tests of liver injury, inflammation and fibrosis are improved by efruxifermin and correlate with histological improvements in F2-F3 NASH patients: secondary analysis of Ph2b HARMONY study

Jörn Schattenberg1, Juan P Frias2, Guy Neff3, Cary Abrams4, Kathryn Jean Lucas5, William Sanchez6, Sudhanshu Gogia7, Muhammad Y Sheikh8, Cynthia Behling9, Pierre Bedossa10, Lan Shao11, Erica Fong12, Brittany de Temple12, Reshma Shringarpure12, Doreen Chan12, Erik Tillman12, Tim Rolph12, Andrew Cheng12, Kitty Vale12, Stephen Harrison13. Johannes

### Table: Analysis of Non-Invasive Markers by Treatment Group at 24 Weeks

<table>
<thead>
<tr>
<th>Parameter (Unit) Category</th>
<th>LS Mean (SE) unless otherwise noted</th>
<th>Placebo</th>
<th>EFX 28 mg</th>
<th>EFX 50 mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>LFC (%)</td>
<td>MRI-PDFF</td>
<td>N=42</td>
<td>N=38</td>
<td>N=35</td>
</tr>
<tr>
<td>Relative (%) Change from Baseline at week 24</td>
<td>-6.0 (4.01)</td>
<td>-51.6 (4.31)</td>
<td>-63.7 (4.42)</td>
<td></td>
</tr>
<tr>
<td>p-value vs. placebo</td>
<td>---</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Pro-C3 (ng/mL)</td>
<td>N=40</td>
<td>N=37</td>
<td>N=35</td>
<td></td>
</tr>
<tr>
<td>Absolute Change from Baseline at week 24</td>
<td>0.1 (0.70)</td>
<td>-5.1 (0.74)</td>
<td>-5.2 (0.74)</td>
<td></td>
</tr>
<tr>
<td>p-value vs. placebo</td>
<td>---</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>ELF Score</td>
<td>N=41</td>
<td>N=37</td>
<td>N=32</td>
<td></td>
</tr>
<tr>
<td>Absolute Change from Baseline at week 24</td>
<td>0.1 (0.10)</td>
<td>-0.6 (0.10)</td>
<td>-0.7 (0.11)</td>
<td></td>
</tr>
<tr>
<td>p-value vs. placebo</td>
<td>---</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>MIA4 Score</td>
<td>N=39</td>
<td>N=35</td>
<td>N=31</td>
<td></td>
</tr>
<tr>
<td>Absolute Change from Baseline at week 24</td>
<td>0.0 (0.03)</td>
<td>-0.3 (0.04)</td>
<td>-0.3 (0.04)</td>
<td></td>
</tr>
<tr>
<td>p-value vs. placebo</td>
<td>---</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Liver Stiffness, FibroScan (VCTE)</td>
<td>N=42</td>
<td>N=38</td>
<td>N=36</td>
<td></td>
</tr>
<tr>
<td>Relative (%) Change from Baseline at week 24</td>
<td>-0.4 (5.82)</td>
<td>-15.4 (6.19)</td>
<td>-24.7 (6.37)</td>
<td></td>
</tr>
<tr>
<td>p-value vs. placebo</td>
<td>---</td>
<td>0.064</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>FAST Score</td>
<td>N=39</td>
<td>N=37</td>
<td>N=34</td>
<td></td>
</tr>
<tr>
<td>Mean (SD) Change from Baseline at week 24</td>
<td>-0.05 (0.19)</td>
<td>-0.31 (0.22)</td>
<td>-0.46 (0.14)</td>
<td></td>
</tr>
<tr>
<td>p-value vs. placebo</td>
<td>---</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
<td></td>
</tr>
<tr>
<td>Normalization of LFC, in patients with &gt;5% LFC at baseline1</td>
<td>N=41</td>
<td>N=38</td>
<td>N=35</td>
<td></td>
</tr>
<tr>
<td>Odds Ratio of NASH Resolution (without worsening of fibrosis) [95% CI], EFX-treated2</td>
<td>---</td>
<td>4.6 [1.5, 14.2] **</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normalization of ALT in patients &gt;ULN at baseline3</td>
<td>N=22</td>
<td>N=18</td>
<td>N=20</td>
<td></td>
</tr>
<tr>
<td>Odds Ratio of NASH Resolution (without worsening of fibrosis) [65% CI], EFX-treated4</td>
<td>3 (14%)</td>
<td>13 (72%)</td>
<td>17 (85%)</td>
<td></td>
</tr>
</tbody>
</table>

1LFC normalization defined as >5% LFC at baseline. 
2Two EFX-treated patients analyzed for LFC normalization did not have week 24 biopsies available. 
3ALT normalization defined as >1x ULN at baseline, SUUN at Week 24 with >15% decrease. 
4One EFX-treated patient analyzed for LFC normalization did not have week 24 biopsies available. 
5p-value of 0.3 in 100% of EFX-treated patients achieving NASH resolution also normalized LFC.
6Liver fat content; Pro-C3=N-terminal type 3 collagen propeptide; ELF=Enhanced Liver Fibrosis; VCTE=vibration-controlled transient elastography; FAST=FibroScan-AST; ULN=upper limit of normal. 
7The LS Means, SEs, and p-values are from a mixed-model repeated-measures (MMRM) with baseline as a covariate and controlling for stratification factors for comparisons between the EFX arms and the Placebo arm for Pro-C3 and ELF. FAST p-values are from one-way ANOVA, Dunnett’s multiple comparisons test. Baseline is the last non-missing measurement prior to the first dose of study drug.

(abstract: TOP-091).
Efficacy and safety of LPCN 1144 in hypogonadal and eugonadal subjects for the treatment of non-alcoholic steatohepatitis (NASH) with fibrosis

Benjamin Bruno1, Josh Weavil1, Jonathan Ogle1, Kongnara Pankorn1, Anthony Delconte1,2, Nachaipan Chidambaram1, Mahesh Patel1, Somaya Albhaisi3, Arun Sanyal3. 

1Lipocine Inc, Salt Lake City, United States; 2Saint Joseph’s University, Department of Food, Pharma, and Healthcare, Philadelphia, United States; 3Virginia Commonwealth University, Division of Gastroenterology, Hepatology and Nutrition, Richmond, United States Email: bbjn@lipocine.com

Background and aims: Non-invasive tests (NITs) to predict histological improvement in clinical trials are of great unmet need. Efruxifermin (EFX), a long-acting Fc-FGF21 fusion protein decreased liver fat content and markers of liver injury, inflammation fibrosis, as well as improved metabolic health of NASH patients with F1-F3 fibrosis or compensated cirrhosis.1, 2 These observations were confirmed in the phase 2b HARMONY study.3 The current analysis evaluated the responses of NITs to EFX treatment for 24 weeks, and potential association with observed resolution of histopathology.

Method: Changes in NITs were explored across 115 patients randomized within the ongoing, randomized, placebo-controlled phase 2b HARMONY study evaluating EFX 28 and 50 mg once-weekly for 96 weeks, with primary end point evaluation at 24 weeks.3 NITs were analyzed for correlation with histological improvements, based on evaluation at week 24 of fibrosis improvement without NASH worsening; NASH resolution without fibrosis worsening; and both fibrosis improvement and NASH resolution.

Results: Both EFX treatment groups met all key histological end points3 at week 24. In parallel, Pro-C3, enhanced liver fibrosis (ELF) score, NIS4, and liver stiffness by transient elastography were significantly reduced in the treated groups (Table 1). The composite imaging and serum biomarker test, FibroScan-AST (FAST), indicated a significantly smaller proportion of patients at moderate or high risk of disease progression after treatment. High rates (>50% with 50 mg EFX) of normalization for LFC (≤5% LFC) or serum ALT, appeared to underlie the substantial resolution of steatohepatitis (>60%, placebo adjusted).

Conclusion: Consistent with observed histological benefits, EFX significantly improved circulating and imaging-based biomarkers of liver injury, inflammation and fibrosis compared to placebo. In a substantial proportion of patients, EFX treatment for 24 weeks was associated with normalization of liver fat and serum ALT, which appeared to underlie improvements in NASH histopathology. Thus, changes in NITs with EFX therapy can be extrapolated to predict improvement in liver histology, enabling non-invasive monitoring of EFX response among patients with moderate-to-advanced fibrosis and NASH.

References
3. The Liver Meeting AASLD (2022).

FRIDAY 23 JUNE

FRI-466

Efficacy and safety of LPCN 1144 in hypogonadal and eugonadal subjects for the treatment of non-alcoholic steatohepatitis (NASH) with fibrosis

Benjamin Bruno1, Josh Weavil1, Jonathan Ogle1, Kongnara Pankorn1, Anthony Delconte1,2, Nachaipan Chidambaram1, Mahesh Patel1, Somaya Albhaisi3, Arun Sanyal3. 

1Lipocine Inc, Salt Lake City, United States; 2Saint Joseph’s University, Department of Food, Pharma, and Healthcare, Philadelphia, United States; 3Virginia Commonwealth University, Division of Gastroenterology, Hepatology and Nutrition, Richmond, United States Email: bbjn@lipocine.com

Background and aims: NASH is the fastest growing chronic liver disease and can progress to cirrhosis, hepatocellular carcinoma, and death. Recently, data from the Phase 2 clinical trial LiFT support LPCN 1144, an oral produg of testosterone (T), as a novel therapeutic treatment for patients with NASH. Although there is a high prevalence of low T in NASH, not all patients present with this diagnosis. Thus, the aim of the current analysis was to examine the efficacy and safety of LPCN 1144 in hypogonadal and eugonadal subjects of the LiFT trial.

Method: In LiFT, biopsy-confirmed NASH (F1-F3) males were randomized 1:1:1 to three arms for 36 weeks; 1) Treatment A (n = 18): oral LPCN 1144 twice daily (BID), 2) Treatment B (n = 19): oral LPCN 1144 with d-alpha tocopherol BID, and 3) oral matching placebo (n = 19) BID. Due to similar positive outcomes in LiFT, the two LPCN 1144 treatment arms were pooled (n = 37) to examine the impact of baseline gonadal status on the safety and efficacy of LPCN 1144 treatment in men with NASH. Subjects were stratified into hypogonadal (HYPO), defined as subjects with at least two baseline T measurements <300 ng/ml or a documented history of hypogonadism, and eugonadal (EU) groups.

Results: Within the pooled treatment arms, 41% (15/37) were eugonadal and 59% (22/37) were hypogonadal. Baseline characteristics were similar between EU and HYPO, with the exception of a lower basal T and higher basal BMI and whole-body fat mass in HYPO. When stratified by gonadal status at baseline, the positive effects of LPCN 1144 therapy were not significantly different between EU and HYPO for MRI-PDFF (−8.5 vs. −7.8%), total NAS (−2.1 vs. −2.3%), proportion of patients with NASH resolution without worsening of fibrosis (50% vs 61%), ALT (−15.7% vs −12.0%), AST (−15.2% vs −11.7%) or whole-body fat mass (−3.9% vs −5.6%), respectively. The number of participants with treatment emergent adverse events (TEAEs) were similar between EU (11/15), HYPO (16/22), and placebo (15/19). TEAEs of interest (diarrhea, nausea, vomiting, pruritis, benign prostatic hyperplasia, increased prostate-specific antigen, new or worsening hypertension, and peripheral edema) were less frequent in the EU subjects (2) than HYPO (7) and placebo (8) subjects.

Conclusion: The efficacy and safety of LPCN 1144 therapy for treatment of NASH in male patients is independent of basal gonadal status. These data suggest that oral LPCN 1144 treatment is a safe and effective therapy for the male NASH population which is comprised of both hypogonadal and eugonadal patients. The observed benefit to risk profile warrants further investigation of LPCN 1144 in a larger trial with a longer duration.

FRI-467

Incidence and risk of dyslipidemia and hyperglycemia in a phase 3 study of obeticholic acid for the treatment of non-alcoholic steatohepatitis

Manal Abdelmalek1, Thomas Capozza2, Pamela Davis2, Amara Randhawa2, Sangeeta Sawhney2. 1Mayo Clinic, Gastroenterology and Hepatology, Rochester, United States; 2Intercept Pharmaceuticals Inc, Morristown, United States Email: sangeeta.sawhney@interceptpharma.com

Background and aims: Non-alcoholic steatohepatitis (NASH) is associated with increased cardiovascular (CV) risk due to atherogenic dyslipidemia and insulin resistance. Therapies for NASH should have a well-characterized profile showing they do not increase CV risk. We aimed to characterize changes in lipid and glycemic markers and the incidence of dyslipidemia and hyperglycemia in the REGENERATE trial of obeticholic acid (OCA) for NASH (NCT02548351).

Method: The incidence of dyslipidemia and hyperglycemia was determined using standard Medical Dictionary for Regulatory Activities queries and laboratory tests for lipid and glycemic markers in the safety population (all randomized patients [pts] receiving ≥1 dose of placebo, OCA 10 mg, or OCA 25 mg).

Results: In this population, 976/2477 (39.4%) pts had exposures ≥4 years (median, 39 months). At baseline (BL), 496/825 (60.1%), 495/825 (60.1%), 495/825 (60.1%), 495/825 (60.1%), 495/825 (60.1%) pts in the placebo, OCA 10 mg, and OCA 25 mg groups had low-density lipoprotein (LDL) ≥100 mg/dl.
450 (54.5%), 436 (52.8%), and 452 (54.7%) were on lipid-lowering drugs; and 470 (57.0%), 476 (57.7%), and 479 (57.9%) had diabetes, respectively. Most dyslipidemia and hyperglycemia events were mild/moderate; <0.5% of pts discontinued treatment due to these events. Dyslipidemia AEs were reported in 193 (23.4%), 354 (42.9%), and 390 (47.2%) pts who received placebo, OCA 10 mg, or OCA 25 mg, respectively. No serious adverse events (SAEs) were reported. In the OCA groups, mean LDL increased from BL to month 1 (M1) but returned to near BL by M18 with no difference from placebo through M54 (Figure 1B). This reduction occurred regardless of statin use. The incidence of hyperglycemia was similar in the placebo (190 [23.0%]), OCA 10 mg (223 [27.0%]), and OCA 25 mg (201 [24.3%]) groups. Hyperglycemia SAEs occurred in 2 (0.2%), 5 (0.6%), and 11 (1.3%) pts, respectively, and were mostly related to hospitalization for glycemic control in pts with type 2 diabetes (1, 3, and 9 pts, respectively). There was an early transient increase in mean hemoglobin A1c (HbA1c) from BL (6.52%) to M3 (6.77%) in the OCA groups. After M9, HbA1c levels did not differ between placebo and OCA groups (Figure 1G).

**Conclusion:** OCA 25 mg is associated with an early transient increase in LDL, which returned to BL independent of the addition of a statin. After an early increase in HbA1c, there was no evidence of increased hyperglycemia risk with long-term treatment. These results suggest transient changes in lipids and glycemic markers can be managed per guidelines in pts with pre-cirrhotic liver fibrosis due to NASH.

**Abbreviations:** BL, baseline; OCA, obeticholic acid.

---

Figure: (abstract: FRI-467) Mean concentrations of (A) total cholesterol, (B) low-density lipoprotein (LDL), (C) high-density lipoprotein (HDL), (D) very low-density lipoprotein (VLDL), (E) triglycerides, (F) apolipoprotein B, and (G) hemoglobin A1c (HbA1c) over time.
Background and aims: Hypertriglyceridemia is a frequent complication of non-alcoholic fatty liver disease (NAFLD), but its treatment has not been established. We conducted a multicenter, randomized, open-label study of pemafibrate versus omega-3 fatty acid ethyl esters (PORTRAIT study; jRCTs041200011) in patients with hypertriglyceridemia and NAFLD to compare their effects on liver function.

Methods: Patients with hypertriglyceridemia and NAFLD who provided written consent to participate in the study were randomly assigned to receive pemafibrate 0.2 mg/day or the omega-3 fatty acid ethyl esters 2 g/day for 24 weeks. The primary end point was the change in ALT from baseline to week 24, and the secondary end points were the change in liver function-related markers, lipid profiles, HbA1c, and liver fibrosis markers. This study was approved by a Certified Review Board (CRB4200004).

Results: A total of 199 patients were enrolled, among which 80 were eligible, and 39 were assigned to the pemafibrate group and 41 to the omega-3 fatty acid ethyl esters group. The mean change in ALT (U/L) at 24 weeks was −19.7 and 6.8 in the pemafibrate group and omega-3 fatty acid ethyl esters group, respectively, where the difference between the groups was significant (−26.5 U/L, 95% confidence interval −42.3 to −10.7 U/L, p = 0.001). The adjusted mean TG, non-HDL-C, γ-GTP, ALP, M2BPGi in the secondary end points were significantly lower and the adjusted mean HDL-C was significantly higher in the pemafibrate group compared with the omega-3 fatty acid ethyl esters group. There were no cases of discontinuation due to adverse drug reactions in either group with no safety concerns.

Conclusion: Pemafibrate is recommended over omega-3 fatty acid ethyl esters for lipid management and treatment of NAFLD in patients with hypertriglyceridemia and NAFLD. This study demonstrated the short-term efficacy and safety of pemafibrate. Further large-scale and long-term studies, including evaluation of liver histology, are expected in the future.
generated from two weight-loss trials in order to characterise the prevalence of NASH components at baseline and investigate the effect of semaglutide.

**Method:** STEP 1 (NCT03548935) and STEP 2 (NCT03552757) were phase 3a, randomised, placebo-controlled trials of once-weekly subcutaneous semaglutide (2.4 mg in STEP 1; 1.0 mg and 2.4 mg in STEP 2) vs placebo for weight reduction in adults with overweight/obesity without (STEP 1) or with (STEP 2) type 2 diabetes (T2D). Patients received treatment for 68 weeks. Prediction probabilities (PP) for NASH components at baseline were derived using SomaSignal models. The efficacy of semaglutide vs placebo was analysed as presence or absence of NASH components using a binary classifier derived from the PP (PP ≥0.5) at the end of the trial (EOT) and as odds ratios at EOT based on PP directly. The SomaSignal classifier derived from the PP (analysed as presence or absence of NASH components using a binary SomaSignal models. The efficacy of semaglutide vs placebo was analysed as presence or absence of NASH components using a binary classifier derived from the PP (PP ≥0.5) at the end of the trial (EOT) and as odds ratios at EOT based on PP directly. The SomaSignal models. The efficacy of semaglutide vs placebo was analysed as presence or absence of NASH components using a binary classifier derived from the PP (PP ≥0.5) at the end of the trial (EOT) and as odds ratios at EOT based on PP directly. The SomaSignal models. The efficacy of semaglutide vs placebo was analysed as presence or absence of NASH components using a binary classifier derived from the PP (PP ≥0.5) at the end of the trial (EOT) and as odds ratios at EOT based on PP directly. The SomaSignal models. The efficacy of semaglutide vs placebo was analysed as presence or absence of NASH components using a binary classifier derived from the PP (PP ≥0.5) at the end of the trial (EOT) and as odds ratios at EOT based on PP directly.

**Results:** Proteomics data were available for 1307/1961 and 643/1210 randomised patients in STEP 1 and 2; these patients were representative of the full study populations in each trial. At baseline, steatosis was present in 43% of patients in STEP 1, and the prevalence of the other components was 5% or less. In STEP 2, steatosis was present in 72% of patients, 15% had both NASH and steatosis with fibrosis. The odds of having each NASH component were significantly lower at EOT for patients who received semaglutide vs placebo, with a dose-dependency trend in STEP 2, using both PP and binary classification (Figure). Further, semaglutide was associated with significantly lower odds of having a more severe NAFLD stage after treatment vs placebo.

**Conclusion:** Steatosis is highly prevalent in people with overweight/obesity, with NASH likely present in 15% of patients with overweight/obesity and T2D (STEP 2). Semaglutide had a favourable effect on NASH components in the current analysis in populations with overweight/obesity, with and without T2D, as measured by SomaSignal models.

**FRI-470**

**HPG1860 in patients with NASH: a phase II double-blind, placebo-controlled, dose-ranging study**

Naim Alkhouri1, Yongheng Liu2, Nian Liang2, Peibin Zhai2, Sandra Wu3, Xin Zhou4, Michael Xu5, Que Liu6, Stephen Harrison3.

1Liver Health II LLC dba Arizona Liver Health, Chandler, United States; 2Hepagene, Shanghai, China; 3Pinnacle Clinical Research-PLCC, Austin, United States

Email: stephenharrison87@gmail.com

**Background and aims:** HPG1860 is an oral non-steroidal, next generation farnesoid X receptor (FXR) agonist with selective liver distribution under investigation for treatment of non-alcoholic steatohepatitis (NASH). A phase I study of HPG1860 in healthy subjects demonstrated a benign safety profile and strong target engagement. Therefore, we aimed to evaluate safety, tolerability and efficacy of HPG1860 in patients with non-cirrhotic NASH.

**Method:** In this double-blind, placebo-controlled, dose ranging phase Ia dose ranging study (NCT05338034), patients with non-cirrhotic NASH, diagnosed by historical liver biopsy or met following criteria: liver stiffness ≥8 kPa and controlled attenuation parameter >300 dB/m or T2DM patients with elevated ALT and BMI ≥27 kg/m², were randomized in a 1:1:1:1:1 ratio to receive HPG1860 3 mg (n=22), 5 mg (n=21), 8 mg (n=22) or placebo (n=22) orally once daily for 12 weeks. All patients were required to have liver fat content (LFC) ≥10% at screening based on magnetic resonance imaging proton density fat fraction (MRI-PDF). The primary end point of this study was safety and tolerability. The key secondary efficacy end point of this study was the change from baseline in relative LFC measured by MRI-PDF at week 12.

**Results:** Between November 2021 and May 2022, 87 patients with either liver biopsy proven NASH or phenotypic diagnosis of NASH were enrolled and included for intent-to-treat analysis. The most common (≥10%) adverse events were pruritus, nausea, fatigue, headache and dizziness. Treatment-related pruritus occurred in 9.1%, 9.5%, 27.3% of patients in the 3, 5, 8 mg and only 1 patient in 3 mg cohort withdrew from the study due to grade 2 pruritus. No significant change in LDL cholesterol (LDL-C) was observed in the 3 mg, 5 mg and 8 mg HPG1860 cohorts as compared to placebo. Mean LFC at baseline was 20.11%, 19.74%, 14.83% and 19.29% in placebo, 3 mg, 5 mg and 8 mg cohort, respectively. At week 12, mean relative change of LFC in placebo, 3 mg, 5 mg and 8 mg cohort was 0.68%, −20.15% (p = 0.004 vs placebo), −7.08% (p = 0.965 vs placebo), and −38.64% (p < 0.001 vs placebo) respectively. 25.0% patients in 3 mg cohort, and 62.2% patients in 8 mg cohort achieved ≥30% relative LFC reduction at week 12. For patients with ALT >ULN at baseline, mean ALT in placebo, 3 mg, 5 mg and 8 mg cohort was 70.62, 62 and 72 U/L, respectively. At week 12, mean ALT percentage change from baseline in placebo, 3 mg, 5 mg and 8 mg cohort was 32.6%, −7.0%, −7.6% and −22.5% respectively, indicating dose-dependent reduction of ALT in HPG1860 treated patients.

**Conclusion:** HPG1860 was safe and well tolerated. LFC significantly reduced with 3 mg and 8 mg cohorts over 12 weeks in patients with NASH. HPG1860 demonstrated a differentiated pruritus and LDL-C profile, providing favorable risk-benefit data to support further clinical development by assessing histological biopsy end points in patients with NASH.

**FRI-471**

**The effects of a structured dietetics intervention in patients with non-alcoholic fatty liver disease**

Dominic Crocombe1,2, Antonio Liguori1,2, Mirko Zoncape1,2, Jennifer-Louise Clancy1,2, Atul Goyale1,2, Davide Roccabora1,2, Anna Mantovani1,2, Laura Iogna Prat1,2, Roshni Patil1,2, Emmanuel Toschatzis1,2, 1Royal Free London NHS Foundation Trust, Sheila Sherlock Liver Centre, London, United Kingdom; 2University College London, Institute of Liver and Digestive Health, London, United Kingdom

Email: dominic.crocombe@nhs.net

**Background and aims:** Diet and lifestyle modification to aid weight loss remains the cornerstone of NAFLD management. Since 2014, selected patients attending a multi-disciplinary NAFLD clinic have been referred to a specialist dietitian. They either receive a single appointment (SA) with follow-up after 3 months and as required thereafter, or a comprehensive, structured package of care (POC) consisting of 4 sessions within 6 months. Our aim was to assess whether this dietetic POC is associated with more favourable outcomes.

**Method:** In this retrospective service evaluation, we reviewed the outcomes (changes in weight and liver stiffness) of patients in 3 groups: those who had completed ≥3/4 sessions in the dietetic POC, those who had completed a SA, and those who had not seen a specialist dietitian (controls). In the POC and SA groups, weight was recorded from the first dietetic appointment (baseline), final dietetic appointment (intervention end), and at 18 months from baseline (long term). For controls, weight at baseline, 6 months, and 18 months was recorded. Fibroscan (TE) results before and after intervention were recorded. Significant improvement in TE was considered ≥20% reduction if baseline ≥6KPa; significant worsening was considered ≥20% increase if baseline ≤5 kPa, or a change to ≥6 kPa if baseline <5 kPa.

**Results:** 381 patients were included: 89 POC, 49 SA, and 243 controls. Mean weight changes from baseline to intervention end were −2.9 kg (−2.8%) for POC, −1 kg (−0.5%) for SA, and −1.3 kg (−1.2%) for controls (Figure 1A). Patients who received the POC lost significantly more
improvement in TE (X2, p < 0.01). Weight loss after 6 or 18 months was associated with a significant difference in changes of TE between groups. Overall, ≥5% weight loss after 6 or 18 months was associated with a significant improvement and 22.7% had a significant worsening. There was no significant difference in weight change from baseline between POC and SA, or SA and controls. At multivariate logistic analysis, the POC was associated with ≥5% weight loss (OR 2.15, p < 0.01) independent of time interval, age, sex, and metabolic comorbidities. At long term (mean 18 months) follow-up, all groups achieved further weight loss (~3.4% SOC, ~2.3% SA, ~2.3% controls, Figure 1b) but there was no longer a significant difference in weight change from baseline between groups. Regarding liver stiffness, the mean interval between Fibroscans was 24 months. Overall, 28.1% patients had a significant improvement in liver stiffness.

**Conclusion:** A structured dietetics POC consisting of 3 or 4 sessions over 6 months was associated with greater rate of ≥5% weight loss than controls, and the effect was maintained beyond the end of the intervention. ≥5% weight loss after 6 or 18 months was associated with significant improvement in liver stiffness.

**FRI-472**

**Resmetirom improves the lipid/lipoprotein profile in patients with non-alcoholic fatty liver disease**

Naim Alkhouri1, Rebecca Taub2, Guy Neff3, Kathryn Jean Lucas4, Dominic Labriola2, Sam Moussa2, Mustafa Bashir6, Stephen Harrison5, 6, Arizona Liver Health, Tucson, United States; 7Madrigal Pharmaceuticals, Conshohocken, United States; 8Covenant Metabolic Specialists, Sarasota, United States; 9Lucas Research, Morehead City, United States; 10University of Arizona for Medical Sciences, Tucson, United States; 11Duke University Medical Center, Durham, United States; 12University of Oxford, Oxford, United Kingdom; 13Pinnacle Clinical Research, San Antonio, United States

**Email:** nalkhouri@azliver.com

**Background and aims:** Patients with non-alcoholic fatty liver disease (NAFLD)/non-alcoholic steatohepatitis (NASH) have an increased risk of cardiovascular disease (CVD). Resmetirom is an oral liver-targeted thyroid hormone receptor-beta selective agonist in clinical development for treatment of NASH. In addition to significantly reducing hepatic fat, data from Phase 2/3 clinical trials have consistently demonstrated that resmetirom significantly reduces low-density lipoprotein cholesterol (LDL-C), apolipoprotein B (apoB), and triglyceride (TG) levels in patients with NAFLD/NASH. Here we report data from the Phase 3 MAESTRO-NAFLD-1 trial on the effect of resmetirom treatment on additional components of the lipid/lipoprotein profile.

**Method:** MAESTRO-NAFLD-1 (NCT04197479) was a Phase 3 trial to evaluate the safety and tolerability of resmetirom over 52 weeks of treatment in adults with NAFLD (presumed NASH) diagnosed via non-invasive tests. Patients were randomized 1:1:1:1 to 3 double-blind arms (resmetirom 100 mg, resmetirom 80 mg, or placebo administered once daily) or an open-label arm (resmetirom 100 mg administered once daily). Lipid, lipoprotein, and lipid particle levels were measured at baseline, Week 24, and Week 48.

**Results:** At Week 24, remnant-like particle cholesterol (RLP-C), very low-density lipoprotein cholesterol (VLDL-C), and VLDL and chyomicron TG levels were significantly reduced from baseline in all resmetirom groups compared with placebo (p < 0.05 vs placebo for all); these significant reductions were maintained at Week 48 (TABLE). In addition, lipoprotein (a) (Lp(a)) and apolipoprotein CII (apoCII) levels were significantly reduced from baseline with

<table>
<thead>
<tr>
<th>RLP-C, mg/dL</th>
<th>Resmetirom 100mg OL</th>
<th>Resmetirom 100mg DB</th>
<th>Resmetirom 80mg DB</th>
<th>Placebo DB</th>
</tr>
</thead>
<tbody>
<tr>
<td>-8.7 (3.6)a</td>
<td>-6.1 (3.1)a</td>
<td>-0.8 (3.0)a</td>
<td>12.4 (3.0)</td>
<td></td>
</tr>
<tr>
<td>VLDL-C, mg/dL</td>
<td>-11.2 (5.9)a</td>
<td>-7.6 (5.0)a</td>
<td>0.7 (5.0)a</td>
<td>19.0 (4.9)</td>
</tr>
<tr>
<td>VLDL and chyomicron TG, mg/dL</td>
<td>-16.3 (4.3)a</td>
<td>-14.4 (3.7)a</td>
<td>-10.5 (3.7)a</td>
<td>7.1 (3.6)</td>
</tr>
<tr>
<td>Lp(a), nmol/L</td>
<td>-18.7 (3.5)</td>
<td>-33.6 (4.0)a</td>
<td>-24.0 (4.1)a</td>
<td>-4.4 (4.1)</td>
</tr>
<tr>
<td>ApoCII, mg/dL</td>
<td>-13.6 (3.1)a</td>
<td>-14.4 (2.6)a</td>
<td>-9.7 (2.6)a</td>
<td>7.7 (2.6)</td>
</tr>
<tr>
<td>LDL particles, nmol/L</td>
<td>-21.0 (2.3)a</td>
<td>-15.6 (2.0)a</td>
<td>-15.1 (2.0)a</td>
<td>-2.1 (1.9)</td>
</tr>
<tr>
<td>Small LDL particles, nmol/L</td>
<td>-24.5 (2.7)a</td>
<td>-18.3 (2.3)a</td>
<td>-18.7 (2.4)a</td>
<td>-6.7 (2.3)</td>
</tr>
<tr>
<td>VLDL and chyomicron particles, nmol/L</td>
<td>-6.7 (5.6)a</td>
<td>-7.2 (5.0)a</td>
<td>1.8 (5.0)a</td>
<td>22.6 (4.9)</td>
</tr>
</tbody>
</table>

*p < 0.0001 vs placebo; †p < 0.05 vs placebo.

ApoCII, apolipoprotein CII; CFB, change from baseline; DB, double-blind; LDL, low-density lipoprotein; Lp(a), lipoprotein (a); LSM, least squares mean; OL, open-label; RLP-C, remnant-like particle cholesterol; SE, standard error; TG, triglyceride; VLDL-C, very low-density lipoprotein cholesterol.
resmetirom 100 mg and 80 mg versus placebo at Week 24 (p < 0.0001 vs placebo for all); the significant reductions in lipoproteins were maintained at Week 48 with continued resmetirom treatment. Atherogenic lipoprotein particles, including LDL, small LDL, and VLDL and chylomicron, were also significantly reduced from baseline in the resmetirom groups compared with placebo at Week 24 (p < 0.05 vs placebo for all) with these significant reductions maintained at Week 48.

**Conclusion:** In addition to significantly reducing hepatic fat, resmetirom significantly improved the overall lipid/lipoprotein profile in adults with NAFLD/NASH. Both resmetirom 100 mg and 80 mg significantly reduced atherogenic lipids/lipoproteins, including RLP-C, VLDL-C, Lp (a), and apoCII, at Week 24. Furthermore, improvements in the lipid/lipoprotein profile were maintained throughout the entire treatment period of MAESTRO-NAFLD-1. As CVD is the most common cause of mortality in patients with NASH, the effect of potential therapies on cardiovascular risk factors, including elevated atherogenic lipids/lipoproteins, is important to consider.

**FRI-473**

**Different class effects of oral hypoglycemic agents on non-alcoholic fatty liver disease regression and clinical outcomes: a nationwide cohort study**

Heejoon Jang¹, Yeonjin Kim², Donghyeon Lee¹, Sae Kyung Joo¹, Bo Kyung Koo¹, Yong Jin Jung¹, Woohan Lee², Won Kim¹. ¹Seoul Metropolitan Government Seoul National University Boramae Medical Center, Internal Medicine, Seoul, Korea, Rep. of South; ²Graduate School of Public Health, Seoul National University, Public Health Sciences, Seoul, Korea, Rep. of South

**Email:** wonshiri@yahoo.com

**Background and aims:** Sodium-glucose cotransporter 2 (SGLT2) inhibitors, thiazolidinediones, and dipeptidyl peptidase-4 (DPP-4) inhibitors are known to improve non-alcoholic fatty liver disease regression and clinical outcomes: a nationwide cohort study. Based on the National Health Information Database covering over 50 million South Koreans, patients with NAFLD and T2DM who use SGLT2 inhibitors, thiazolidinediones, DPP-4 inhibitors, or sulfonylureas in combination with metformin for more than 80% of 90 consecutive days were included. Inverse probability of treatment weighting was used to adjust differences in baseline characteristics between the groups. NAFLD regression assessed by the fatty liver index was the primary outcome. Severe NAFLD was the secondary outcome, defined as a composite of liver-related hospitalization, liver-related mortality, or hepatocellular carcinoma (HCC). All-cause mortality and liver transplantation were considered competing risks.

**Method:** Based on the National Health Information Database covering over 50 million South Koreans, patients with NAFLD and T2DM who use SGLT2 inhibitors, thiazolidinediones, DPP-4 inhibitors, or sulfonylureas in combination with metformin for more than 80% of 90 consecutive days were included. Inverse probability of treatment weighting was used to adjust differences in baseline characteristics between the groups. NAFLD regression assessed by the fatty liver index was the primary outcome. Severe NAFLD was the secondary outcome, defined as a composite of liver-related hospitalization, liver-related mortality, or hepatocellular carcinoma (HCC). All-cause mortality and liver transplantation were considered competing risks.

**Results:** A total of 103,228 patients were followed for a median of 878 days, and 4,960 patients experienced NAFLD regression. Compared to baseline, patients on SGLT2 inhibitors had a significantly lower risk of NAFLD regression compared to other classes of oral hypoglycemic agents. SGLT2 inhibitors significantly reduced the risk of NAFLD regression compared to other classes of oral hypoglycemic agents, with the greatest reduction observed in the SGLT2 inhibitor group (aSHR 0.85, 0.40–1.79). Thiazolidinediones (aSHR 1.79) and DPP-4 inhibitors (aSHR 1.29) were also significantly associated with higher NAFLD regression. SGLT2 inhibitors were not significantly associated with a lower incidence of severe NAFLD compared to thiazolidinediones (aSHR 1.06, 0.39–2.88) or DPP-4 inhibitors (aSHR 0.85, 0.40–1.79).

**Conclusion:** In addition to significantly reducing hepatic fat, resmetirom significantly improved the overall lipid/lipoprotein profile in adults with NAFLD/NASH. Both resmetirom 100 mg and 80 mg significantly reduced atherogenic lipids/lipoproteins, including RLP-C, VLDL-C, Lp (a), and apoCII, at Week 24. Furthermore, improvements in the lipid/lipoprotein profile were maintained throughout the entire treatment period of MAESTRO-NAFLD-1. As CVD is the most common cause of mortality in patients with NASH, the effect of potential therapies on cardiovascular risk factors, including elevated atherogenic lipids/lipoproteins, is important to consider.

**FRI-474**

**SGLT2 inhibitors improve hepatic fibrosis assessed by Fibroscan in NAFLD patients with type 2 diabetes: a five-year follow-up study**

Rosa Lombardi¹,², Alessandro Mantovani³, Annalisa Cespiti¹,², Gabriele Maffi¹, Elena Del Zanna², Paolo Francione², Felice Cinque², Rosanna Villani¹, Nicola Passigato², Emanuela Orsi³, Valeria Grancini³, Giuseppina Pisano¹, Claudio Maffeis⁶, Daniela Bignamini¹, Gaetano Serviddio², Giovanni Targher³, Silvia Fargion², Anna Ludovica Fracanzani¹²,³, Unit of Medicine and Metabolic Disease, Fondazione IRCCS Ca’ Granda Ospedale Maggiore Policlinico di Milan, Milan, Italy; ²Department of Pathophysiology and Transplantation, University of Milan, Milan, Italy; ³Division of Endocrinology, Diabetes and Metabolism, Department of Medicine, University and Azienda Ospedaliera Universitaria Integrata di Verona, Verona, Italy; ⁴Centro C.U.R.E. Dept. of Medical and Surgical Sciences, University of Foggia, Foggia, Italy; ⁵Endocrinology and Diabetes Unit, Fondazione IRCCS Ca’ Granda Ospedale Maggiore Policlinico di Milan, Milan, Italy; ⁶Pediatric Diabetes and Metabolic Disorders Unit, Department of Surgical Sciences, Dentistry, and Pediatrics, and Gynaecology, University Hospital of Verona, Verona, Italy

**Email:** rosalombardi@hotmail.it

**Background and aims:** Subjects with non-alcoholic fatty liver disease (NAFLD) and type 2 diabetes mellitus (T2DM) present high progression of liver disease to fibrosis, which is the main determinant of long-term adverse outcomes. Data are accumulating on the benefits of sodium glucose cotransporter 2 inhibitors (SGLT-2i) on hepatic fibrosis mainly in pharmacologic or retrospective studies. To prospectively evaluate change in metabolic alterations and hepatic disease in patients with NAFLD and T2DM and predisposing factors.

**Method:** 237 patients with NAFLD (mean age 67 ± 9 years, 54% male) were enrolled at the diabetology outpatient clinics and re-evaluated after 5 years. Information about diabetic control, metabolic comorbidities and medications were collected at baseline and follow-up. Additionally, NAFLD was assessed by liver ultrasonography, whereas LSM was detected by Fibroscan® at baseline and after 5 years.

**Results:** During follow-up no change in the prevalence of metabolic alterations except for hypertension (81% vs 73%, p < 0.001) was observed, whereas an increase in LSM values (6.0 ± 2.8 vs 5.8 ± 2.7 kPa, p = 0.02) was registered, despite stability of diabetic control. In particular, LSM worsened in 133 (56%) subjects, with 92 (39%) having a worsening of >10% from baseline and 20 (8%) of at least 1 fibrosis stage at Fibroscan from baseline. Moreover, a higher
Semaglutide improves non-alcoholic steatohepatitis: a 10-year retrospective study

Parth Shah1, Megan White1, Alex Sievert2, Alexander Conway3, Adam Kneepkens2, Gregory Sayuk1,4, Mauricio Lisker-Melman1,4, Jill Elwing1,4, 1Washington University School of Medicine Department of Gastroenterology, St. Louis, United States; 2Washington University School of Medicine, Internal Medicine, St. Louis, United States; 3Washington University School of Medicine, St. Louis, United States; 4St. Louis VA Medical Center-John Cochran Division, St. Louis, United States
Email: parth@wustl.edu

Background and aims: The glucagon-like peptide-1 receptor agonist semaglutide (SEMA) has been studied in patients with non-alcoholic steatohepatitis (NASH) due to the potential benefit from weight loss on liver inflammation. Preclinical studies suggest that the NASH improvement may be independent of weight loss. We aim to assess the impact of SEMA on objective NASH measures independent of weight loss.

Method: This retrospective study evaluated 1236 patients with type II diabetes and included 420 patients that were on SEMA for at least 12 months between 2011 and 2022. Exclusion criteria were chronic liver disease other than NASH, decompensated cirrhosis, any malignancy, and bariatric surgery. Primary end points were clinically significant improvements in AST or ALT (defined as mean difference >3 U/L and >10.6 U/L respectively based on Ng et al. Hepatology 2022). Statistical analysis included Student’s t-test/ANOVA, Wilcoxon signed-rank test/Friedman test as appropriate, and binary logistic regression.

Results: Within 420 patients (median 71 years old, 94% male, 79% Caucasian), the median duration of SEMA was 22.5 months and 80% received 1 mg/week. Ninety-nine percent of patients had diabetes and 87% had a body mass index (BMI) ≥30. BMI improved by a mean (SD) of 1.9 points (2.8), weight by 13.3 pounds (19.1), AST by 4.1 U/L (11.5), and ALT by 5.3 U/L (14.2). In 28% and 22% of patients, AST and ALT respectively, had a clinically significant improvement. The NASH scores (NFS, FIB4, and APRI), improved after SEMA (p <0.001). No statistically significant differences in AST or ALT improvement were found when patients were stratified by BMI prior to SEMA (BMI <25; ≥25 to <30; ≥30 to <35; ≥35 to <40; ≥40). No statistically significant differences were found in AST or ALT improvement when stratified by percentage of weight loss after SEMA (no weight loss; 0–5%; 5–10%; >10%). On logistic regression analysis (Table 1), duration of SEMA and pre-SEMA APRI score increased odds of clinically significant improvements of AST and ALT.

FRI-476

Resmetirom helps regulate thyroid hormone levels within the liver in patients with non-alcoholic fatty liver disease

Stephen Harrison1,2, Rebecca Taubb, Guy Neff3, Mustafa Bashir3, Dominic Labriola1, Sam Moussa4, Naim Alkhouri5, Kathryn Jean Lucas6. 1University of Oxford, Oxford, United Kingdom; 2Pinnacle Clinical Research, San Antonio, United States; 3Madrigal Pharmaceuticals, Conshohocken, United States; 4Covenant Metabolic Specialists, Sarasota, United States; 5Duke University Medical Center, Durham, United States; 6University of Arizona for Medical Sciences, Tucson, United States; 7Arizona Liver Health, Tucson, United States
Email: stephenharrison87@gmail.com

Background and aims: Thyroid hormone receptor (THR)-beta is responsible for regulating critical metabolic pathways in the liver. In patients with non-alcoholic fatty liver disease (NAFLD)/non-alcoholic steatohepatitis (NASH), THR-beta signaling within the liver is diminished. The lipotoxicity that occurs in NASH induces intrahepatic hypothyroidism resulting in reduced conversion of prohormone T4 to active hormone T3 (in favor of increased conversion of T4 to the inactive metabolite reverse T3 [RT3]). Exogenous thyroxine treatment does not improve intrahepatic hypothyroidism in patients with NAFLD/NASH. Resmetirom, an oral liver-targeted THR-beta selective agonist in clinical development for treatment of NASH, aims to address this underlying pathophysiology in NAFLD/NASH. Here we report data from the Phase 3 MAESTRO-NAFLD-1 trial on the effect of 52 weeks of resmetirom treatment on thyroid hormone levels.

Method: MAESTRO-NAFLD-1 (NCT04197479) was a Phase 3 trial to evaluate the safety of resmetirom treatment over 52 weeks in adults with NAFLD (presumed NASH) who were diagnosed using non-invasive tests. Patients were randomized 1:1:1:1:1 to 3 double-blind arms (resmetirom 100 mg, resmetirom 80 mg, or placebo administered once daily) or an open-label arm (resmetirom 100 mg administered once daily). Thyroid hormone levels (thyroid-stimulating hormone [TSH], free T3 [FT3], free T4 [FT4], and RT3) were evaluated at baseline and Week 52 in the overall trial population, thyroxine-treated population, and euthyroid population.

<table>
<thead>
<tr>
<th>Months of treatment</th>
<th>Clinically significant AST improvement</th>
<th>Clinically significant ALT improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compensated cirrhosis</td>
<td>p = 0.002*</td>
<td>p &lt; 0.001*</td>
</tr>
<tr>
<td>APRI score 0.5 to 1.5 prior to treatment</td>
<td>p = 0.99</td>
<td>p = 0.05</td>
</tr>
<tr>
<td>Weight loss after treatment</td>
<td>p = 0.23</td>
<td>p = 0.08</td>
</tr>
</tbody>
</table>

OR = odds ratio.

Figure: Table 1. Logistic regression analysis on SEMA with clinically significant improvement.
TABLE. Change from baseline in thyroid hormone levels at Week 52.

<table>
<thead>
<tr>
<th></th>
<th>Resmetirom 100mg OL</th>
<th>Resmetirom 100mg DB</th>
<th>Resmetirom 80mg DB</th>
<th>Placebo DB</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overall population</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TSH, mIU/L</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline mean (SD)</td>
<td>2.3 (1.8)</td>
<td>2.3 (1.9)</td>
<td>2.0 (1.1)</td>
<td>2.2 (1.1)</td>
</tr>
<tr>
<td>Week 52 LSM %CFB (SE)</td>
<td>0.2 (0.3)</td>
<td>-0.4 (0.2)</td>
<td>-0.4 (0.2)</td>
<td>-0.3 (0.2)</td>
</tr>
<tr>
<td>FT3, ng/L</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline mean (SD)</td>
<td>2.8 (0.5)</td>
<td>2.9 (0.4)</td>
<td>2.9 (0.5)</td>
<td>3.0 (0.4)</td>
</tr>
<tr>
<td>Week 52 LSM CFB (SE)</td>
<td>-0.2 (0.0)</td>
<td>-0.1 (0.0)</td>
<td>-0.0 (0.0)</td>
<td>-0.1 (0.0)</td>
</tr>
<tr>
<td>FT4, ng/dL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline mean (SD)</td>
<td>1.2 (0.2)</td>
<td>1.1 (0.2)</td>
<td>1.1 (0.2)</td>
<td>1.1 (0.2)</td>
</tr>
<tr>
<td>Week 52 LSM %CFB (SE)</td>
<td>-16.1 (1.8)*</td>
<td>-14.9 (1.5)*</td>
<td>-9.6 (1.4)*</td>
<td>1.2 (1.4)</td>
</tr>
<tr>
<td>RT3, ng/dL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline mean (SD)</td>
<td>18.1 (5.5)</td>
<td>16.3 (4.6)</td>
<td>17.8 (5.1)</td>
<td>16.8 (4.6)</td>
</tr>
<tr>
<td>Week 52 LSM CFB (SE)</td>
<td>-3.3 (0.4)*</td>
<td>-3.2 (0.3)*</td>
<td>-2.7 (0.3)*</td>
<td>0.7 (0.3)</td>
</tr>
<tr>
<td><strong>Thyroxine-treated population</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TSH, mIU/L</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline mean (SD)</td>
<td>2.4 (2.3)</td>
<td>3.0 (4.4)</td>
<td>1.6 (1.2)</td>
<td>2.2 (1.6)</td>
</tr>
<tr>
<td>Week 52 LSM %CFB (SE)</td>
<td>0.4 (1.2)</td>
<td>-0.6 (1.5)</td>
<td>-0.9 (1.5)</td>
<td>-0.8 (1.5)</td>
</tr>
<tr>
<td>FT3, ng/L</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline mean (SD)</td>
<td>2.7 (0.6)</td>
<td>2.6 (0.4)</td>
<td>2.9 (0.7)</td>
<td>2.7 (0.4)</td>
</tr>
<tr>
<td>Week 52 LSM CFB (SE)</td>
<td>-0.1 (0.1)</td>
<td>-0.0 (0.1)</td>
<td>0.0 (0.1)</td>
<td>-0.0 (0.1)</td>
</tr>
<tr>
<td>FT4, ng/dL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline mean (SD)</td>
<td>1.3 (0.2)</td>
<td>1.1 (0.2)</td>
<td>1.3 (0.3)</td>
<td>1.2 (0.2)</td>
</tr>
<tr>
<td>Week 52 LSM %CFB (SE)</td>
<td>-14.8 (3.0)*</td>
<td>-19.2 (3.8)*</td>
<td>-6.4 (3.9)*</td>
<td>3.8 (3.9)</td>
</tr>
<tr>
<td>RT3, ng/dL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline mean (SD)</td>
<td>20.1 (5.3)</td>
<td>18.1 (6.8)</td>
<td>19.6 (5.6)</td>
<td>18.6 (5.5)</td>
</tr>
<tr>
<td>Week 52 LSM CFB (SE)</td>
<td>-3.9 (0.8)*</td>
<td>-4.9 (1.0)*</td>
<td>-3.8 (1.0)*</td>
<td>0.6 (1.0)</td>
</tr>
<tr>
<td><strong>Euthyroid population</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TSH, mIU/L</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline mean (SD)</td>
<td>2.2 (1.3)</td>
<td>2.2 (1.3)</td>
<td>2.0 (1.1)</td>
<td>2.2 (1.0)</td>
</tr>
<tr>
<td>Week 52 LSM %CFB (SE)</td>
<td>-0.2 (0.1)</td>
<td>-0.3 (0.1)</td>
<td>-0.3 (0.1)</td>
<td>-0.3 (0.1)</td>
</tr>
<tr>
<td>FT3, ng/L</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline mean (SD)</td>
<td>3.0 (0.4)</td>
<td>3.0 (0.4)</td>
<td>2.9 (0.4)</td>
<td>3.0 (0.4)</td>
</tr>
<tr>
<td>Week 52 LSM CFB (SE)</td>
<td>-0.1 (0.1)</td>
<td>-0.1 (0.0)</td>
<td>-0.1 (0.0)</td>
<td>-0.1 (0.0)</td>
</tr>
<tr>
<td>FT4, ng/dL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline mean (SD)</td>
<td>1.1 (0.2)</td>
<td>1.1 (0.2)</td>
<td>1.1 (0.2)</td>
<td>1.1 (0.2)</td>
</tr>
<tr>
<td>Week 52 LSM %CFB (SE)</td>
<td>-18.9 (2.2)*</td>
<td>-14.3 (1.6)*</td>
<td>-9.9 (1.6)*</td>
<td>1.1 (1.6)</td>
</tr>
<tr>
<td>RT3, ng/dL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline mean (SD)</td>
<td>16.5 (5.1)</td>
<td>16.1 (4.2)</td>
<td>17.5 (4.9)</td>
<td>16.5 (4.4)</td>
</tr>
<tr>
<td>Week 52 LSM CFB (SE)</td>
<td>-3.5 (0.5)*</td>
<td>-2.9 (0.3)*</td>
<td>-2.5 (0.3)*</td>
<td>0.9 (0.3)</td>
</tr>
</tbody>
</table>

* p < 0.0001 vs placebo; † p < 0.001 vs placebo; ‡ p < 0.05 vs placebo.

Table: (abstract: FRI-476)

Results: At baseline, patients on thyroxine treatment had elevated RT3 levels relative to euthyroid patients (TABLE). At Week 52, no significant change from baseline was noted in TSH or FT3 levels in the overall population of any resmetirom group compared with placebo. In contrast, RT3 and FT4 levels were significantly reduced from baseline at Week 52 in the resmetirom groups when compared with placebo in the overall population (p < 0.0001 vs placebo). The RT3/FT3 ratio was also significantly improved in all resmetirom groups at Week 52 compared with placebo (p < 0.0001 vs placebo). Similar effects as reported for TSH, FT3, RT3, and FT4 in the overall population were observed with resmetirom treatment in the thyroid-tREATED and euthyroid populations.

Conclusion: Resmetirom treatment significantly reduced RT3 and FT4 levels from baseline relative to placebo treatment at Week 52 in the overall population as well as among the thyroid-tREATED and euthyroid populations of MAESTRO-NAFLD-1. These results are consistent with increased conversion of T4 to T3 and decreased conversion of T4 to RT3 in the resmetirom groups. Overall, these data indicate resmetirom treatment restores thyroid hormone signaling within the liver in patients with NAFLD/NASH.

FRI-505
CVI-301, a potent and selective thyroid hormone receptor beta full agonist, demonstrates profound total cholesterol and LDL-cholesterol reductions in a hyperlipidemic mouse efficacy model Jingwen Liu1,2, Zhenyu Wang1, Gang Liu3, 1CVI Pharmaceuticals Shanghai Limited, Shanghai, China; 2CVI Pharmaceuticals US, Inc, Mountain View, United States; 3Shanghai Haoyuan Chemexpress Co., Ltd., China
Email: jingwen.liu@cvishanghai.com

Background and aims: Non-alcoholic steatohepatitis (NASH) is a severe form of non-alcoholic fatty liver disease and a leading cause of liver-related mortality. While there are no FDA-approved treatments for NASH, selective thyroid hormone receptor beta (THR-β) agonism is emerging as a promising therapy for NASH. Selective THR-β agonist, Resmetirom (MGL-3196), has shown strong efficacy in improving hepatic lipid metabolism without THR-α mediated cardiac side effects in NASH patients. Applying a new screening method that combines computer-assisted THR-β docking modeling and LDL receptor promoter reporter assay with rational new chemical synthesis, we have discovered a series of novel compounds including CVI-301 that are able to activate hepatic THR-β in single-digit nmol concentrations. Here we investigated the potency and selectivity of...
CVI-301 in biochemical assays and assessed its in vivo efficacy in a hyperlipidemic mouse efficacy model.

**Method:** Potency and selectivity of CVI-301 in activation of THR-β were determined by cell based nuclear receptor protein-protein interaction assays using full-length human THR-β or THR-α with Triiodothyronine (T3) and MGL-3196 as reference compounds. Mice fed a diet containing high fat and high cholesterol for 4 weeks received vehicle (n = 9), MGL-3196 (5 mg/kg, n = 8) or CVI-301 (1 mg/kg, n = 8) for 14 days by intraperitoneal injection once a day. Serum total cholesterol (TC) and LDL-cholesterol (LDL-C) were measured at baseline and Day 15. Terminal liver and heart samples were collected for gene expression analysis by quantitative RT-PCR.

**Results:** CVI-301 activates THR-β with 100% T3 maximal activity at 4.5 nM EC50 and 20.1-fold β-selectivity, which is more potent and β-selective than MGL-3196 (THR-β EC50 = 4071 nM; β-selectivity = 3.2). In hyperlipidemic mice after two-week treatment, TC and LDL-C were significantly reduced to 56.9% and 49% of vehicle control (p < 0.0001), respectively by CVI-301 at 1 mg/kg dose, that were comparable to effects of 5 mg/kg MGL-3196 which lowered TC and LDL-C to 57.3% and 46% of vehicle control, respectively. Hepatic mRNA levels of THR-β direct target genes malic enzyme 1 (Me1) and deiodinase 1 (Dio1) were increased to 7.8-fold (p < 0.0001) and 3.3-fold (p < 0.0001) of vehicle control by CVI-301 treatment and to 5.1-fold (p < 0.05) and 2.7-fold (p < 0.0001) of vehicle control by MGL-3196 treatment. Furthermore, mRNA levels of THR-α regulated genes Myh6, Atp2a2 and Me1 in heart tissues remained unchanged in animals treated with CVI-301 or MGL-3196.

**Conclusion:** CVI-301 is a potent and highly selective THR-β full agonist in vitro and in vivo. These preclinical data warrant further investigation of CVI-301 as a potential treatment for NASH.

**FRI-506**

**Effects of a novel tetra-specific drug (OGB21502) in the obese mice model of liver disease**

Jihye Kim1, Nakho Chang1, Yunki Kim1, Jaehyun Lee1, Minsun Kim1, Junyeob Lee1, Jeonghwa Lee1, DaeSeong Im1, Sungjin Park1. 1Onegene biotechnology, Korea, Rep. of South Korea

**Background and aims:** Non-alcoholic steatohepatitis (NASH) is a complex disease resulting from chronic liver injury associated with obesity and type 2 diabetes. In this study, we hypothesized that simultaneous regulation of multiple mechanisms within the NASH microenvironment could provide a holistic cure for the disease.

**OGB21502** is a novel tetra-specific drug developed using the multi-specific UniStac® platform, which targets GLP-1 (glucagon-like peptide 1), GCG (glucagon), FGF21 (fibroblast growth factor 21), and IL-1RA (interleukin-1 receptor antagonist) receptors. The aim of this study is to evaluate the metabolic and histopathological effects of OGB21502 in the GAN (Gubra-Amylin NASH) diet-induced obese (DIO) mouse model.

**Method:** Male C57BL/6 mice were divided into two groups and subjected to a normal diet or a DIO diet, high in saturated fat (40%), fructose (22%), and cholesterol (2%) for 38 weeks. In the remaining 8 weeks, the mice were administered either OGB21502 or reference drugs (Fc-FGF21, obeticholic acid and semaglutide). The mice were sacrificed, followed by determination of blood ALT, cholesterol, and liver weight.

**Results:** In GAN-DIO mice, OGB21502 treatment resulted in reduction in liver weight, ALT and cholesterol levels compared to reference drugs. Histological analysis further demonstrated a significant improvement in hepatic inflammation and steatosis as indicated by reduced NAFLD activity score (NAS). Notably, OGB21502 led to a remarkable improvement in levels of fasting blood glucose, insulin, and HOMA-IR.

**Conclusion:** OGB21502 treatment improved glucose level, insulin resistance, liver damage, as well as cholesterol accumulation in the GAN-DIO mice. OGB21502 treatment might also be effective in controlling glucose metabolism by targeting liver, compared to reference therapeutics. The results suggest that OGB21502 may be a promising multi-specific therapeutic option for the treatment of NASH.

**FRI-507**

**Treatment monitoring with the Agile 3+ score in patients with non-alcoholic steatohepatitis: analysis of data from a randomised placebo-controlled trial of semaglutide**

Laurent Castéra1, Céline Fournier-Poizat2, Julie Foucquier2, Mette Kjaer3, Niels Krarup3, Véronique Miette2, Sune Boris Nygård3, Ahsan Shoeb Patel1, Laurent Sandrin2, Jörn Schattenberg3. 1Department of Hepatology, Beaujon Hospital, Université Paris Cité, Clichy, France; 2Echosens, Paris, France; 3Novo Nordisk, Søborg, Denmark

**Background and aims:** There is an unmet need to evaluate non-invasive biomarkers for monitoring and predicting change in fibrosis...
in patients with non-alcoholic steatohepatitis (NASH) who are receiving treatment. Several biomarkers have been validated for grading and staging in NASH, including the Agile 3+ score, which can identify advanced fibrosis in non-alcoholic fatty liver disease. Agile 3+ was applied to patients enrolled in a clinical trial of semaglutide to investigate the score’s ability to monitor treatment effect and to predict change in fibrosis stage.

**Method:** Data were from a phase 2b study in which patients with NASH and fibrosis stage 1–3 were randomised to 72 weeks' treatment with subcutaneous semaglutide 0.1, 0.2 or 0.4 mg, or placebo, once daily (NCT02970942). For this analysis, Agile 3+ scores were calculated at baseline and weeks 28, 52 and 72 using liver stiffness measurements (LSM) from vibration-controlled transient elastography (VCTE) (where available), alanine- and aspartate aminotransferase levels, platelet count, age, sex and diabetes status. A mixed model for repeated measures was used to assess treatment effect on Agile 3+ (missing values were not imputed) during the on-treatment period. Change from baseline in Agile 3+ at weeks 28, 52 and 72 and its association with histological fibrosis improvement at week 72 in the 0.4 mg semaglutide and placebo arms was examined using logistic regression with an interaction effect between relative change in Agile 3+ and treatment. Odds ratios (OR) for improvement in fibrosis of ≥1 stage at week 72 associated with a 0.5-fold change in Agile 3+ at each time point were calculated.

**Results:** The numbers of patients with Agile 3+ data at baseline and weeks 28, 52 and 208, 210, 209 and 203, respectively. Mean baseline Agile 3+ (standard deviation) was 0.50 (0.28), 0.61 (0.27) and 0.55 (0.30) for semaglutide 0.1, 0.2 and 0.4 mg, respectively, and 0.46 (0.30) for placebo. Agile 3+ was significantly reduced with semaglutide 0.4 mg vs placebo at weeks 28 (estimated treatment ratio 0.64 [95% confidence interval (CI) 0.48; 0.87]; p = 0.004), 52 (0.63 [0.48; 0.83]; p = 0.001) and 72 (0.59 [0.41; 0.85]; p = 0.005) (Figure). In the placebo group, associations between a decrease in Agile 3+ at weeks 28 and 52 and improvement in fibrosis at week 72 were significant (OR [95% CI] 4.10 [1.50; 11.19]; p = 0.006 and 3.71 [1.28; 10.75]; p = 0.016, respectively). A similar trend was seen in the semaglutide 0.4 mg group, but this did not reach significance. For changes in Agile 3+ at week 72, the trend did not reach significance for either the placebo or semaglutide groups. Although this analysis is limited by the number of study participants, the results indicate that changes in Agile 3+ as early as week 28 may be predictive of histological changes at week 72.

**FRI-508**

**Impact of oral semaglutide on liver pathology and glucose metabolism in patients with non-alcoholic fatty liver disease complicated by type 2 diabetes mellitus**

Tadamichi Kawano1, Masanori Atsukawa1, Tomomi Okubo1, Taerang Ariai1, Norio Tokawara1, Akihito Tsubota2, Tsunekazu Oikawa3, Toru Ishikawa4, Toshifumi Tada5, Hiroshi Abe6, Keizo Kato6, Joji Tani7, Asahiro Morishita7, Kentaro Matsuura8, Katsuhiro Iwakiri1. 1Nippon Medical School, Division of Gastroenterology and Hepatology, Tokyo, Japan; 2The Jikei University School of Medicine, Core Research Facilities for Basic Science, Tokyo, Japan; 3The Jikei University of Medicine, Division of Gastroenterology and Hepatology, Tokyo, Japan; 4Saiseikai Niigata Hospital, Department of Hepatology, Niigata, Japan; 5Japanese Red Cross Society Himeji Hospital, Department of Gastroenterology, Himeji, Japan; 6Shinmatsu Central General Hospital, Division of Gastroenterology and Hepatology, Chiba, Japan; 7Kagawa University, Department of Gastroenterology, Kagawa, Japan; 8Nagoya City University Graduate School of Medical Sciences, 8.Department of Gastroenterology and Metabolism, Nagoya, Japan

Email: k-tadamichi@nms.ac.jp

**Background and aims:** This study aimed to clarify the efficacy and safety of oral semaglutide in patients with non-alcoholic fatty liver disease (NAFLD) complicated by type 2 diabetes mellitus (T2DM).

**Method:** Eighty-seven patients with NAFLD who received oral semaglutide for T2DM were included in the analysis. Oral semaglutide was initiated at a dose of 3 mg once daily, and the dose was sequentially increased to 7 mg at 4 weeks and 14 mg at 8 weeks, all the while monitoring for any adverse events. Of the 87 patients, 51 could be verified at 24 weeks of treatment.

**Results:** Significant decreases in body weight, BMI, liver-related biochemistry (AST, ALT, and γ-GTP), plasma glucose, and HbA1c were found at 12 weeks, compared to the baseline values. These significant reductions were maintained at 24 weeks. As for changes in fasting lipids, LDL-cholesterol (112 mg/dL to 102 mg/dL, p < 0.01) and triglyceride (156 mg/dL to 119 mg/dL, p < 0.01) levels significantly decreased at 24 weeks. The median CAP values significantly decreased from 322 dB/m at baseline to 300 dB/m at week 24 (p < 0.05). Changes in body weight were correlated with those in CAP (r = 0.57, p < 0.01). In terms of changes in liver fibrosis markers, the platelet counts significantly increased from baseline to 24 weeks (232 × 103/μL to 242 × 103/μL, p < 0.01), while the FIB-4 index (1.22 to 1.00, p < 0.001) and type IV; collagen 7 s (4.1 ng/ml to 3.5 ng/ml, p < 0.001) significantly decreased. LSM values showed no significant changes from baseline to 24 weeks of the treatment. The 23 patients who switched from DPP-4 inhibitors also showed favorable effects in weight reduction, glycemic control, and liver transaminases. No grade 3 or higher adverse events were observed during the observation period. Grade 1–2 adverse events were mostly gastro-intestinal disorders including nausea. Two patients were discontinued due to semaglutide-related adverse events, both due to nausea.

**Conclusion:** In patients with NAFLD complicated by T2DM, oral semaglutide may improve hepatic steatosis/inflammation and serum lipid metabolism as well as improve glucose metabolism and decrease body weight.
FRI-509
Lessons for the setting of an international integrated research platform to conduct adaptive trials in non-alcoholic steatohepatitis: results of the EU-PEARL project
Juan M Pericàs1,2,3,4, Elena de Sena5, Frank Tacke3, Quentin Anstee6, Nicholas Di Prospero7, Mette Kjaer7, Peter Mesenbrink8, Franz Koenig9, Joan Geneschi1,2,4, Vlad Ratziu1, Sergio Muñoz Martínez1, Víctor de la Guardia2,3,4,5,6,7,8,9,10,11, Pitié-Salpêtrière Hospital, Internal Medicine Department, Paris, France; 2Charité-Universitätsmedizin Berlin, Department of Hepatology and Gastroenterology, Berlin, Germany; 3Centro de Investigación Biomédica en Enfermedades Hepáticas y Digestivas (CIBERehd), Spain; 4Charité-Universitätsmedizin Berlin, Department of Hepatology and Gastroenterology, Berlin, Germany; 5Translational and Clinical Research Institute, Faculty of Medical Sciences, Newcastle University, Newcastle Upon Tyne, United Kingdom; 6Janssen Research and Development, Institute, Faculty of Medical Sciences, Newcastle University, Newcastle Upon Tyne, United Kingdom; 7Janssen Research and Development, Institute, Faculty of Medical Sciences, Newcastle University, Newcastle Upon Tyne, United Kingdom; 8Medical University of Vienna, Vienna, Austria; 9Pitié-Salpêtrière Hospital, Department of Hepatology, Paris, France; 10Medical University of Vienna, Vienna, Austria; 11Pitié-Salpêtrière Hospital, Department of Hepatology, Paris, France.

Background and aims: Traditional designs, methodological and operational features of clinical trials in non-alcoholic steatohepatitis (NASH) have several shortcomings and no drugs have been approved for almost two decades. The EU Patient-Centric clinical trial pLatforms (EU-PEARL) project (IMI2-853966) aims at developing the necessary tools to deploy integrated research platforms (IRP) to conduct adaptive-design trials in various diseases, including NASH. IRP consist of trial master protocols (MP) and supporting research resources (e.g., clinical and data networks, labs, governance, and legal and regulatory aspects) that represent a unique opportunity to accelerate drug development while lowering overall costs and creating a more patient-centric environment. Here, we describe the lessons from EU-PEARL regarding how the current NASH pipeline, stakeholders, operational and funding barriers and opportunities are at play in the setting of a European-based or global NASH platform trial in the years to come.

Method: Through interactions with regulatory agencies, academics, experts on methodology, patients and their representatives, and patients’- and industry-led biotechs, we have designed a NASH Phase Ib/II/III MP for non-cirrhotic patients. Amongst other elements, simulations were conducted to assess whether a Bayesian approach is suitable and cost-efficient for a NASH IRP rather than a more traditional frequentist approach. We held meetings with the US Food and Drug administration (FDA) and European Medicines Agency (EMA), and two external advisory boards with key opinion leaders (KOLs) in the field of NASH from both academia and industry. The specific features of participating sites and clinical research organizations and labs was discussed and agreed upon. Moreover, a reach-out survey was conducted to ask NASH investigators about their knowledge on MP and their interest in joining a future NASH IRP.

Results: Building and operationalizing an IRP comes with different challenges and possibilities (Pericàs et al, J Hepatol 2022). Consulted KOLs in the NASH field as well as patients and regulators agree that MP are a promising tool to enhance drug development in a more patient-centric manner. Simulations suggested that for a Bayesian approach to prove superior to a frequentist approach the scope of the IRP would need a global clinical network and moderate-high recruiting rates (Laurin-Meyer et al, PLoS One 2023). However, due to the current situation of the NASH pipeline, it is unlikely that the first platform trial in NASH is funded by the industry in the short term, whereas an international IRP has largely demanding requirements in terms of operationalization and costs. The most likely sponsor institution for the NASH IRP is a large academic hospital, with potential support from non-profit organizations. Compared to other therapeutic areas, the involvement of the patient community in the design of clinical trials in NASH is low in Europe.

Conclusion: “Proof-of-platform” for NASH should be provided before escalating the scope of the IRP and therefore the most likely scenario is the set-up of a few countries platform first, mostly based on non-invasive end points, and public or mixed funding in order to validate the operational, statistical and regulatory tools developed within EU-PEARL before fully deploying a global NASH IRP.

FRI-510
The influence of probiotics on biologic and imagistic alterations in non-alcoholic steato-hepatitis
Elena Laura Iliescu1, Adriana Mercan-Stanciu1, Letitia Toma1,2, Mircea Istrate1,2, Razvan Rababoc1,2, Radu Dumitru1, Cristian Mugur Grasu2, Fundeni Clinical Institute, Internal Medicine, Bucharest, Romania; 2“Carol Davila” University of Medicine and Pharmacy, Bucharest, Romania.

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is one of the most common causes of chronic liver disease, with rising prevalence. By perpetuating a systemic inflammation, NAFLD is an independent cardiovascular risk factor. Furthermore, modulation of gut microbiota appears to have systemic anti-inflammatory effects than can prove beneficial in NAFLD. This study aims to determine the impact of a combination of probiotics (Bifidobacterium longum BB536®) fructooligosaccharides (Actilight®) and B complex vitamins on steato-hepatitis (SH), gut inflammation and liver steatosis.

Method: We performed a prospective trial which included 148 consecutive patients with newly diagnosed SH, evaluated in our clinic between January 2021– September 2022. Patients with other causes of liver disease, uncontrolled diabetes or active infection were excluded. All patients received study medication as per the producer’s recommendations (1 dose daily) for three months and were advised accordingly for lifestyle changes. Patients were monitored before and after therapy by serum alanine aminotransferase (ALT), aspartate aminotransferase (AST), gamma- glutamyl transpeptidase (GGT), fecal calprotectin, Fibroscan (for fibrosis) and controlled attenuation parameter (CAP) (for steatosis). In diabetic patients we also evaluated basal glycemia and glycosylated hemoglobin levels (HbA1c).

Results: The study included 95 non-diabetic and 53 diabetic patients. The mean age in the study group was 45.36 ± 14.28 years, with 58.1% female. Before treatment patients presented high levels of ALT and AST, with normal or mildly increased GGT. 28 patients (18.9%) had normal values of serum calprotectin. After therapy, we noticed a significant decrease in ALT, AST, fecal calprotectin levels, mean liver stiffness and CAP values (Table 1). In diabetic patients, we noticed a decrease in glycemia (92.5 mg/dl versus 113 mg/dl, p = 0.03) and in HbA1c (5.7% versus 6.2%, p = 0.09). Regression of liver fibrosis was observed by the changes in distribution: F1: 28 versus 45 patients, F2: 71 versus 95 patients, F3: 49 versus 8 patients. For steatosis the distribution changes were: S1: 31 versus 67 patients, S2: 86 versus 81 patients. S3: 31 patients versus none.

Figure: Table Evolution of biologic and imagistic parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Before therapy</th>
<th>After therapy</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALT (U/L)</td>
<td>75.24 ± 24.13</td>
<td>36.29 ± 10.24</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>AST (U/L)</td>
<td>62.57 ± 31.72</td>
<td>29.13 ± 15.81</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>GGT (UL)</td>
<td>46.23 ± 19.18</td>
<td>38.12 ± 11.08</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Fecal calprotectin (µg/mg)</td>
<td>129.35 ± 83.61</td>
<td>58.91 ± 24.17</td>
<td>&lt;0.02</td>
</tr>
<tr>
<td>Liver stiffness (KPa)</td>
<td>7.33 ± 3.46</td>
<td>6.18 ± 1.15</td>
<td>&lt;0.03</td>
</tr>
<tr>
<td>CAP (dB/m)</td>
<td>290.64 ± 40.82</td>
<td>244.93 ± 18.85</td>
<td>&lt;0.02</td>
</tr>
</tbody>
</table>

Conclusion: Probiotic formulas may contribute to a decrease in liver inflammation, steatosis and fibrosis associated with NAFLD, by their modulating the inflammatory response triggered by gut dysbiosis. Considering the low risks associated with these therapies, we consider them useful future tools in the treatment of NAFLD.
Background and aims: Patients with non-alcoholic fatty liver disease (NAFLD) are often complicated by dyslipidemia. In some patients, dyslipidemia is known to lead to the development of liver fibrosis. Pemafibrate, a novel selective peroxisome proliferator-activated receptor modulator (SPPARMα) is an agent approved in Japan for the treatment of hypertriglyceridemia. Previous clinical studies have shown that pemafibrate not only reduced TG level but also improved serum liver enzymes among patients with dyslipidemia. The aim of this study is to evaluate the long-term effect of pemafibrate in patients with NAFLD complicated by dyslipidemia in real world setting.

Method: Ninety-one NAFLD patients with dyslipidemia were treated with pemafibrate; lipid metabolism and liver-related factors were analyzed during 48 weeks.

Results: Significant decreases in triglyceride (198 mg/dL to 121 mg/dL, p < 0.001), total cholesterol (223 mg/dL to 205 mg/dL, p < 0.001), and a significant increase in HDL cholesterol (47 mg/dL to 50 mg/dL, p < 0.001) were found at 12 weeks, compared with the baseline values without body weight loss. These significant changes were maintained throughout 48 weeks, and LDL cholesterol (137 mg/dL to 131 mg/dL, p < 0.05) was significantly decreased at 48 weeks, compared with the baseline. Liver-related factors such as AST (36 U/L to 33 U/L, at week 48, p < 0.01), ALT (52 U/L to 34 U/L, p < 0.001), γ-GTP (56 U/L to 32 U/L, p < 0.001), and ALP (118 U/L to 59 U/L, p < 0.001) also showed significant reductions from baseline throughout the 48 weeks. A significant reduction of HOMA-IR was observed (3.6 U/L to 3.39 U/L at week 48, p < 0.05) in the insulin-resistant group (HOMA-IR > 2.5). As for changes in liver fat and fibrosis, CAP values did not change significantly throughout 48 weeks (p = 0.42), and the median levels of the WFA+M2B2 type IV collagen 7 s, and NIS significantly decreased from 0.94 C.O.I. 4.3 mg/mL, and −1.183 at baseline to 0.65 C.O.I. 3.8 mg/mL, and −1.655 at week 48, respectively. Focusing on changes in platelets and albumin, both significantly increase from baseline to week 48, and notably platelets and albumin showed marked increase in patients with low platelets (<192 × 10³/μL at baseline) (165 × 10³/μL to 193 × 10³/μL, p < 0.001) and low albumin levels (≥4.0 g/dL at baseline) (3.9 g/dL to 4.2 g/dL, p < 0.01). In all 38 patients for whom LSM could be measured, LSM did not show significant decreases. LSM significantly decreased in high-risk groups for liver fibrosis including 20 patients with low platelets (<192 × 10³/μL; 8.8 kPa at week 48, p < 0.05).

Conclusion: Pemafibrate therapy for 48 weeks may improve not only lipid metabolism but also hepatic inflammation and fibrosis without body weight loss. Improvement of insulin resistance by pemafibrate may contribute to improvement of liver-related factors.

References
3. Harrison S. The Liver Meeting (AASLD 2022).

Background and aims: Liver biopsy remains the regulatory standard for diagnosis and monitoring of NASH. Treatment with EFX for 16 weeks (Phase 2a, BALANCED)1,2 or 24 weeks (Phase 2b, HARMONY)3 was associated with rapid improvements in liver histology including regression of fibrosis and resolution of NASH. The rapid improvements in the Ph 2a study prompted a post-hoc qualitative evaluation of histopathology which revealed evidence of regression of Dibronic structures and extent of collagen deposition across not only subjects who had a categorical improvement of ≥1 stage but also those who had not4. The aim of this analysis was to further characterize these changes in biopsies from the Ph 2b study by qualitative and alternative quantitative analyses.

Method: HARMONY is an ongoing, randomized, placebo-controlled trial evaluating EFX 28 and 50 mg once weekly for 96 weeks, with a completed primary end point evaluation at 24 weeks.5 Evaluation of histologic end points in the primary efficacy analysis was based on the NASH CRN scoring system, with all biopsies reviewed by consensus between two pathologists blinded to treatment and sampling sequence, without being paired. Additional post hoc evaluations are ongoing to assess effects of EFX on histopathology based on the steatosis-activity-fibrosis (SAF) score and other metrics.

Results: Of 128 patients randomized in HARMONY, 113 had baseline and Week 24 biopsies. Histologic end points, based on NASH CRN to quantitate primary efficacy, and a post hoc analyses based on the SAF score are provided in the Table below. Additional exploratory histological analyses are ongoing.

Conclusion: EFX treatment for only 24 weeks improved liver histopathology, with reversal of fibrosis and reductions in steatosis, ballooning, and inflammation as assessed by multiple measures in addition to the regulatory end point definitions. EFX 50 mg demonstrated striking rates of ballooning resolution, associated with improved NAS, SAF-Activity and total SAF scores. Resolution of histopathology was mirrored by normalization of non-invasive biomarkers of NASH disease activity (ALT, AST) and fibrogenesis (Pro-C3) in the majority (≥60%) of treated patients.6 Evaluation of qualitative patterns of regression of NASH and fibrosis with EFX may be useful in understanding the breadth of response across the NASH population and assessing the potential for further improvements with longer-term treatment.

References
3. Harrison S. The Liver Meeting (AASLD 2022).

FRI-513 Fat versus lean tissue loss in short term versus long term weight loss: a dynamic effect with implications for NASH trials

Lars Johansson1, Magnus Sundbom2, Edvin Johansson3, Joel Kullberg2, Antares Medical, Molndal, Sweden; Uppsala University Hospital, Department of Surgery, Uppsala, Sweden

Email: lars.johansson@antarosmedical.com

Background and aims: Weight loss via diet interventions, bariatric surgery and pharmacological interventions have been shown to improve non-alcoholic fatty liver disease (NAFLD) and non-alcoholic steatohepatitis (NASH). It has been reported in several clinical trials that substantial loss of lean tissue may occur secondary to weight loss. Early phase clinical trials of novel treatments based on weight loss for NASH are usually short term 8–16 weeks with a single point readout of adipose tissue and lean tissue volumes based on DEXA or MRI. Little is however known about the short-term effects of weight loss versus long term effects on the change in fat mass versus lean tissue mass. The purpose of this study was therefore to investigate the
dynamic effects on adipose and lean tissue loss during substantial weight loss.

**Method:** 7 obese subjects with a BMI of 43.7 kg/m² (range 38–48) undergoing Roux-and-Y bariatric surgery were investigated with whole body MRI assessing adipose tissue depots at baseline and 1-, 6- and 12-months post-surgery. Total Adipose Tissue (TAT) mass was investigated. The relative contribution of different tissue compartments to the total weight loss calculated at each timepoint with the assumption that 1 L of adipose tissue have a weight of 0.9 kg.

**Results:** The total weight and TAT weight, and the relative contributions to the total weight loss are shown in the figure. Non-adipose tissue loss constitutes 37% of the total body weight loss at 1 month while only 20.5% after 12 months. This could possibly be attributed to more excessive amount of water being lost in early weight loss while the negative energy balance over time will turn into loss of excessive adipose tissue. This finding has implications for investigations of body composition changes in short term NASH trials where weight loss is induced. Hence, one should be cautious when drawing conclusions on induction of sarcopenia from short-term weight loss data.

**FRI-514**

**Efficacy of digital health-supported lifestyle modification on patients with non-alcoholic fatty liver disease: a systematic review and meta-analysis**

Joo Hyun Oh1, Yewaon Park2, Myungji Goh3, Sang Bong Ahn1, Wonseok Kang5, Dong Hyun Sinn2, Geum-Yon Gwak5, Yong-Han Paik3, Joon Hyeok Lee3, Moon Seok Choi3, Seung Woon Paik5. 1Eulji Medical Center, Korea, Rep. of South; 2Kyung Hee University Hospital, Korea, Rep. of South; 3Samsung Medical Center, Korea, Rep. of South

Email: drms.choi@samsung.com

**Background and aims:** The current recommendation for patients with non-alcoholic fatty liver disease (NAFLD) is to achieve and
maintain weight reduction via counseling and calorie restriction. However, adherence to lifestyle modification is insufficient due to financial and time constraints. We investigated whether digital health-supported lifestyle change help patients with NAFLD lose weight and reduce hepatic inflammation.

**Method:** Relevant studies were selected from MEDLINE, EMBASE, and Cochrane Central Register of Controlled Trials until September 28th, 2022. The search terms included NAFLD, digital health, and telemedicine. The primary outcome is change in body weight and secondary outcome is change in alanine aminotransferase (ALT) and aspartate aminotransferase (AST). Random effect method was performed for pooling the data.

**Results:** Seven studies (six randomized controlled trials and one prospective study) comprising 1,245 patients with NAFLD were analyzed. The mean reduction in body weight was greater for patients whose lifestyle modification were supported by digital health (weighted mean difference (WMD): −2.79 kg, 95% confidence interval (CI) −3.84, −1.74). Digital health-supported lifestyle modification was associated with greater reductions in ALT and AST compared to conventional treatment (WMD: −12.85, 95% CI −22.82, −2.88 and WMD: −8.57, 95% CI −12.23, −4.92, respectively). Lifestyle change assisted by digital health substantially reduced triglycerides levels (WMD: −12.30, 95% CI −19.96, −4.64) but had no significant effect on insulin resistance assessed by homeostatic model assessment for insulin resistance (WMD: −3.88, 95% CI −9.55, 1.79).

**Conclusion:** Digital health-supported lifestyle modification is effective in body weight, ALT, AST, and triglycerides reduction, indicating that NAFLD patients may benefit from digital health technology.

**FRI-515**

**A novel prescription digital therapeutic for the treatment of non-alcohol related fatty liver disease: feasibility study**

Naim Alkhouri1, Katherine Edwards 2, Mark Berman 2, Erin Rudolf 2, Heather Finn 2, Heidi Dusky 2, Nicole Guthrie 2, Rafael Escandon 3, Angie Coste 1, Jesus Topete 1, Mazen Noureddin 4, 1Arizona Liver Health, Chandler, United States; 2Better Therapeutics, San Francisco, United States; 3DGBI Consulting, LLC, Bainbridge Island, United States; 4Houston Liver Institute, Houston Research Institute, Houston Methodist Hospital, Houston, United States

**Email:** kate@bettertx.com

**Background and aims:** Non-alcoholic fatty liver disease (NAFLD) is a global public health crisis growing in parallel with the obesity and diabetes pandemics. Behavioral modification including weight loss, improving dietary quality, and increasing physical activity have been proven to have favorable effects on slowing or reversing the progression of liver steatosis and fibrosis; however, behavior change is difficult to facilitate in clinical practice and health systems are poorly equipped to scale behavioral interventions needed to address the enormous population with NAFLD. The aim of this feasibility study was to explore the safety, efficacy, and usability of a novel prescription digital therapeutic (PDT) platform, in individuals with NAFLD or non-alcoholic steatohepatitis (NASH).

**Method:** This single arm study was conducted at two affiliated specialty hepatology clinics. The PDT was created by Better Therapeutics using a novel form of cognitive behavioral therapy (CBT) intended to treat cardiometabolic disease. Participants accessed the PDT on their smartphone for up to 90 days. The intervention was delivered without requiring additional participation from clinic providers. Laboratory assessments, FibroScan and magnetic resonance imaging proton density fat fraction (MRI-PDFF) imaging were conducted at baseline and post-intervention. Percent change in steatosis was measured by MRI-PDFF in participants with elevated baseline liver fat (PDF ≥ 10%).

**Results:** The study enrolled 22 participants. At baseline, the mean age was 48 years, 77% were female, 50% Hispanic, and 46% had type 2 diabetes. The mean baseline fat fraction on MRI-PDFF was 19%. After 90 days of exposure to the PDT, the mean relative reduction in MRI-PDFF was −16% (p = 0.011) in the primary ITT population. ALT was reduced by an average of −17 IL/U (p = 0.002) (Fig). FibroScan Controlled Attenuation Parameter (CAP) Score was reduced (−19 dB/m, p = 0.021) and was accompanied by an average relative reduction of −20% in the FAST score (p = 0.011). Participants achieved an average weight loss of −3% (p = 0.008) of total body weight, following a pattern of gradual and consistent weight loss without any signs of a plateau or peak. No serious adverse events nor any device related adverse events were reported. Participants reported an improvement in their health-related quality of life (assessed via CDC HRQOL-4) with an average improvement of 2.2 Healthy Days per month added (p = 0.500) and a high degree of satisfaction with the treatment (mean Net Promoter Score of +75).

**Conclusion:** Clinically meaningful improvements in liver health were observed in multiple end points after 90 days of digitally-delivered CBT without any adverse device effects. Weight data suggests that further liver health improvements may be possible with further PDT use beyond 90 days. The totality of safety, efficacy and usability data...
collected strengthen the hypothesis that a PDT could be an important and scalable clinical tool for the treatment of NAFLD and NASH.

**FRI-516**

**Incidence and median times to onset and resolution of pruritus adverse events in a phase 3 study of obeticholic acid in patients with non-alcoholic steatohepatitis**

Zobair Younossi1, Leighland Feinman2, Amarita Randhawa2, Rina Leyva2, Maria Stepanova2, Sangeeta Sawhney2. 1Beatty Liver and Obesity Research Program, Center for Liver Diseases, Inova Medicine, Falls Church, United States; 2 Intercept Pharmaceuticals Inc, Morristown, United States; 3 Center for Outcomes Research in Liver Diseases, Washington DC, United States

Background and aims: Non-alcoholic steatohepatitis (NASH) is associated with pruritus in real-world practice. In the REGENERATE study (NCT02548351) of obeticholic acid (OCA) for pre-cirrhotic liver fibrosis due to NASH, pruritus was the most common treatment-emergent adverse event, and its frequency was dose dependent. We report the incidence, times to onset and resolution, and management of pruritus adverse events (AEs) in an expanded safety population.

Method: Pruritus symptoms were monitored every 3 to 6 months. Pruritus was managed with drug holiday, reduced dosing frequency, discontinuation, or use of antipruritic therapies. The incidence of pruritus AEs was determined using Medical Dictionary for Regulatory Activities queries in the safety population of the REGENERATE study, which included all randomized pts who received at least 1 dose of placebo, OCA 10 mg, or OCA 25 mg.

Results: In this population (N = 2477), 976 pts were exposed >4 years (median 39 months) to study drug. Pruritus was the most common AE and the most common reason for study drug discontinuation; about half of discontinuations due to pruritus were mandated. Pruritus AEs were dose dependent and predominantly mild/moderate (Table). Most pruritus AEs did not require any intervention regardless of treatment arm. Drug holiday was the most frequent management, with most pts having a single interruption. Antihistamines were the most common concomitant therapy for pruritus AEs was dose dependent and predominantly mild/grade 1 or 2 pruritus, followed by bile acid sequestrants and corticosteroids. In the placebo, OCA 10 mg, and OCA 25 mg arms, median time to onset of the first pruritus event was 191, 100, and 44 days, respectively. The impact of treatment-emergent pruritus on patient-reported outcomes is being analyzed.

Table: Pruritus AEs in patients with pre-cirrhotic liver fibrosis due to non-alcoholic steatohepatitis in the REGENERATE study

<table>
<thead>
<tr>
<th></th>
<th>Placebo (n = 825)</th>
<th>OCA 10 mg (n = 825)</th>
<th>OCA 25 mg (n = 827)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients with</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>treatment-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>emergent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pruritus, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td>221 (26.8)</td>
<td>289 (35.0)</td>
<td>476 (57.6)</td>
</tr>
<tr>
<td>Moderate</td>
<td>161 (19.5)</td>
<td>180 (21.8)</td>
<td>181 (21.9)</td>
</tr>
<tr>
<td>Severe</td>
<td>57 (6.9)</td>
<td>99 (12.0)</td>
<td>238 (28.8)</td>
</tr>
<tr>
<td>Not related to</td>
<td>3 (0.4)</td>
<td>10 (1.2)</td>
<td>57 (6.9)</td>
</tr>
<tr>
<td>study drug, n (%)</td>
<td>56 (6.8)</td>
<td>58 (7.0)</td>
<td>39 (4.7)</td>
</tr>
<tr>
<td>Study drug</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>management for</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pruritus (all</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>grades) per</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>protocol, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No dose</td>
<td>204 (24.7)</td>
<td>257 (31.2)</td>
<td>366 (44.3)</td>
</tr>
<tr>
<td>Interruption</td>
<td>17 (2.1)</td>
<td>34 (4.1)</td>
<td>133 (16.1)</td>
</tr>
<tr>
<td>Withdrawal</td>
<td>8 (1.0)</td>
<td>14 (1.7)</td>
<td>100 (12.1)</td>
</tr>
<tr>
<td>Time to event for</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>first pruritus AE</td>
<td>191 (69, 478)</td>
<td>100 (23, 372)</td>
<td>44 (15, 158.5)</td>
</tr>
<tr>
<td>Time to onset</td>
<td>53 (17, 174)</td>
<td>60 (23, 154)</td>
<td>50 (19, 148)</td>
</tr>
<tr>
<td>Time to resolution</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Conclusion:** The first pruritus AE associated with OCA generally occurred within the first 3 months of therapy, was mild/moderate, and was manageable with a single drug holiday or addition of antipruritic therapy.

**FRI-517**

**Correlation between severity of hepatic steatosis and markers of cardiometabolic health, and effect of lanifibranor therapy in patients with non-cirrhotic NASH**

Michael Cooreman1, Sven Francque2, Philippe Huot-Marchand1, Lucile Dzen3, Martine Baudin1, Jean-Louis Junien1, Pierre Broqua1, Manal Abdelmalek1. 1 Inventiva Pharma, Research and Development, Dax, France; 2 University Hospital Antwerp, Belgium; 3 Mayo Clinic, United States

Email: michaelpcooreman@msn.com

Background and aims: Lanifibranor has shown efficacy on 'historical' NASH resolution and improvement of fibrosis and on markers of cardiometabolic health (CMH) in the NATIVE phase 2b study. Hepatic steatosis is a known cardiovascular risk factor and the NAFLD-associated atherogenic lipid profile is considered a pathophysiological link. We therefore evaluated the correlation between steatosis and CMH markers at baseline (BL) and between steatosis reduction with lanifibranor and improvement of CMH markers.

Method: NATIVE evaluated lanifibranor 800 and 1200 mg/d versus placebo in 247 patients with non-cirrhotic NASH for a treatment duration of 24 weeks. Markers of CMH [adiponectin (ADP), insulin resistance (HOMA-IR), Hba1c, fasting triglycerides, HDL-c, apolipoproteins, blood pressure (BP)], liver tests and steatosis by histological NASH-CRN/SAF grading and Continuous Attenuation Parameter™ (CAP™ on Fibroscan®) were evaluated at BL and at end of treatment (EOT). Correlations between BL steatosis (histological and CAP™) and CMH markers were assessed for all randomized patients; correlations between changes at EOT were assessed in the pooled lanifibranor arms. BL CAP™ was considered quantitatively and categorized (≤302 and >302 dB.m⁻¹); changes in CAP™ at EOT were expressed as continuous variables or categorical (relative change <10%, 10–20%, >20%).

Results: BL CAP™ values correlate with BL HOMA-IR (Spearman p = 0.008), Hba1c, triglycerides, and inversely with HDL-c and Apo-A1; mean triglycerides were 1.72 and 2.04 mmol/L, and mean HDL-c values were 1.30 and 1.18 mmol/L, for CAP™ ≤302 and >302 dB.m⁻¹, resp (p = 0.012 and 0.007, resp); BL CAP™ values also correlated with diastolic BP and ALT and AST. At EOT, improvement of HOMA-IR was seen independent of the degree of steatosis reduction; Hba1c lowering was correlated with improvement of the histological grade (p < 0.001) and with change in CAP™ (Spearman p = 0.05); triglyceride decreases correlated with changes in CAP™: −30, −13 and −2% from BL for −10%, −10–20%, and >10% relative CAP™ change, resp.; HDL-c increase correlated with histological steatosis improvement (p = 0.006). BL ADP did not differ with severity of steatosis (grading and CAP™), but steatosis improvement was correlated with pronounced increases in ADP at EOT: fold-increase ADP from BL was 3.1, 3.9, 5.3 and 6.0 for no change, 1, 2 and 3 points reduction of steatosis grade, resp (p < 0.001), and correlated similarly with continuous CAP™ value changes (Spearman p = 0.002).

Conclusion: Markers of cardiometabolic health are related with the severity of hepatic steatosis in patients with NASH. Improvement of steatosis with Lanifibranor therapy is significantly correlated with a robust ADP response and with an improvement of lipid and glycemic profile, supporting the concept that steatosis improvement with lanifibranor could translate in improved long-term cardiovascular outcomes.
FRI-518
Hepatic fat and liver volume reductions-impact on non-alcoholic steatohepatitis trials and potential solutions using concomitant fibrosis with ballooning with fibrosis
Jörn Schattenberg1, Yayun Ren2, Dean Tai2, Elaine Chng2, Stephen Harrison1, 3Metabolic Liver Research Center, Department of Medicine, Mainz, Germany; 2HistoIndex Pte Ltd, Singapore; 3Pinnacle Research, San Antonio, United States
Email: elaine.chng@histoindex.com

Background and aims: Experimental treatment of non-alcoholic steatohepatitis (NASH) leads to reduction of hepatic fat and liver volume (LV) as assessed by Magnetic Resonance Imaging-Proton Density Fat Fraction (MRI-PDFF). The impact of hepatic fat and LV reduction on histological fibrosis interpretation using the CRN system remains unexplored. We propose analyzing the concomitant changes of qFibrosis (qF) with qSteatosis (qS) and qBallooning (qB) in zonal regions to evaluate the impact of hepatic fat and LV reduction on fibrosis changes.

Method: NASH patients were included from two phase 2b studies: 24-week study of Aldafermin (NCT02443316) and 36-week study of Resmetirom (NCT02912260). Steatosis correction (SC) was done by subtracting the steatosis area as detected by qS from total tissue area followed by an analysis of zonal fibrosis in the respective zones 1, 2, and 3. Concomitant fibrosis with drug-induced steatosis and ballooning changes were evaluated by co-localization of qF changes around qS and qB, respectively.

Results: qF continuous measures on the phase 2 Aldafermin study revealed 54% fibrosis regression in the treated group versus 19% in placebo group (p = 0.007). With SC, zonal qF assessment showed trends of dose-dependent fibrosis reduction in portal, periportal (p = 0.02) and zone 2 regions. In the Resmetirom study where the treated group had markedly reduced LV, LV correction was applied and there was a greater reduction in concomitant fibrosis, as well as significant zonal steatosis reduction across all zones (Figure 1A, 1B). In contrast, the impact of LV is negligible on concomitant qB/qF. Further qB analysis revealed an association between 1-stage fibrosis improvement with a decrease in qB area from baseline to end-of-treatment (Figure 1C). Using cut-off of –30.46%, the performance for predicting 1-point reduction was 50% sensitivity, 58% specificity with 39% negative predictive value and 68% positive predictive value.

Conclusion: Results from this proof-of-concept analysis highlights the impact of hepatic fat reduction on fibrosis regression in NASH. The impact of SC and LV correction is great on the concomitant fibrosis around steatosis, but minimal on the concomitant fibrosis around ballooning. Therefore, concomitant analyses with digital pathology can augment the interpretation of the mechanism of action of drugs in NASH as well as allow for a better understanding of the impact these drugs have on histopathology and should be considered in future trials. Validation with clinical outcomes is ongoing.

FRI-519
Effectiveness of prebiotic treatment in patients with non-alcoholic fatty liver disease (NAFLD)-a randomized trial
Yaakov Maoz1,2, Naama Reshef3,4, Uri Gophna5, Fred Konikoff6,7, Hilla Knobler2,3, 1Kaplan Medical Center, Institute of Gastroenterology and Hepatology, Rehovot, Israel; 2The Hebrew University, Hadassah School of Medicine, Jerusalem, Israel; 3Kaplan Medical Center, Institute of Diabetes and Metabolism, Rehovot, Israel; 4The Hebrew University, Faculty of Agriculture, Food and Environment, School of Nutritional Sciences, Rehovot, Israel; 5Tel-Aviv University, Faculty of Life Sciences, Department of Molecular Microbiology and Biotechnology, Tel-Aviv, Israel; 6Tel-Aviv University, Sackler School of Medicine, Tel-Aviv, Israel; 7Sapir Medical Center, Institute of Gastroenterology and Hepatology, Kfar Sava, Israel
Email: halishy@netvision.net.il

Background and aims: Several observations show that fecal microbial species of patients with NAFLD differ from that of healthy population. Recent studies explored pathways linking altered composition of gut microbiota with the pathogenesis of NAFLD. Prebiotics are dietary fibers that manipulate gut microbiota to a more favorable profile. The aim of the study was to explore the effectiveness of prebiotic supplementation in liver fat reduction and on the composition of the fecal microbiome.

Method: 19 patients with NAFLD were randomized to receive either 16 gr/day Inulin Type Fructans (ITF) (Inulin/OFS75/25) prebiotic or (n = 9) placebo-maltodextrin (n = 10) for 12 weeks. Patients were instructed to maintain their usual diet and physical activity to ensure stable weight throughout the study. Liver fat content was measured by magnetic resonance spectroscopy (MRS). Fecal microbiome was analyzed by 16S ribosomal DNA sequencing. We collected detailed anthropometric, metabolic, liver-related and inflammatory mediators from all participants.

Results: Baseline and end-of-study liver fat content did not change significantly in the prebiotic (22.1% ± 12.7% and 19.8% ± 11.7%) and in the placebo group (15.2% ± 8.6% and 12.5% ± 9.4%). Fecal samples from patients who received the prebiotic had higher proportions of Bifidobacterium species in the placebo group (Figure). We observed an increase in FGFI-19 levels in the prebiotic group, compared with the placebo group, this however, did not reach a meaningful difference. Bifidobacterium negatively correlated with the difference in FGF-19: R = –0.88, p = 0.03. Body weight and body composition remained stable in both groups.
reduction of liver fat content. Weight loss may still have a pivotal role in NAFLD management.

**FRI-520**

**B-cell activating factor in non-alcoholic steatohepatitis**

Iris Gines Mir1, Raju Kumar1, Patricia Garrido1, Wenhao Li1, Hamish Miller1, Hajar Saihi1, Gillian Hood1, William Alazawi1. 1Barts Liver Centre, Blizard Institute, Queen Mary University of London, Immunobiology, London, United Kingdom

**Background and aims:** Non-alcoholic fatty liver disease (NAFLD) is one of the most prevalent causes of liver disease worldwide. In a subset of patients, hepatic fat is associated with liver cell injury and inflammation; non-alcoholic steatohepatitis (NASH) and fibrosis. While NASH is the likely driver of disease, the extent of liver fibrosis is more predictive of liver-related clinical events, but the mechanisms that link metabolic dysfunction, inflammation and fibrosis in NASH are poorly understood. B cell-activating factor (BAFF) is a pro-inflammatory adipokine with 3 known receptors (BAFF-R, BCMA and TACI). It is associated with impaired insulin sensitivity, liver steatosis and inflammation in mice and serum BAFF is higher in human NASH patients compared to simple steatosis. In this study we test the hypothesis that BAFF signalling is associated with fibrosis in blood and liver tissue from people living with NAFLD.

**Method:** Concentration of BAFF in sera from 106 people with biopsyproven NAFLD and NASH was measured using ELISA. The RNA and protein expression of BAFF and its receptors in liver tissue were evaluated using RT-PCR (GAPDH housekeeping gene), Western blot and immunofluorescence assays in liver biopsy tissue from patients with NASH and in hepatocyte-like cells and stellate-like cells, using B-cells as positive control.

**Results:** BAFF concentrations were higher in patients with NASH F3-4 compared to those with NASH F0 1118.06 pg/ml vs 1333.39 pg/ml, p = 0.03) (figure) with an association of BAFF concentration with age, fibrosis grade and BMI, but no association, with ballooning or inflammation nor with, ethnicity or type 2 diabetes. BCMA, BAFF-R and TACI mRNA were detectable in liver tissue, and this was recapitulated at the protein level, but TACI was not detected by Western blot or immunofluorescence. BCMA relative gene expression was higher in patients with NASH F3 (no F4 patients in this analysis) compared to NASH F0-2 (4.5-fold, p = 0.05). In hepatocyte-like cells (HepG2) and stellate-like cells (LX-2), BAFF, BCMA and BAFF-R but not TACI were detected at RNA and protein levels. Treatment with a toxic combination of oleic acid and palmitic acid (1 mM and 0.5 mM) resulted in an up regulation of BAFF-R in LX-2 cells (1.7-fold, p = 0.02).

**Conclusion:** BAFF is increased in patients with advance liver fibrosis. BAFF-R, BCMA, TACI and BAFF itself are detected in human liver. BAFF-R, BCMA and BAFF are detected in hepatocyte-like and stellate-like cells.

**FRI-521**

**SNP-630, a novel compound with multiple mechanisms, reverses liver inflammation and fibrosis in preclinical model and NASH phase 2 clinical trial**

Hsin-Tien Ho1, Shin-Wei Chen1,2, Yu-Lueng Shih3, Tien-Yu Huang3, Wenhao Li1, Hamish Miller1, Hajar Saihi1, Gillian Hood1, William Alazawi1. 1Barts Liver Centre, Blizard Institute, Queen Mary University of London, Immunobiology, London, United Kingdom

**Email:** i.g.mir@qmul.ac.uk

**Background and aims:** Non-alcoholic steatohepatitis (NASH) is a metabolic liver disease characterized by hepatic lipid accumulation, chronic inflammation and fibrosis. Recent studies have been underlined the pathogenesis of NASH and the complex interplay between them will be essential for the developing therapies that can effectively against the multiple hits that lead to the disease. SNP-630 is a prospective novel synthetic molecule inhibits NASH processing by multiple mechanisms of action. In *in vitro* hepatocytes and hepatic stellate cells co-culture system, we elucidated that SNP-630 significantly decreases fibrosis markers expression with multiple mechanisms of action such as heaptic de novo lipogenesis (DNL) pathway inhibition and inflammation. Most importantly, we are already seeing improvement in both in vivo mouse model and the NASH patients clinically treated with SNP-630 and its active metabolites SNP-612.

**Method:** [*in vitro model*] HepG2 and LX2 were seeded in the same plate considering a ratio of 5:1 respectively. After 24 hours, cells were exposed to 750 μM of palmitic acid combined with SNP-630 for 24 hrs, then cells and supernatants were harvested for analysis. [*in vivo model*] Male C57BL/6 mice were fed with a high fat diet (HFD) for 21weeks. In week 21, the HFD-induced NASH mice continued to receive a HFD along with SNP-630 or its metabolites SNP-612 by oral gavage once daily for more 6–10 weeks. [*phase2 clinical trial*] SNP-612 tolerability, safety, and efficacy in 35 NASH patients were evaluated. The primary and secondary end points were the change in serum alanine aminotransferase (ALT), liver inflammation, steatosis and fibrosis at week 12 of administration.

**Results:** NASH regression led to significant changes at haematological, histological, whole-liver transcriptional, and single-cell levels. In *in vitro HepG2-LX2 co-culture model*, the expression level of triacylglycerol synthesis enzyme (DGAT1), inflammation related cytokines (IL1b, IL6, and CCL2), and fibrosis-related markers (ACTA2, COL1A1, and TIMP1) were significantly decreased in SNP630-treatment. Also, in HFD-induced NASH mice, SNP-630 or SNP-612 treatment significantly decreased serum ALT, hepatic steatosis (triglyceride), inflammation (CCL2), and fibrosis (Col1A1 and Timp1). In the clinical trial, patients treated with the active metabolites, SNP-612, demonstrated a significant change in ALT at week 12 compared to baseline values, with no sever adverse events observed. In addition, SNP-612 demonstrated antifibrotic potential, including a significant decrease in fibrogenesis-related biomarkers (ie, CCL4 and CCL5). Moreover, FibroScan measurements indicated the efficacy of SNP-612 to ameliorate liver fibrosis in subgroup analysis.
Conclusion: These preclinical and phase 2 clinical data demonstrated that SNP-630 and its metabolites can suppress NASH fibrosis through DNL inhibition and inflammation.

FRI-522
Serological biomarkers PRO-C3 and PRO-C6 reveal the anti-fibrotic and pro-metabolic effects of MSDC-0602 K, an insulin sensitizer, in non-alcoholic steatohepatitis patients during the EMINENCE phase IIb study
Alejandro Mayorca Guiliani 1, Peder Frederiksen 1, Morten Karsdal 1, Diana Leeming 1, Jerry Colca 2.
1Nordic Bioscience, Biomarkers and Research, Herlev, Denmark; 2Cirius Therapeutics, Kalamazoo, United States
Email: amg@nordicbio.com

Background and aims: MSDC-0602K is a second-generation insulin sensitizer designed to inhibit the mitochondrial carrier (MPC) without direct activation of the transcription factor PPARγ. The EMINENCE trial evaluated efficacy and safety of MSDC-0602K in patients with non-alcoholic steatohepatitis (NASH). As previously published, MSDC-0602K missed statistical significance on the pre-specified primary analysis of liver histology, but led to significant reductions in glucose, glycated Hb and liver enzymes. Notably edema, the principle PPARγ agonist-associated side effect, was not higher than placebo and there were more dropouts in the placebo than in the active arms Here, we assessed the serological extracellular matrix biomarkers PRO-C3, PRO-C4 and PRO-C6, which serve as surrogates of fibroblast activity, pericellular fibrosis formation and the profibrotic and proinflammatory fragment endotrophin.

Method: In the EMINENCE study (NCT02784444), 392 NASH patients were randomized to placebo (PL), 62.5 mg, 125 mg or a 250 mg daily dose of MSDC-0602K for 12 months. The primary efficacy end point was defined as an improvement of ≥2 points in NAS score, with ≥1 decrease in either ballooning or inflammation and no increase in fibrosis at 12mo based on randomized readings of only completing subjects. Liver biopsy was performed at baseline (BL) and at 12mo. Plasma samples were collected at BL, 6mo and 12mo to measure PRO-C3, PRO-C4 and PRO-C6 and analyzed statistically at the end of the study.

Results: PRO-C3 levels increased along with fibrosis stage at baseline (p = 0.0021). 125 and 250 mg doses of MSDC-0602K significantly reduced PRO-C3 at 6mo and 12mo (p = 0.003 – 0.03; PL: −3%, MSDC-0602K: −6 to −11% at 12mo). MSDC-0602K significantly reduced PRO-C6 at 12mo for all three doses (p = 0.026 – 0.047, PL: +3%, MSDC-0602K: −2.5 to −3.5% at 12mo) compared to PL (See figure below). Furthermore, our data suggested the presence of a F3/4 patient responder subgroup, characterized by lower levels of PRO-C3 at baseline.

Conclusion: MSDC-0602K reduced both PRO-C3 and PRO-C6 levels, indicating an anti-fibrotic and pro-metabolic effect. Furthermore, the biomarkers identified a subgroup of patients with lower baseline PRO-C3 and a F3-F4 diagnosis at BL that had a high likelihood of improvement in fibrosis. Our findings suggest that measuring ECM neo-epitope biomarkers may aid in understanding the pharmacodynamic effects of MSDC-0602K as well as support future exploration of MSDC-0602K in patients with NASH.
Background and aims: In the absence of any globally approved pharmacotherapy, current guidelines recommend lifestyle modification and weight loss in people with obesity and non-alcoholic fatty liver disease (NAFLD), including non-alcoholic steatohepatitis (NASH). Semaglutide, a glucagon-like peptide (GLP)-1 analogue indicated for management of body weight and type 2 diabetes (T2D), is under investigation in NASH. However, T2D seems to reduce weight loss in people with overweight/obesity. We evaluated the impact of T2D and other cardiometabolic parameters on weight loss in randomised controlled trials of subcutaneous semaglutide in NAFLD including NASH.

Method: Data were taken from adults in NCT03357380 (NAFLD; semaglutide 0.4 mg or placebo once daily [OD] for 72 weeks), NCT02970942 (NASH and fibrosis stage [F] 1–3; semaglutide 0.1, 0.2 or 0.4 mg or placebo OD for 72 weeks) and NCT03987451 (NASH, F4 and compensated liver cirrhosis; semaglutide 2.4 mg or placebo once weekly [OW] for 48 weeks). This post-hoc analysis pooled data for semaglutide (0.4 mg OD and 2.4 mg OW) and placebo, with weight changes grouped by baseline T2D status (previously diagnosed or no T2D [HbA1c <5.7%]). Mean on-treatment changes from baseline to post-hoc analysis at 24 weeks. There was a significant reduction in BMI, ALT, glycated haemoglobin [HbA1c], liver stiffness, CAP and lipid profile. There were no significant treatment-emergent adverse events. There is a need of randomized placebo-controlled trials to further explore its role in diabetes-associated NAFLD.

<table>
<thead>
<tr>
<th></th>
<th>Semaglutide</th>
<th>Placebo</th>
<th>p value vs non-T2D</th>
<th>p value vs pre-T2D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight change (kg)</td>
<td>11.1</td>
<td>2.0</td>
<td>–.07</td>
<td>–</td>
</tr>
<tr>
<td>Weight change (kg)</td>
<td>11.6</td>
<td>3.6</td>
<td>–.07</td>
<td>–</td>
</tr>
<tr>
<td>ETD (95% CI) (kg)</td>
<td>–8.9</td>
<td>–8.5</td>
<td>.07</td>
<td>.04</td>
</tr>
</tbody>
</table>

Conclusion: Oral Semaglutide was safe and efficacious and well tolerated in overweight diabetic patients with NAFLD in this interim analysis at 24 weeks. There was a significant reduction in BMI, ALT, liver stiffness, CAP and lipid profile. There were no significant treatment-emergent adverse events. There is a need of randomized placebo-controlled trials to further explore its role in diabetes-associated NAFLD.
FRI-525
The effects of a novel online app (Noom Weight) on weight loss and liver biomarkers in patients with NAFLD: a single arm proof-of-concept study
Naim Alkhouri¹, Jesus Topete¹, Meaghan McCallum², Kelly Blessing², Mazen Noureddin², Angie Coste¹, Anita Kohli¹. ¹Arizona Liver Health, Phoenix, United States; ²Noom, United States; ³Houston Research Institute, United States
Email: naim.alkhouri@gmail.com

Background and aims: Weight loss through lifestyle modifications remains the mainstay for NAFLD treatment; however, implementing effective lifestyle interventions in clinical practice has been challenging due to time and cost constraints. Having a comprehensive approach to weight loss in patients with NAFLD that can be scaled and provided at low cost is a key unmet need. The objective of this study is to assess the effects of a mobile weight management program on weight loss and liver health biomarkers in adults with obesity and NAFLD.

Method: Adults with obesity (BMI 30 to 49.9 kg/m² inclusive) and evidence of NAFLD based on Fibroscan CAP ≥ 274 dB/m were included. Patients were given access to the Noom Weight program for 16 weeks (midpoint) and then were followed for an additional 8 weeks (week 24 or end point). Measurements completed at baseline, midpoint, and end point included: weight/BMI, Fibroscan, routine labs (Complete Metabolic Panel and CBC), and the exploratory biomarker cytokeratin 18 fragment (CK18f). All tests of significance were performed at alpha = 0.05, two sided.

Results: 40 subjects were enrolled and 82.5% (33/40) completed the study. The mean age was 55.9 years (range 29–79) with a mean BMI of 38 kg/m² (30.5–49.8) and a mean baseline CAP score of 331.9 dB/m² (276–396) and a mean LSM of 7.54 kPa (4.9–13.3). The average change in body weight from baseline was a 4.0% reduction and 32.4% (11/34) achieved total body weight reduction by 5% or more. There was a significant reduction in the CAP score by end point of 21.35 dB/m (p = 0.024). The ALT decreased by 10 U/L or more in 27.3% (9/33). There was moderate correlation between BMI decrease and reduction in the CAP score (R = 0.533). There was no change in the LSM at the end point, and 62% (21) of subjects achieved >5% drop in CK18f. The change in CK18f correlated weakly (R = 0.215) with BMI drop but more strongly with Fibroscan CAP score (R = 0.468) and LSM (R = 0.764).

Conclusion: The Noom Weight program had beneficial effects in patients with obesity and NAFLD, including significant reduction in the CAP score and one third of patients achieving 5% or more reduction in their weight. Steatosis of the liver was affected by weight loss as a result of engagement with the Noom Weight program. Fibrosis was not significantly affected by the Noom Weight program in the timeframe of the study. Fibrosis may require a longer timeframe for changes to be measured.

FRI-526
The effect of standard of care lifestyle advice by a hepatologist in a routine clinical practice on steatosis and fibrosis development among NAFLD patients
Leen Heyens¹,²,³, Wouter Robaeys¹,³, Mathieu Struyve³, Gerit Stockmans¹, Sven Francque²,³, Geert Robaeys¹. ¹Hasselt University, Faculty of Life Sciences and Medicine, Hasselt, Belgium; ²Maastricht University, NUTRIM, Maastricht, Netherlands; ³Hospital Oost-Limburg, Gastro-enterology, Genk, Belgium; ⁴University of Antwerp, Gastro-enterology and Hepatology, Antwerpen, Belgium; ⁵Antwerp University Hospital, Gastro-enterology and Hepatology, Edegem, Belgium
Email: leen.heyens@uhasselt.be

Background and aims: Non-alcoholic fatty liver disease (NAFLD) has become the most frequent cause of chronic liver disease. The leading cause of NAFLD has been defined as a behavioural phenotype comprising low physical activity and an obesogenic diet. The primary therapeutic advice is lifestyle changes leading to weight loss. Previous studies indicated that a weight reduction of 5% or more could induce regression of steatosis or fibrosis. However, hepatologists only have time during consultations to give a short outline of the optimal lifestyle. As no data is available on the outcome of this routine practice, we evaluated the effect of this lifestyle advice on steatosis and fibrosis development among NAFLD patients.
Method: Data were collected retrospectively using the electronic patient files of NAFLD patients in whom a baseline and a follow-up FibroScan® measurement (for assessment of steatosis by CAP™ and of liver stiffness (LSM) as a surrogate for fibrosis) were performed between November 2019 and 2022 at Ziekenhuis Oost-Limburg, Genk, Belgium. At the start, patients received Mediterranean diet related-advice, tips on improving exercise, and an information brochure concerning NAFLD from the hepatologist. Clinically meaningful weight loss was defined as a loss of at least 1 kg.

Results: Of the 218 NAFLD patients evaluated, 130 (59.6%) were excluded due to the usage of semaglutide, not fasting, IQR/MED>30%, or bariatric surgery. In total, 88 (40.4%) patients were included, of whom 53 (60.2%) were men and 38 (43.2%) had type 2 diabetes mellitus (T2DM). The mean age, median BMI, and mean waist circumference were 54 ± 13 years, 31.0 (28.4–34.9) kg/m² and 105.2 ± 12.7 cm, respectively. On average, there were 186 (124–280) days between the measurements. The median weight loss between measurements was −1.2 (−4.1, 1.4) kg. The decrease in LSM and CAP™ were −1.2 (−3.1;0.3) kPa and −7.0 (−50.5;8.8) dB/m, respectively. Within this group, 47 (53.4%) had clinically meaningful weight loss, while 41 (46.6%) did not lose any weight or gained weight. The group with weight loss developed a significantly (p < 0.001) lower CAP™ compared to baseline values, but there was no significant change in LSM during the same time period. Furthermore, within the weight loss group, there were no differences in magnitude of weight loss or CAP™ when stratified based on sex, age categories (±50 years vs. >50 years), or having T2DM or not (p > 0.05).

Conclusion: To the best of our knowledge, this is the first study to assess the effect of routine lifestyle advice by a hepatologist on body weight, steatosis, and fibrosis, measured by FibroScan®. The lifestyle advice leads to a weight reduction of at least 1 kg in almost half of NAFLD patients and a significant reduction in steatosis over six months in those patients. However, the recommended reduction in body weight (at least 5%) is not reached. Other measures to support the advice on lifestyle change given by the hepatologist are hence necessary to improve efficacy.

FRI-527
Comparison of efficacy between liraglutide and phentermine/topiramate in obese patients with non-alcoholic fatty liver disease
Young Eun Chon1, Kwan Sik Lee1, Yeonjung Ha1, Joo Ho Lee1. 1CHA Bundang Medical Center, CHA University, Korea, Rep. of South
Email: nacihyosoo@chamc.co.kr

Background and aims: Anti-obesity drugs are known to improve hepatic inflammation in patients with non-alcoholic fatty liver disease (NAFLD). We aimed to compare the effect of liraglutide and phentermine/topiramate in obese NAFLD patients.

Method: We retrospectively enrolled 65 obese NAFLD patients without type 2 diabetes mellitus (liraglutide group [n = 30], phentermine/topiramate group [n = 35]) who were treated with liraglutide or phentermine/topiramate for 12 months. Changes in laboratory data, body weight, degree of steatosis and fibrosis were compared between two groups. Steatosis was assessed using the fatty liver index: NAFLD liver fat score, and controlled attenuation parameter (CAP). Fibrosis was assessed using fibrosis index based on four factors (FIB-4) and liver stiffness.

Results: The mean body weight (80.3 ± 12.3 kg) and body mass index (29.4 ± 3.2) were similar between two groups. After 12 month of treatment, phentermine/topiramate group showed significantly greater effect in weight loss than liraglutide group (−8.4 ± 0.6 vs. −6.3 ± 0.4 kg, p = 0.003). Both group showed similar effect showing significant steatosis reduction (phentermine/topiramate vs. liraglutide; Δfatty liver index: −8.9 ± 2.3 vs. −8.4 ± 1.7, p = 0.449; ΔCAP liver fat score: −0.5 ± 0.2 vs. −0.4 ± 0.2, p = 0.835; ΔCAP: −9.2 ± 6.9 vs. −8.3 ± 4.6 dB/m², p = 0.129). Fibrosis improvement was noted in both groups (Δliver stiffness, −2.2 ± 1.0 vs. −1.8 ± 0.9, p = 0.052; ΔFIB-4 index: −0.10 ± 0.10 vs. −0.11 ± 0.13, p = 0.860).

Conclusion: Liraglutide or phentermine/topiramate treatment significantly ameliorated liver steatosis and inflammation, but either treatment showed minimal effect on fibrosis improvement.

FRI-528
Development of physiologically based pharmacokinetic model to predict liver exposure of SRT-015, a next-generation inhibitor of apoptosis signal-regulating kinase 1
Artur Plonski1, Daniel Burge1, Kathleen Elias1, Neil D. McDonnell1. 1Seal Rock Therapeutics, Inc., United States
Email: aplonski@sealrocktx.com

Background and aims: SRT-015 is a novel, clinical-stage, small molecule inhibitor of Apoptosis Signal-regulating Kinase 1 (ASK1) in development for liver diseases, including alcoholic hepatitis (AH), acute-on-chronic liver failure (ACLF), and non-alcoholic steatohepatitis (NASH). In all preclinical species evaluated, SRT-015 is preferentially distributed to liver, with liver/plasma ratio ranging 10–60x. We aimed to develop a physiologically based pharmacokinetic (PBPK) model to non-invasively estimate liver exposure of SRT-015 in humans.

Method: GastroPlus software (Simulation Plus, Lancaster, CA) was used first to build and validate PBPK models for SRT-015 PK in mouse, rat, and non-human primates to explain the observed plasma concentrations vs. time profiles following intravenous (IV) and oral administration. The model was further expanded with the addition of efficacious liver and plasma concentrations of SRT-015 determined in preclinical models of NASH (DIO-NASH model, Gubra), AH/ACLF and acetaminophen overdose toxicity. Knowledge gained during preclinical PBPK modeling was then applied to build a human PBPK model for SRT-015 and predict First-in-Human (FIH) exposure following oral administration. Actual plasma exposure of SRT-015 from the FIH study (NCT04887038) was then used to refine the human PBPK model and predict human liver exposure of SRT-015. The established model was also used to simulate human plasma and liver exposure after IV administration of SRT-015.

Results: The preclinical PBPK model was highly predictive of human SRT-015 plasma exposure with all observed values of Cmax and AUC from FIH study falling within the predicted ranges across all dose levels (40, 80, 160, 320, and 640 mg; po) administered to healthy participants. After further refinement, the Cmax and AUC values predicted by the model correlated well with the observed values (r² = 0.89 and r² = 0.99, respectively). The clinical PBPK model of orally administered SRT-015 predicted a robust exposure of SRT-015 within the liver, with dose-proportional increase of Cmax between 40 and 320 mg, and less-than-proportional increase between 320 and 640 mg. Importantly, the predicted hepatic Cmax values were well above the efficacious exposure levels observed in preclinical efficacy models. Additionally, the model predicts efficacious exposure with IV formulated, continuous infusion SRT-015.

Conclusion: We have established a highly predictive PBPK model of SRT-015 exposure in human liver. The model indicates efficacious exposure in the liver with all oral doses tested in the phase 1 clinical trial in healthy participants and will help in the dose selection for Phase 2 trials. The model also indicates the feasibility to attain efficacious exposure via IV infusion, which could be a preferred administration route in ACLF patients with impaired consciousness or otherwise unable to swallow an oral drug.
FRI-529
Barriers for regular exercise in people with non-alcoholic fatty liver disease
Kedar Deshpande1, Ken Nosaka1, Oyekoya Ayanrinde1, John Olynuk1,
Marcelle Scagliotta2, Wendy Lam3, Huirong Ma2, Crystal Connelly2,
1Edith Cowan University, School of Medical and Health Sciences,
Australia; 2Fiona Stanley Hospital, Gastroenterology and Hepatology,
Australia
Email: kdeshp@our.ecu.edu.au

Background and aims: Performing regular exercises is an important alternative or adjunct to pharmacotherapy for treating non-alcoholic fatty liver disease (NAFLD). While many people with NAFLD do not perform adequate physical activity and exercise, it is important to understand barriers for them to achieve an effective exercise routine. We therefore aimed to examine associations between patients’ knowledge of exercise as treatment of NAFLD, their self-perceived barriers to exercise, and their stages in NAFLD.

Method: Patients with NAFLD attending an outpatient hepatology clinic were recruited. They were assessed for the severity of hepatic steatosis using controlled attenuation parameter (CAP) and fibrosis by transient elastography (TE). An online questionnaire was administered to them to ask their self-reported exercise patterns, barriers to exercise, and knowledge regarding effectiveness of different types of exercise for NAFLD. We sought associations between the questionnaire responses and liver characteristics.

Results: Forty-seven patients (29 females) with a mean age of 57.6 ± 11.7 years and body mass index (BMI) of 33.7 ± 6.3 completed the questionnaire. The mean CAP and liver stiffness measurement (LSM) values by TE were 336.2 ± 44.5 dB/m and 13.2 ± 12.6 kPa, respectively. Although the majority of patients (n = 42, 89%) considered NAFLD to be a serious health concern, 72% (n = 34) of them did not achieve recommended exercise levels of ≥150 minutes of moderate-intensity physical activity per week, and 64% (n = 30) were unsure about the role of exercise in NAFLD treatment. The most common barriers to exercise reported were health problems (64%), lack of time (36%), and lack of enjoyment in exercising (26%). There were no significant associations between CAP, LSM and exercise questionnaire responses.

Conclusion: The majority of patients were unaware of the role of exercise as a potential treatment for NAFLD and were not achieving recommended exercise levels. Inadequate time to exercise, physical and mental health problems, and lack of enjoyment in exercise were the major barriers for them to exercise. Future randomised exercise trials and behavioural research for NAFLD should focus on individualised and sustainable exercise programs to improve patients’ long-term adherence to exercise to reduce the burden of NAFLD.

FRI-530
A randomized controlled trial of kalmegh supplementation on non-alcoholic fatty liver disease
Sanket Nandekar1, Sunil Kumar1, Devesh Yadav2, Binay Sen3,
Pournima Gadge4, 1Institute of medical sciences, Banaras hindu university,
Department of community medicine, Varanasi, India; 2Institute of medical sciences, Banaras hindu university, Department of gastroenterology, Varanasi, India; 3Institute of medical sciences, Banaras hindu university, Department of dryanaguna, Varanasi, India; 4Apex institute of ayurvedic medicine and hospital, Department of prasuti tantra, Mirzapur, India
Email: snktmv@bhu.ac.in

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is the most common liver disease worldwide (prevalence 20–30%). Kalmegh (Botanical name: Andrographis-paniculata nees, Family: Acanthaceae) is an exceptional herb from classical Indian literature having comprehensive action over liver. Our aim was to assess the safety, effectiveness and cost of treatment for kalmegh supplementation in NAFLD using modern day investigations and standard procedures of randomized controlled trial.

Method: We have enrolled 91 patients of age group 18–60 years from Gastroenterology OPD of tertiary care hospital in northern India. Written and informed consent was obtained and patients were randomized to group A and group B. Patients in group A (n = 49) were given kalmegh capsules and group B (n = 42) were given placebo capsules, each having dose of 1600 mg per day. Standard lifestyle modification and dietary intervention were advised in both the groups. Patients were followed up for the period of 90 days at 30 days interval for 3 subsequent visits. Anthropometric measurements along with blood and radiological investigation were performed during each follow-up. Ethical approval was obtained from institutional ethical committee-ECR/526/Inst/UP/2014/RR-20.

RESULTS: Patients in both the groups have shown significant improvement in anthropometric parameters with p < 0.05 at all the follow-ups. In group A, serum low density lipoprotein (STD LDL), LDL/HDL ratio and serum triglyceride reduced significantly (p < 0.05) at all the subsequent follow-ups while in group B reduction was non-significant at most of the follow-up except some. Similarly in group A aspartate aminotransferase (AST) and alanine aminotransferase (ALT) reduced significantly (p < 0.05) at all the subsequent follow-ups while in group B reduction was non-significant in some follow-ups. In group A, liver stiffness reduced significantly (p < 0.05) when compared with group B.

Cost of treatment of NAFLD for 1 month with modern medicine was Rs 1394 and with kalmegh it is Rs 82.

Figure: Showing improvement in clinical and biochemical parameters in both groups at different follow-ups.
Non-invasive assessment of liver disease except NAFLD

FRI-477
Dynamics of liver stiffness measurements provide incremental prognostic information in advanced chronic liver disease
David JM Bauer1,2,3, Zhenwei Yang4, Fiona Köck1, Laurenz Fritz1, Benedikt Hofer1,2,5, Lorenz Balcar1,2, Lukas Hartl1,2, Mathias Jachs1,2, Katharina Stopfer1, Theresa Bucsics1,2, Benedikt Simbrunner1,2,5, Bernhard Scheiner1,2, Michael Trauner1, Mattias Mandorfer1,2, Thomas Reiberger1,2,5, Georg Semmler1,2,1, Medical University of Vienna; Division of Gastroenterology and Hepatology, Department of Internal Medicine III, Wien, Austria; 2Medical University of Vienna, Vienna Hepatic Hemodynamic Lab, Division of Gastroenterology and Hepatology, Vienna, Austria; 3Klinik Ottakring-Wien, Austria

Background and aims: Liver stiffness measurements (LSM) allow for non-invasive assessment of the severity of chronic liver disease and identification of advanced chronic liver disease (ACLD). Yet, the clinical relevance of dynamics in LSM within ACLD are unclear. This study examines the significance of LSM dynamics as a marker of liver disease regression or progression, and as a predictor of hepatic decompensation and liver-related mortality.

Method: Patients with chronic liver disease who underwent ≥2 reliable LSM, least 6 months apart, were retrospectively included. At baseline (BL), participants were divided into three groups: non-ACLD with BL-LSM <10 kPa, and compensated ACLD (cACLD) with BL-LSM ≥10 kPa. Joint modelling (combining a linear mixed effects model with a cause-specific proportional hazard model) was used to assess the association of longitudinal changes in LSM with hepatic decompensation and liver-related mortality.

Results: 2123 patients (67% non-ACLD, 33% cACLD) were followed for a median of 65 months, during which 4 (0.3%) non-ACLD and 72...
(9.9%) eACLD patients developed hepatic decompensation, while 2 (0.1%) and 41 (5.3%) died of liver-related causes. In eACLD patients, doubling of LSM at any point was linked to a significantly higher risk of hepatic decompensation ([adjusted hazard ratio (aHR)] per log-increase: 4.33 [95%CI: 2.74–7.06], p < 0.001) and liver-related death ([aHR] 4.00 [95%CI: 2.47–6.87], p < 0.001), indicating a ~50% change in risk for every 20% change in LSM over time, in a model adjusted for age, platelet count, MELD, and albumin. Results were robust and numerically similar in subgroup analyses of hepatitis C patients, and in a model adjusted for etiological cure as a time-dependent covariate. The accuracy of LSM dynamics (ROC: 0.847) for predicting hepatic decompensation within 2 years was higher than to a single BL-LSM (0.805), and dynamics in platelet count (0.754), MELD (0.722) or albumin (0.559). The definition of a clinically significant LSM-decrease suggested by the Baveno VII consensus, i.e., a 20% decrease in LSM to a value <20 kPa or <10 kPa was validated to identify patients with a significantly reduced risk of hepatic decompensation ([HR]: 0.18, 95% CI: 0.09–0.37, p < 0.001).

Conclusion: Repeated longitudinal measurements of LSM facilitate diagnosis of hepatic decompensation and liver-related mortality. Importantly, the prognostic value of dynamics in LSM was superior to those of other established prognostic markers.

FRI-478
Liver stiffness measurement Baveno VII rule of 5 and risk of hepatocellular carcinoma after HCV eradication in patients with cirrhosis
Binu John1, Yangyang Deng2, David Kaplan3, Janice Jou4, Tamir Taddei5, Paul Martin6, Dustin Bastaich7, Hann-Hsiang Chao7, Bassam Dahman2. 1Miami VA Health System and University of Miami, Gastroenterology and Hepatology, Miami, United States; 2University of Pennsylvania, Department of Medicine, Philadelphia, United States; 3University of Southern Denmark, Research, Faculty of Health Sciences, Odense, Denmark; 4Virginia Commonwealth University, United States; 5University of Pittsburgh, United States; 6Portland VA and Oregon Health Sciences University, United States; 7VA Connecticut Health System and Yale University, United States; 8University of Miami, United States; 9VA Richmond Health Care, United States
Email: binu.john@gmail.com.

Background and aims: Liver stiffness (LSM) using the Baveno VII “Rule of 5” cut-offs can reliably predict risk of hepatic decompensation and cirrhosis secondary to chronic hepatitis C (HCV) are at risk for hepatocellular carcinoma (HCC) despite sustained virological response (SVR). We examined if post-SVR LSM using the Baveno VII “Rule of 5” cut-offs can be used for risk stratification to predict the annual risk of HCC.

Method: This was a retrospective cohort study of 1,605 participants from the VOCAL cohort, with HCV cirrhosis and SVR. Patients were followed from the time of post-SVR LSM until diagnosis of HCC, death, or 03/01/2022 in the VOCAL cohort for a total follow-up of 4444.06 person-years.

Results: The annual risk of HCC was 1.43% among participants with post SVR LSM <10 KPa, 2.52% in those with LSM 10–14.9 KPa ([aHR] vs. baseline 1.83, 95% CI 1.06–3.18, p = 0.03), 2.15% for LSM 15–19.9 KPa ([aHR] 1.56, 95% CI 0.76–3.21, p = 0.22), 3.43% among LSM 20–24.9 KPa ([aHR] 2.51, 95% CI 1.24–5.07, p = 0.01), and 4.14% in LSM≥25 KPa ([aHR] 3.20, 95% CI 1.84–5.56, p < 0.0001). When post SVR Fib-4 was used, the annual risk of HCC was 1.47% in participants with post-SVR Fib-4 < 1.45 (baseline) and similar at 1.82% in those with Fib-4 ≥ 1.45 (aHR 1.29, 95% CI 0.68–2.43, p = 0.44), but elevated at 3.96% ([aHR] 2.91, 95% CI 1.47–5.75 p = 0.002) in participants with Fib-4≥2.35.

Conclusion: Increase in LSM using the Baveno VII criteria “rule of 5” on liver elastography predicts higher rates of HCC in HCV cirrhosis after SVR at multiple cut-off levels, compared to dichotomous risk stratification by Fib-4, and offers a single test to predict risk of hepatic decompensation and HCC.

FRI-479
Liver stiffness can monitor disease severity and changes predict decomposition in alcohol-related liver disease
Katrine Thorhaug1,2, Georg Semmler1,2, Stine Johansen1,2, Katrine Prier Lindvig1,2, Maria Kjærgaard1,2, Nikolaj Torp1,2, Johanne Kragh Hansen1,2, Camilla Dalby Hansen1,2, Peter Andersen1,2, Mads Israelen1,2, Jonel Trebicka2, Thomas Reiberger2, Maja Thiele1,2, Aleksander Krag1,2, 1Fibrosis, fatty liver and steatohepatitis Research Center Odense (FLASH), Department of gastroenterology and hepatology, Odense University Hospital, Odense, Denmark; 2Institute of Clinical Research, Faculty of Health Sciences, University of Southern Denmark, Odense, Denmark; 3Division of Gastroenterology and Hepatology, Department of Internal Medicine III, Medical University of Vienna, Vienna, Austria; 4Münster University Hospital, WWU, Department of Internal Medicine B, Münster, Germany
Email: katrine.holtz.thorhauge@rsyd.dk.

A. Liver Stiffness

B. FIB-4

Figure: (abstract: FRI-478) Cumulative incidence frequency for adjusted hazard ratio of liver cancer by liver stiffness and FIB-4, among patients with HCV cirrhosis after SVR.
Background and aims: More than 75 million people worldwide are at-risk of alcohol-related liver disease (ALD). Transient elastography (TE) is an established diagnostic and prognostic tool, but is not yet validated for disease monitoring in compensated advanced chronic liver disease (cACLD). We aimed to evaluate the value of TE for disease monitoring in ALD, as suggested by Baveno VII.

Method: Two cohorts of compensated ALD patients with long-term outcome evaluation were included. Based on repeated TE, we evaluated the risk of decompensation in cACLD (TE ≥10 kPa) stratified for changes in disease severity and compared to patients without cACLD (TE <10 kPa). According to the rule-of-five (e.g. TE: 10–15–20–25 kPa), we defined disease progression as an increase of ≥5.0 kPa, while disease regression was defined as a repeated TE <10 kPa or a repeated TE <20 kPa with an associated decrease of ≥20%. We calculated subdistribution hazard ratios (SHR) from competing risk analysis with death prior to decompensation as a competing event. Moreover, we report the 3-year decompensation-free survival for the full cohort.

Results: We included 537 patients (n = 440 Odense, n = 97 Vienna) with a median age of 57 years (IQR: 49–63) and baseline TE of 8.2 kPa (IQR: 5.0–21.6). 371 patients (69%) had a repeated TE after a median of 25 months (IQR: 18–38) and were followed for additionally 37 months (IQR: 25–61) during which 41 decompensated (11%) and 55 died (15%). In cACLD patients with repeated TE (n = 125/371) 10% progressed (progressors), 43% regressed (regressors), while 14% had stable non-severe disease (TE <25 kPa) and 33% had stable severe disease (TE ≥25 kPa). We found an increased risk of decompensation for patients with cACLD vs. without cACLD (SHR = 17.5, CI: 7.1–43.0, P < 0.01). Moreover, progressors (SHR = 3.6, CI: 1.2–11.1, P = 0.03) and patients with stable severe disease (SHR = 3.9, CI: 1.6–9.1, P = 0.01) had a significant higher risk of decompensation than regressors (progressors), 43% regressed (regressors), while 14% had stable non-severe disease (TE <25 kPa) and 33% had stable severe disease (TE ≥25 kPa). We found an increased risk of decompensation for patients with cACLD vs. without cACLD (SHR = 17.5, CI: 7.1–43.0, P < 0.01). Moreover, progressors (SHR = 3.6, CI: 1.2–11.1, P = 0.03) and patients with stable severe disease (SHR = 3.9, CI: 1.6–9.1, P = 0.01) had a significant higher risk of decompensation than regressors.

Conclusion: Repeated TE is useful for monitoring disease severity in cACLD as defined by Baveno VII, and changes in TE accurately predicts decompensation in patients with ALD.

FRI-480
Transient elastography efficiently detects severe fibrosis in patients with chronic hepatitis D
Dominique Roulot1, Segolene Brichler2, Layese Richard3, Nathalie Ganne-Carrié4, Christiane Stern4, Veronique Loustaud-Ratti5, Martial Gouton6, Françoise Roudot-Thoraval3, Victor de Lédinghen2, 1AP-HP, hopital Henri Mondor, Unité de recherche clinique, Université Paris-El Est, Créteil, France; 2AP-HP, hopital Beaujon, Liver Unit, Clichy, France; 3CHU Limoges, hopital Dupuytren, Liver Unit, Limoges, France; 4AP-HP, hopital Avicenne, Liver Unit, France; 5CHU Bordeaux, Hopital Haut Leveque, Liver Unit, Bordeaux Pessac, France
Email: dominique.roulot@aphp.fr.

Background and aims: Hepatitis D virus infection (HDV) is associated with accelerated progression of liver disease to cirrhosis. Identifying severe fibrosis in chronic HDV-infected patients requiring urgent treatment is crucial. Non-invasive transient elastography (TE) has transformed the management of chronic hepatitis B and C virus infection. In patients with chronic hepatitis D, liver biopsy remains the gold standard procedure for fibrosis staging. The aim of this study was to evaluate the performance of TE (FibroScan) for the diagnosis of liver fibrosis in HDV-infected patients.

Method: TE was evaluated in HDV RNA-positive patients with liver biopsy (LB) included in a national cohort. LB and laboratory parameters were performed within 6 months from TE. Hepatic fibrosis was assessed using the Metavir stages (F0–4). TE diagnostic performance in identifying cirrhosis (F4), severe fibrosis (F3) and significant fibrosis (F2) was compared to that of non-invasive fibrosis tests, such as the aspartate aminotransferase to platelet ratio index (APRI), the fibrosis-4 score (F4S) and the Delta-4 fibrosis score (D4FS). Area under receiver operator characteristics (AUROC) and Youden indexes were used to establish new cut-offs values.

Results: Data from 192 HDV-infected patients with valid TE measurements were analyzed (66% males, median age 35 [29–43] yrs, median BMI 24.0 [21.6–27.3] kg/m²). The prevalence of histologic fibrosis stages was 22.6% for F0F1, 25.5% for F2, 8.4% for F3 and 33.5% for F4. TE demonstrated excellent diagnostic accuracy for the detection of cirrhosis with an AUROC of 0.87, compared with that of APRI (0.72), FIB-4 (0.75) and D4FS (0.84) (p = 0.002). TE was also superior for the detection of severe fibrosis (AUROC of 0.84, compared to 0.70 for APRI and 0.74 for FIB-4 (p = 0.002). TE performance was not better, however, for the detection of significant fibrosis (AUROC of 0.78 compared to 0.73 for APRI and 0.70 for FIB-4). At the optimized cut-off value of 11 kPa for determining cirrhosis, TE showed a sensitivity of 79%, a specificity of 80%, a predictive positive value (PPV) of 67% and a negative predictive value (NPV) of 88%; 80% of the patients being correctly classified. At the optimized cut-off value of 9 kPa for determining severe fibrosis, TE had a sensitivity of 81%, a specificity of 72%, a PPV of 77% and a NPV of 77%, with 77% of correctly classified patients.

Conclusion: In summary, based on these data from a large real-life cohort, TE has a good diagnostic performance for determining severe fibrosis in HDV-infected patients.

Figure: AUROC for Diagnosis of HDV cirrhosis.

FRI-551
Transmitral flow velocities predict the probability of hepatic vein occlusion in a liver transplantation waitlist population
Olivier Bouchet, Siranush Amalrajabi, Pierre-Jean Vacher, Couscous Marzouk, Franck Pillot, Philippe Chanez, Maxime Kieffer, Jean-François Pouliquen, Yves Amsellem, Franck Vivien, Maxime Menu, Cédric Pichon, Jean-Marc Millet, François Hubert, Jean-François Caen, Jean-Baptiste Zamboni, Pauline Bazin, Yves Houdart, Vincent Schmied, Fabrice Lefrère, Éric Cosseron, Aurélien Bories, François Lefebvre, Philippe Loutradis, François Chonchol, Hervé Franchi, Tristan Sevrier, Christiane Faroux, Jean-Louis Cravioto, Jean-Luc Pinder, Alain Bourliere, Pierre-Michel Mounier, Éric Gili, Bruno Caputo, Jean-Paul Trilles, Eric Lender, Jean-François Poynard, Álvaro Guallar, Pierre-Jean Franchi, Éric Lefebvre, Marie-Claude Duclos, Damien Taupin, Jean-Claude Gueguen
Email: olivier.bouchet@ap-hp.fr.

Background and aims: The liver is the most common organ to be transplanted due to end-stage liver disease. HVE is a life-threatening complication of liver transplantation (LT) and confers increased mortality. The aim of this study was to determine whether subclinical signs of HVE, such as abnormal liver flow patterns on Doppler US, were associated with an increased probability of HVE in a LT waitlist population.

Method: This was a retrospective observational study conducted at the French national center for LT. The study population included all LT candidates who were included in the prospective biovigilance program between January 2006 and December 2017. The primary outcome of interest was the occurrence of subclinical signs of HVE, defined as the presence of abnormal liver flow on Doppler US. The secondary outcome was the occurrence of HVE requiring urgent LT. The predictive performance of the subclinical signs of HVE was evaluated using the area under the receiver operating characteristic curve (AUC).

Results: A total of 1,284 patients were included in the study. The incidence of subclinical signs of HVE was 7.5% (n = 96) and the incidence of HVE requiring urgent LT was 0.5% (n = 6). The AUC for the prediction of HVE was 0.75 (95% CI: 0.68–0.81), with a sensitivity of 75% and a specificity of 85%. The multivariate analysis showed that age greater than 60 years (OR = 2.3, 95% CI: 1.2–4.3), a MELD score greater than 15 (OR = 2.0, 95% CI: 1.1–3.6) and the presence of subclinical signs of HVE (OR = 2.8, 95% CI: 1.5–4.9) were independent predictors of HVE requiring urgent LT.

Conclusion: The presence of subclinical signs of HVE on Doppler US was associated with an increased probability of HVE requiring urgent LT in a LT waitlist population. These findings highlight the importance of monitoring liver flow patterns in order to identify patients at high risk of HVE and to optimize their management before LT.

Figure: Area under the receiver operating characteristic curve for the prediction of HVE requiring urgent LT.
fibrosis and cirrhosis in patients with chronic HDV infection at baseline. The high probability of severe fibrosis or cirrhosis in patients with LSM >9 kPa necessitates rapid appropriate treatment. In case of LSM <9 kPa, a liver biopsy is recommended. Additional studies will evaluate the potential superior diagnostic performance of combining TE with biomarkers.

**FRI-481** Screening for hepatic fibrosis in primary care by FIB-4 score, followed in second line f the ELF (enhanced liver fibrosis) test: what are the best thresholds?

Denis Ouzan1,2, Guillaume Peneranda 3,4, Malik Jlaiel 5, Jeremie Cornelle6, Institut Arnaud Tzanck, SAINT LAURENT DU Var, France; 2RHECCA, France; 3AlphaBio, Marseille, France; 4BIOGROUP ALPHABIO-Laboratoire Européen, France; 5BIOGROUP BIOESTEREL-Laboratoire Mandelieu-Passero, France; 6BIOGROUP BIOESTEREL-Laboratoire Mougins-L’Espérance, France

Email: denis.ouzan@wanadoo.fr.

**Background and aims:** Screening for liver fibrosis in the general population is a public health issue. We have shown in a previous study that FIB-4 (1), can detect liver fibrosis in general practice and identify a possible cause of liver disease. But the optimal FIB-4 threshold remains to be specified. The FIB-4 thresholds usually used are: low risk if ≤1.3, intermediate risk between 1.3 and 2.67, and high risk if ≥2.67. Only one study (2) has proposed an age-dependent FIB-4 threshold: FIB-4 ≥1.3 for subjects younger than 65 years and ≥2 for those older than 65 years. The objective of our work was to explore different FIB-4 thresholds and in particular the threshold of >2 for all patients, which is much simpler and independent of age, by performing a second-line ELF (Enhanced Liver Fibrosis) score, after screening for liver fibrosis by FIB-4 in general practice.

**Method:** The FIB-4 score was performed prospectively from March to September 2022 in all consecutive patients seen by 17, outside the emergency. When the FIB-4 was ≥1.3, it was defined as positive, and a confirmatory ELF test was systematically performed. The positive FIB-4 test was confirmed when the second line ELF test was ≥9.8 (indicating an advanced fibrosis).

**Results:** The results are reported in the table below. Among the 3427 patients seen in general practice, 869 (25%) had a positive FIB4 score, which was confirmed by the ELF test in 59% (n = 509) of cases. 35% of them were older than 65 years. Confirmation was significantly more frequent in subjects over 65 years of age compared to those under 65 years of age: 67% vs 36%, p < .0001. For an age-dependent FIB-4 threshold (≥1.3 ≤65 yrs.)/≥2 >65 yrs.) which concerned 55% of the FIB-4 positive subjects (n = 481), 56% were confirmed by the ELF test (n = 271). For the FIB-4 threshold of 2, regardless of age which concerned 33% of the FIB-4 positive subjects (n = 284), 74% of the FIB4 ≥2 subjects were confirmed by ELF testing versus 51% of those with a FIB4 score <2 (Relative Risk IC95: 1.88 (1.52, 2.32) p < 0.001). 80% of the subjects in the high risk zone of fibrosis (FIB-4 ≥2.67) were confirmed by ELF test. The percentage of subjects in the intermediate fibrosis risk decreases from 90% for a FIB-4 between 1.3 and 2.67, to 45% for a FIB-4 between 1.3/2and 2.67, and to 23% for a FIB-4 between 2 and 2.67.

**Conclusion:** ELF testing performed in the second line had significantly confirmed proven fibrosis in subjects with FIB-4 ≥2. The high percentage of confirmation when the FIB-4 is ≥2.67 confirms the high fibrosis risk of this aera. A threshold of 2 retains a high percentage of confirmation while reducing the size of the intermediate risk zone for fibrosis and may allow more effective screening for liver fibrosis in primary care.

**References**


**FRI-482** Validation of cut-off values proposed by the society of radiologists in ultrasound liver elastography for diagnosis of compensated advanced chronic liver disease using 2D shear wave elastography

Ji Hun Kang1, Yeri Lee1, Young Seo Cho1, Yongsoo Kim1, Nam Hee Kim2.

1Hanyang University College of Medicine, Hanyang University Guri Hospital, Radiology, Guri, Korea, Rep. of South; 2Sungkyunkwan University School of Medicine, Kangbuk Samsung Hospital, Division of Gastroenterology, Department of Internal Medicine, Korea, Rep. of South Email: jihunkang@hanyang.ac.kr

**Background and aims:** The Society of Radiologists in Ultrasound Liver Elastography proposed dual cut-off values of <9 and >13 kPa to rule out and rule in compensated advanced chronic liver disease (cACLD) using acoustic radiation force impulse techniques. However, the diagnostic performance of this recommendation has not been extensively validated. Therefore, this study aimed to validate the cut-off values for the diagnosis of cACLD using 2D shear wave elastography (SWE).

**Method:** From the database of liver stiffness (LS) measurement in a single center using an Supersonic Aixplorer ultrasound between 2018 and 2021, we included patients who performed esophagogastroduodenoscopy or liver biopsy within 1 year of their LS measurement. We selected the first examination in cases of multiple LS measurements and excluded unreliable LS measurement. cACLD was defined as varices shown on EGD or severe fibrosis or cirrhosis on liver biopsy, according to the Baveno VII consensus.

**Results:** In total, 1440 patients (mean age 58 ± 12 years, 61 males) were included and cACLD was confirmed in 717 (50%) patients. The cohort consisted of patients with chronic hepatitis B (n = 563, 39%), chronic hepatitis C (n = 92, 6%), alcohol-related liver disease (n = 475, 33%), non-alcoholic fatty liver disease (n = 151, 11%), and other etiologies (n = 159, 11%). Overall, 688 (48%) and 548 (38%) patients had LS <9 and >13 kPa, respectively. Using cut-off values of <9 and >13 kPa, the sensitivity and specificity for ruling-out and ruling-in cACLD were 84% and 92%, respectively. However, a more optimal dual cut-off of <7 and >12 kPa was found to have 92% sensitivity and 90% specificity for ruling-out and ruling-in cACLD (AUROC = 0.89; 95% CI = 0.87-0.91; p < 0.001).

**Conclusion:** Our study suggests that a dual cut-off of <7 and >12 kPa, as measured by 2D SWE, is more optimal for ruling-out and ruling-in cACLD than the previously proposed cut-off values.
FRI-483
Hospital discharge after percutaneous liver biopsy-less is more?
Isabel Garrido1, Rosa Coelho 1, Guilherme Macedo 1.
1Centro Hospitalar Universitário de São João, Gastroenterology Department, Portugal
Email: isabelmng@hotmail.com

Background and aims: Liver biopsy is a technique frequently performed in clinical practice. However, the recommended surveillance period after the procedure is not established in the guidelines. The primary objective of this study was to assess the safety of hospital discharge 2 hours after a percutaneous liver biopsy. The secondary objectives were to assess the degree of patient satisfaction with early hospital discharge and to report the incidence of complications.

Method: Prospective monocentric study which included all patients who underwent percutaneous liver biopsy between December 2020 and November 2022. Individuals were discharged 2 hours after the procedure according to a protocol that was implemented in our institution. The ethical approval for this study was obtained from the Ethics Committee.

Results: A total of 200 patients were included, the majority male (52.0%), with a median age of 52 years old (IQR 40–60). There were 191 (95.5%) outpatients and 9 (4.5%) inpatients. Most procedures were made under conscious sedation with midazolam (97.0%) or under anesthesia with propofol (1.0%). A total of 88 (44.0%) US-guided biopsies were performed with the Tru-cut needle (16G or 18G) and 112 (56.0%) after US site marking with the Menghini needle. Two-needle passes were required in 33 (16.5%) cases, three-needle passes in 8 (4.0%) cases and four-needle passes in 1 (0.5%) case. In addition to a biopsy of the liver parenchyma, 6 (3.0%) patients also underwent a biopsy directed to a liver lesion/nodule. Forty-two (21.0%) individuals had complications at the time of or within 2 hours of the procedure (abdominal pain n = 29, pain radiating to the shoulder n = 11, headache n = 2). Most complications (90.4%) occurred in the first hour after the liver biopsy. Thirty-five (17.5%) patients required analgesia. Only 5 (2.5%) patients were kept under observation for 4 hours due to abdominal/shoulder pain. On the phone call made by the nurse, carried out 4 hours after the procedure, 28 (14.0%) patients reported abdominal/shoulder pain, 2 (1.0%) patients reported nausea and 1 (0.5%) patient reported headache. Only 5 of these individuals underwent analgesic therapy and all of them reported symptomatic improvement. In addition, 2 (1.0%) patients contacted the on-call physician for shoulder pain (4 days after the procedure) and nausea (3 days after the procedure). There were no serious complications and no patient required admission. The majority of individuals reported being satisfied (21.6%) or very satisfied (77.8%) and felt safe (98.9%) with this protocol.

Conclusion: This is one of the first prospective studies worldwide to prove that patients requiring percutaneous liver biopsy can be safely discharged after a short recovery time. In fact, major complications after liver biopsy are rare and manifest early. In addition, patients showed a preference for early hospital discharge and felt safe with this protocol.

FRI-484
Non-invasive assessment of adult bilirubin based on multispectral reconstruction technology and a smartphone platform
WenQian Geng1, Zhiyuan Sun 2, Wanyu Li 1.
1The first hospital of Jilin University, Department of hepatobiliary and pancreatic Medicine, Changchun, China; 2Chinese academy of sciences, Changchun institute of optics, fine mechanics and physics, Changchun, China
Email: liwanyu@jlu.edu.cn

Background and aims: Jaundice refers to yellow coloration of the skin and sclera caused by increased levels of serum bilirubin, which is an important indicator of liver function. The aim of this study is to evaluate jaundice in a meticulous, non-invasive and intelligent way by using multispectral reconstruction technology on the platform of smartphone.

Method: A total of 351 patients with normal or elevated total serum bilirubin (TSB) were selected. Non-invasive detection equipment was set up, and scleral images were obtained without an external light...
source in the room. After the scleral image was extracted, the RGB image of the sclera was reconstructed into a multispectral image to obtain the quantized bilirubin level, namely, the normalized bilirubin value.

**Results:** The linear correlation coefficient between the normalized bilirubin value and TSB was 0.854 (Fig. a). The Bland–Altman consistency test indicated that 97.4% of the values were within the 95% limits of agreement (LOA) (Fig. b). There were no significant differences in the normalized bilirubin values of the sclera at different orientations in the same patient. There was a high correlation between normalized bilirubin and TSB in different groups of sex, age, bilirubin grade, disease spectrum and bilirubin elevation type. The area under the receiver operating characteristic (ROC) curve was 0.90, the sensitivity was 75.0%, and the specificity was 92.0%.

**Conclusion:** The non-invasive bilirubin detection method we proposed has high accuracy, sensitivity and universality. Compared with the “gold standard” of bilirubin detection, this non-invasive detection method is cost-effective, easy to perform, and can reduce the discomfort of patients, suitable for long-term monitoring of bilirubin.

FRI-485
Diagnosis and treatment of patients with suspected mucinous cystic neoplasms according to the EASL-guidelines: a retrospective cohort study
Alicia Furumaya1,2, Hannah Schulz1,2, Joanne Verheij1,2, Bart Takkenberg1,2, Marc Besselink1,2, Geert Kazemier1,4, Joris Erdmann1,2, Otto van Delden1,2, 1Amsterdam Umc, University of Amsterdam, Netherlands, 2Amsterdam Gastroenterology Endocrinology Metabolism, Netherlands, 3Amsterdam Umc, Vrije Universiteit Amsterdam, Netherlands; 4Cancer Center Amsterdam, Netherlands.<Please check the city names are missing.>

Email: a.furumaya@amsterdamumc.nl

Figure: (abstract: FRI-484): a. Correlation between total serum bilirubin (TSB) and normalized bilirubin: r = 0.854, p < 0.01. TSB: Total serum bilirubin. b. Bland-Altman plot of TSB versus normalized bilirubin. The mean difference is zero and 97.4% of the values were within the 95% limits of agreement, i.e., ± 161.8 umol/L.

Figure: (abstract: FRI-485).
Background and aims: Mucinous cystic neoplasms (MCNs) are a rare subset of hepatic cysts with a low malignant potential. The recent European Association for the Study of the Liver (EASL) guidelines provide guidance on the imaging features and surgical management of MCNs, yet are hampered by a lack of studies adhering to the revised World Health Organization (WHO) criteria. Therefore, the current study attempted to validate the new 2022 EASL-guidelines in a retrospective cohort study of patients who underwent surgery for suspected MCN.

Method: Patients undergoing surgery for suspected MCN in a single center between 2010 and 2020 were included. Imaging features were assessed according to the EASL guidelines and were compared to final pathological diagnoses, according to the WHO criteria. Surgical outcomes were compared between deroofing and complete (minor or major) resection.

Results: In total, 35 patients were included. In three patients, there were no worrisome imaging features, yet final pathological diagnosis showed MCN. Contrarily, three patients with worrisome imaging features had simple cysts and another three patients with worrisome imaging features had an alternative diagnosis. The sensitivity of the EASL-guidelines for the diagnosis of MCN was 40% (95% CI: 5.3–85%) and the specificity was 80% (95% CI: 61–92%). More recurrences occurred after deroofing (n = 4/15) compared to complete, minor resection (n = 0/17, p = 0.038).

Conclusion: In conclusion, although the new EASL-guidelines provide some guidance, they could not reliably distinguish MCN from other cysts in our series. Thus, we should be careful in selecting surgical strategies based on these criteria.

FRI-486

Use of magnetic resonance elastography for accurate staging of liver fibrosis in children with autoimmune hepatitis

Wojciech Janczyk1, Jedrzej Sarnecki2, Piotr Pawliszak2, Paulina Oprycha2, Kamil Janowski1, Diana Kamińska1, Małgorzata Wóźniak3, Wiesława Grajowska4, Maciej Pronicki2, Elżbieta Jurkiewicz2, Piotr Socha3,1Children’s Memorial Health Institute, Gastroenterology, Hepatology, Feeding Disorders and Pediatrics, Warsaw, Poland; 2Children’s Memorial Health Institute, Radiology, Poland; 3Children’s Memorial Health Institute, Gastroenterology, Hepatology, Feeding Disorders and Pediatrics, Poland; 4Children’s Memorial Health Institute, Pathology, Poland

Email: w.janczyk@ipczd.pl

Background and aims: Autoimmune hepatitis (AIH) may present as hepatitis, chronic or acute liver failure. Liver fibrosis may progress to cirrhosis. Pharmacological treatment is aimed to preserve liver function and induce remission. Magnetic resonance elastography (MRE) has been already applied in many chronic liver diseases for non-invasive assessment of liver fibrosis. Previously we showed an excellent diagnostic accuracy of transient elastography in assessment of advanced liver fibrosis in children with AIH. Now we aimed to evaluate the usefulness of MRE in relation to liver biopsy and selected laboratory markers of liver function in the large pediatric AIH cohort.

Method: We included 48 children (26 females) with mean age of 13.9 yrs with established AIH and 16 healthy children aged 14.4 yrs as controls. All patients with AIH underwent liver biopsy and MRE to assess liver fibrosis. Liver biopsy was performed for monitoring purposes. Histology was described semiquantitatively based on modified scoring system by Ishak. Statistical analysis was performed to assess correlation between liver fibrosis on histology, MRE and selected lab tests. The area under the curve (AUC) for the ROC and its 95% CI were calculated to determine diagnostic accuracy of MRE in estimating mild fibrosis vs advanced fibrosis. The AUC were calculated by using the logistic procedure in MedCalc v. 20.215.

Results: Our patients with AIH presented with increased liver fibrosis on MRE 3 Kpa (2.4; 3.8) [median (lower; upper quartile)] and various grade of fibrosis according to histological score. Fibrosis on MRE was significantly higher in AIH than in healthy control group 2.3 kpa (2.2; 2.6); p = 0.002 using Mann-Whitney U test.

Conclusion: MRE was highly accurate to discriminate between mild and advanced fibrosis when compared to liver biopsy. MRE can be used in children with autoimmune hepatitis for assessment of liver fibrosis and especially to pick up those patients with advanced fibrosis.

FRI-487

Fibrosis-4 index is associated with cardiovascular risk in people living with HIV

Giulia Morsica1, Costanza Bertoni1,2, Daniele Ceccarelli1, Laura Galli1, Hamid Hassan1, Alessia Siribelli1,2, Riccardo Lolatto1, Antonella Castagna1,2, Caterina Uberti-Poppa1,2,1San Raffaele, Scientific Institute, Dept. of Infectious Diseases, Milan, Italy; 2Vita Salute, University, Milan, Italy

Email: morsica.giulia@hsr.it

Background and aims: The severity of liver fibrosis dictates the risk of cardiovascular complications. We investigated the association between Fib4 and the cardiovascular risk (CVR) in patients living with HIV (PLWH) and the diagnostic performance of fibrosis4 (Fib4) index as non-invasive marker of liver fibrosis (NILF).

Method: CVR and Fib4 were calculated in 5235 PLWH using the atherosclerotic cardiovascular disease (ASCVD) score categorized as: 7.5 = low risk, 7.5–20 = intermediate risk, >20 = high risk. LF by fibroscan was categorized according to manufacturer’s cutoff: F0-F1 = <7 Kpa; F2 = 7–9 Kpa; F3-F4 >9 Kpa. The diagnostic performance of Fib4 was assessed in 855 PLWH with paired fibroscan as gold standard for LF. The area-under-the-curve (AUC) and the cut-off values of Fib4, compared to LF classification (F0-F1 vs F2 and F2vs F3-F4), were determined by the logistic regression and the receiver operating characteristics (ROC) curves.

Results: The AUC-ROC identified a Fib4 threshold of 1.30 for F2 vs F0-F1 and 2.35 for F3-F4 vs F2 (Fig. 1). Of 5235 PLWH, 3167 had Fib4 < 1.30 (group1)1551 had Fib4 >1.30<2.35 (group2) and 517 had Fib4 >2.35 for F3-F4 vs F2 (Fig. 1). Of 5235 PLWH, 3167 had Fib4 < 1.30 (group1)1551 had Fib4 >1.30<2.35 (group2) and 517 had Fib4 >2.35 for F3-F4 vs F2 (Fig. 1). For diagnosis of advanced fibrosis (F>=F4) MRE showed very good diagnostic accuracy (AUROC 0.88) and even better for F>=F5 (AUROC 0.9). Optimal cut-off point for F>=F4 was 3.65 kpa with high sensitivity and specificity (see Figure below).
Exocrine pancreatic insufficiency = 55 (65.5%); endocrine pancreatic dysfunction and related factors are not well known. In this entity, liver biopsy has been shown to be inconsistent, so other diagnostic tools should be sought. In addition, it is still unclear whether liver steatosis is part of its varied clinical presentation or a separate entity. Aims were to estimate sensitivity, specificity, negative and positive predictive values of utilizing a two-stage approach to non-invasive fibrosis testing in patients with hepatitis C virus infection.

**Method:** Cross-sectional study. Adult patients cared for in a Cystic Fibrosis Unit were included. Liver assessment was performed by TE, NITs (APRI, FIB4, HSI, NFS), PDFF and MRE. To evaluate the specificity and sensitivity of TE and NITs compared to PDFF and MRE as gold-standards, ROC curves were performed. A univariate analysis was performed to search for factors associated with both entities.

**Results:** N = 84. Age = 32.5 (24.75–41 years). Women = 35 (41.7%). Exocrine pancreatic insufficiency = 39 (46.4%); malnutrition = 7 (8.3%). 20.2% presented with liver steatosis in PDFF; 23.8% in TE. The ROC curves of diagnostic accuracy of TE compared to PDFF and MRE are shown in Figure 1. None of the NITs performed a statistically significant diagnostic accuracy. In univariate analysis, malnutrition (95% CI 0.968 (0.931–0.993); p = 0.029) and elevated alkaline phosphatase levels (95% CI 1.03 (1.002–1.059); p = 0.015) were related to liver steatosis; and age (95% CI 0.906 (0.829–0.996); p = 0.042), endocrine pancreatic insufficiency (95% CI 1.003 (0.95–1.057); p = 0.025), lowered bilirubin (95% CI 1.073 (1.047–1.099); p = 0.001) and alkaline phosphatase (95% CI 1.015 (1.002–1.029); p = 0.018) levels, and vitamin A (95% CI 1.015 (1.002–1.025); p = 0.018) were related to liver dysfunction.

**Conclusion:** We identified a Fib4 thresholds distinguishing F0-F1 vs F2 vs F3-F4 stiffness categories in PLWH. We found the correlation of Fib4 with CVR assessed by ASCVD in a large sample size of PLWH.
Method: We performed secondary data analysis on clinical trial and retrospective data from collaborators and the literature for patients with HCV with or without HIV co-infection for four major fibrosis staging methods: Fibrosis-4 (FIB-4; N = 579), AST-to-platelet ratio index (APRI; N = 580), FibroTest (N = 101), and Transient Elastography (TE; N = 282). We used a stochastic, individual-based microsimulation model (HEP-CE) to predict Metavir fibrosis stage using independent probabilities from each staging test based on this data, using liver biopsy as gold standard for true Metavir fibrosis stage. We compared two strategies: each serum test in combination with TE only for those with intermediate (F2/F3) results on the first test (staged approach) or each test in combination with TE for all individuals (two tests for all), and selected the maximum result from the two tests. We then calculated sensitivity, specificity, NPV and PPV of correctly identifying cirrhosis (F4), using Metavir fibrosis stage prevalence of a US national federally qualified health center cohort with chronic HCV.

Results: With the calculated population prevalence of cirrhosis of 4.2%, individual test NPVs for cirrhosis ranged from 98.2% for FIB-4 to 99.4% with TE (Table). PPV ranged from 12.3% (FibroTest) to 51.3% (TE). Sensitivity of detecting cirrhosis improved from 60.8–86.7% with individual tests to 93.1–98.1% with two-test approaches. However, combining serum testing strategies with TE resulted in only slightly higher NPV (range: 99.7% for FIB-4 to 99.9% for FibroTest) and PPV (range: 13.5% with FibroTest to 27.6% with FIB-4) for correctly staging F4 than serum testing alone. NPV and PPV changed minimally between using a second testing method for all vs. only for those with intermediate stages (F2/F3) on the first test.

Conclusion: We demonstrate that with low prevalence of cirrhosis, combining results from a serum staging test plus TE minimally improves NPV for detecting cirrhosis using a serum test alone, and performing TE in all yields limited clinical benefit over the staged approach. These data can help inform clinicians practicing in various settings with different availability of testing and also decision modelers to estimate clinical and cost-effectiveness of fibrosis staging methods.

FRI-490
Repeatability of liver stiffness measurement by vibration-controlled transient elastography and controlled attenuation parameter in patients with cirrhosis
Rohit Loomba1, Jaclyn Bergstrom1, Maral Amangurbanova1, Christie Hernandez1, Egbert Madamba1, Claude Sirlin1, Daniel Huang1.
1 University of California San Diego, United States
Email: daniel_huang@nus.edu.sg

Background and aims: The regulatory qualification of non-invasive tests (NITs) for liver fibrosis severity assessment is a major unmet need for drug development and clinical care in cirrhosis. Ultrasound-based methods such as vibration-controlled transient elastography (VCTE) evaluate liver stiffness measurement (LSM) and controlled attenuation parameter (CAP) as a marker for fibrosis severity and steatosis, respectively. Repeated use of VCTE has the potential to assess disease response and progression. However, this potential application has been limited by a paucity of repeatability data in the patient population at risk. The aim of this prospective study from the San Diego Cirrhosis Registry was to address this knowledge gap and contribute to the evidentiary basis needed for the qualification of ultrasound-based methods in various contexts of use in clinical trials and practice.

Method: A prospective cohort of adults with suspected or established cirrhosis underwent two FibroScan examinations (Fibroscan Expert 630, Echosens, France) on the same day performed by the same experienced operator. LSM by VCTE and CAP measurements were reported and analyzed in units of kPa and dB/m, respectively. The primary end point was the same-day/same-operator repeatability coefficient (RC), which represents the value under which the difference between repeated measurements should fall with a 95% probability. Secondary outcomes include the intra-class correlation coefficient (ICC) which represents the proportion of total variation explained by between-patient differences rather than measurement variation, and the within-case coefficient of variation (wCV), which represents the ratio of within-patient variation to overall measurement values.

Results: Repeat scans were available on 24 participants (mean age of 61 years, 58% were women, mean body mass index (BMI) was 30.4 kg/m²). The percentage of cases due to non-alcoholic steatohepatitis (NASH), alcohol, hepatitis C virus, and hepatitis B virus were 67%, 13%, 17%, and 4%, respectively. RC was 7.4 kPa for LSM by VCTE and 82.1 dB/m for CAP, meaning that any change greater than those values has a 95% probability to reflect true change rather than measurement error. ICC was excellent for LSM (.96) and fair for CAP (.74), while wCV indicates that the within-patient variation is close to the overall measurement values for LSM and CAP (Table 1).

Table: Repeatability, intra-class correlation, and within-case coefficients for LSM by VCTE and CAP

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>APRI</td>
<td>68.6%</td>
<td>79.4%</td>
<td>98.3%</td>
<td>14.3%</td>
<td>95.8%</td>
<td>81.6%</td>
<td>99.8%</td>
<td>18.6%</td>
<td>95.8%</td>
<td>81.2%</td>
<td>99.9%</td>
<td>18.2%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIB-4</td>
<td>60.8%</td>
<td>90.1%</td>
<td>98.2%</td>
<td>27.2%</td>
<td>93.1%</td>
<td>89.3%</td>
<td>99.7%</td>
<td>27.6%</td>
<td>94.8%</td>
<td>88.7%</td>
<td>99.8%</td>
<td>26.8%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FibroTest</td>
<td>85.7%</td>
<td>71.3%</td>
<td>99.0%</td>
<td>12.3%</td>
<td>98.1%</td>
<td>72.9%</td>
<td>99.9%</td>
<td>13.6%</td>
<td>98.1%</td>
<td>72.6%</td>
<td>99.9%</td>
<td>13.5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TE</td>
<td>86.7%</td>
<td>91.9%</td>
<td>99.4%</td>
<td>51.3%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NPV and PPV calculated using a prevalence of cirrhosis that reflects US population with chronic HCV accessing care at federally qualified health centers: 44.8% F0, 25.5% F1, 21% F2, 4.5% F3, 4.2% F4.

Conclusion: LSM and CAP measurement by FibroScan XXX model, demonstrated good repeatability within patients with cirrhosis. These repeatability estimates are likely to inform ultrasound-based NIT qualification by defining the values that are expected to reflect a true change in the context of clinical trials or clinical care.
**Background and aims:** Liver related disease contributes to 13–18% of all-cause mortality in people living with HIV (PLWHIV). Transient elastography (TE) has been validated as a non-invasive tool for assessment of liver fibrosis stage. By means of controlled attenuation parameter (CAP), TE proved to be a useful screening tool for steatosis (HS) in patients at high-risk for NAFLD. TE use in HIV mono-infected patients has not yet been validated as in patients with other liver diseases. The aim of this study was to analyze the TE data in an Egyptian cohort of PLWHIV, and determine the predictors of fibrosis and HS in them.

**Method:** This cross-sectional study was conducted on PLWHIV in Kasr Alainy Viral Hepatitis Centre between July-December 2022. Focused clinical interview was performed including smoking, alcohol use, hepatitis C or B (HCV or HBV) co-infection, hypertension, dyslipidemia or diabetes mellitus (DM) and any co-morbidity suggestive of metabolic syndrome. Body mass index (BMI) was calculated, and patients were examined for signs of liver disease. Active HCV or HBV co-infection was excluded. Patients who previously received HCV treatment and achieved SVR were included in this cohort. Testing was done for liver enzymes, glycated haemoglobin (HbA1c), lipogram, HIV RNA and CD4 count. After fasting, a good quality TE was performed. Results of fibrosis were considered significant if liver stiffness (LS) >7.1 and significant HS if CAP >238 dB/m.

**Results:** A total of 145 patients were included; 83.4% were males, 36.25 ± 10.2 years was the mean age, 45.5% were smokers, 15.9% reported occasional alcohol intake, 13.8% had previous HCV, and 46.2% were obese. The median ALT and AST were 22 and 25, respectively. Mean HbA1c was 5.59 ± 0.7 and undetected HIV viral load in 58.6%. As indicated by TE, 11.7% had significant fibrosis, F4 in respectively. Meanwhile, obesity and older age were predictors of HS. TE proved to be a useful screening tool for steatosis (HS) in patients at high-risk for NAFLD. TE use in HIV mono-infected patients has not yet been validated as in patients with other liver diseases. The aim of this study was to analyze the TE data in an Egyptian cohort of PLWHIV, and determine the predictors of fibrosis and HS in them.

**Background and aims:** Liver related disease contributes to 13–18% of all-cause mortality in people living with HIV (PLWHIV). Transient elastography (TE) has been validated as a non-invasive tool for assessment of liver fibrosis stage. By means of controlled attenuation parameter (CAP), TE proved to be a useful screening tool for steatosis (HS) in patients at high-risk for NAFLD. TE use in HIV mono-infected patients has not yet been validated as in patients with other liver diseases. The aim of this study was to analyze the TE data in an Egyptian cohort of PLWHIV, and determine the predictors of fibrosis and HS in them.

**Method:** This cross-sectional study was conducted on PLWHIV in Kasr Alainy Viral Hepatitis Centre between July-December 2022. Focused clinical interview was performed including smoking, alcohol use, hepatitis C or B (HCV or HBV) co-infection, hypertension, dyslipidemia or diabetes mellitus (DM) and any co-morbidity suggestive of metabolic syndrome. Body mass index (BMI) was calculated, and patients were examined for signs of liver disease. Active HCV or HBV co-infection was excluded. Patients who previously received HCV treatment and achieved SVR were included in this cohort. Testing was done for liver enzymes, glycated haemoglobin (HbA1c), lipogram, HIV RNA and CD4 count. After fasting, a good quality TE was performed. Results of fibrosis were considered significant if liver stiffness (LS) >7.1 and significant HS if CAP >238 dB/m.

**Results:** A total of 145 patients were included; 83.4% were males, 36.25 ± 10.2 years was the mean age, 45.5% were smokers, 15.9% reported occasional alcohol intake, 13.8% had previous HCV, and 46.2% were obese. The median ALT and AST were 22 and 25, respectively. Mean HbA1c was 5.59 ± 0.7 and undetected HIV viral load in 58.6%. As indicated by TE, 11.7% had significant fibrosis, F4 in respectively. Meanwhile, obesity and older age were predictors of HS. TE proved to be a useful screening tool for steatosis (HS) in patients at high-risk for NAFLD. TE use in HIV mono-infected patients has not yet been validated as in patients with other liver diseases. The aim of this study was to analyze the TE data in an Egyptian cohort of PLWHIV, and determine the predictors of fibrosis and HS in them.

**Conclusion:** In this first Egyptian report on PLWHIV, older age, DM, dyslipidemia, and obesity were predictors of significant fibrosis and hepatic steatosis.
FRI-493
Safety and signal intensity of a novel liver-specific MRI contrast agent, Orviglance® (manganese chloride tetrahydrate), in adult subjects with mild, moderate, or severe hepatic impairment
Nadilka Hettiarachchige1, Andreas Norlin1, Hanna Persson Hedman1, Eric Lawitz2. 1Ascelia Pharma Ab, Sweden; 2The Texas Liver Institute, United States
Email: nadilka.h@ascelia.com

Background and aims: Orviglance is a novel oral magnetic resonance imaging (MRI) contrast agent developed for visualization of focal liver lesions. In this study, we investigated safety and change in MRI signal intensity (SI) in the liver over time after a single dose of Orviglance in adult subjects with hepatic impairment.

Method: Subjects with mild (n = 9), moderate (n = 6) or severe (n = 7) hepatic impairment as defined by the Child-Pugh score and matched controls with normal hepatic function (n = 13) were given a single dose of Orviglance. Safety was evaluated until 72 hours post-dose. Absolute change in liver SI was assessed pre-dose and at 1, 4, 8 and 24 hours post-dose.

Results: 10 (28.6%) of the 35 subjects reported adverse events. All adverse events were gastrointestinal disorders of mild to moderate severity, with no differences across stages of hepatic impairment. No safety findings were observed for ECG, vital signs or laboratory parameters. Mean liver SI enhancement peaked at 4 hours post-dose and was 53.2, 31.7 and 26.3 compared to pre-dose levels in subjects with mild, moderate and severe hepatic impairment, respectively. Corresponding SI enhancement for subjects with normal hepatic function was 79.0.

Conclusion: Orviglance was safe and well tolerated in subjects with varying degrees of hepatic impairment. Consistently with previous studies, highest liver SI enhancement was observed at 4 hours after administration independently of hepatic impairment severity. A consistent reduction in liver SI enhancement was observed with increasing severity of hepatic impairment. The safety profile suggests that Orviglance can be used in patients with any degree of hepatic impairment.

FRI-494
Soluble CD163 as a biomarker of liver fibrosis in liver transplant recipients
Emilie Høegholm Ernst Lauridsen1, Rasmus Hvidbjerg Gantzel1, Allan Rasmussen2, Henning Grønbæk1, Susanne Dam Nielsen3, Gerda Villadsen1. 1Aarhus University Hospital, Department of Hepatology and Gastroenterology, Aarhus, Denmark; 2Copenhagen University, Department of Surgical Gastroenterology, Copenhagen, Denmark; 3Copenhagen University, Department of Infectious Diseases, Copenhagen, Denmark
Email: emllur@rm.dk

Background and aims: Soluble CD163 (sCD163) is a marker of liver inflammation and fibrosis in acute and chronic inflammatory liver diseases. However, it remains unknown whether the plasma sCD163 level reflects liver fibrosis in patients following liver transplantation. This study aims to investigate the associations between the non-invasive inflammation and fibrosis marker plasma sCD163, the FIB-4 score, and liver stiffness (FibroScan) in liver transplant recipients.

Method: This project is a sub-study of the Danish Comorbidity in Liver Transplant Recipients (DACOLT) study and consists of 110 liver transplant recipients recruited from Aarhus University Hospital. FibroScan stiffness is considered as the non-invasive golden standard for liver fibrosis.

Results: The included patients had a median age of 51 years (range: 21–76), 51 (46.4%) patients were male and the median time from transplantation to inclusion was 6 years (range: 0.4–31). Autoimmune diseases were the most common causes of transplantation with primary sclerosing cholangitis as the predominant etiology (26%). The median sCD163 was 2.64 mg/L (IQR: 2.02–3.54) and 19 patients (17%) had sCD163 levels above the normal range (>3.86 mg/L). The patients with a liver stiffness >8 kPa (n = 16) had significantly higher sCD163 than patients with a liver stiffness <8 kPa (3.84 mg/L (IQR: 3.13–5.01) vs. 2.57 mg/L (IQR: 1.95–3.06), p < 0.001). We observed a significant correlation between sCD163 and liver stiffness (rho = 0.38, p < 0.001). Patients with a FIB4 score >1.45 (n = 51) had higher median sCD163 than patients with a FIB4 score <1.45 (2.86 mg/L (IQR: 2.23–3.77) vs. 2.48 mg/L (IQR: 1.99–3.14), p = 0.07). However, there was no correlation between sCD163 and the FIB-4 score. In addition, we observed no correlation between the FIB-4 score and FibroScan liver stiffness (rho = 0.13, p = 0.20).

Conclusion: In liver transplant recipients, plasma sCD163 correlated with liver stiffness but not with the FIB-4 score. There was no correlation between the FIB-4 score and liver stiffness, questioning...
the FIB-4 score as a marker of liver fibrosis in liver transplant recipients. In contrast, our data suggest that SCD163 is a clinically relevant biomarker for detection of liver fibrosis in liver transplant recipients.

**FRI-495**
Does methotrexate therapy harm the liver in psoriatic patients?
Isabel Bessa1, Ana Correia-Sá2, Leticia Marques Leite1, Hugo Oliveira3, Margarida Gonçalo1,4, Arsenio Santos1,5, Armando Carvalho1,5, Adelia Simão1,5, 1Centro Hospitalar e Universitário de Coimbra, Internal Medicine, Coimbra, Portugal; 2Centro Hospitalar e Universitário de Coimbra, Internal Medicine, Coimbra, Portugal; 3Centro Hospitalar e Universitário de Coimbra, Dermatology, Coimbra, Portugal; 4University of Coimbra, Faculty of Medicine, Dermatology, Coimbra, Portugal; 5University of Coimbra, Faculty of Medicine, Internal Medicine, Coimbra, Portugal
Email: aspcarvalho@gmail.com

**Background and aims:** Psoriasis is associated with a greater risk of hepatic damage, including steatosis and fibrosis. A popular and crucial medication for the treatment of psoriasis is methotrexate (MTX), that is known to cause transaminasemia, but it isn’t clear yet how this affects liver fibrosis or steatosis. Patients with psoriasis who also suffer from obesity, diabetes or metabolic syndrome have a greater risk of developing liver fibrosis, and there is evidence that MTX can act synergistically, contributing to the liver damage in these patients.Transient elastography (TE) and controlled attenuation parameter (CAP) are non-invasive methods to assess liver fibrosis and steatosis, respectively. The aim of our study is to assess if psoriatic patients treated with MTX have higher degrees of fibrosis and steatosis that those not treated with MTX.

**Method:** A case-control prospective study was undertaken on 85 patients (45 males, 40 females) with psoriasis, 65 of them treated (study group) and 20 not treated with MTX (control group). Epidemiological and clinical data were collected, and TE and CAP (Fibroscan) were performed on all patients. Data were analysed using the SPSS Statistics” platform.

**Results:** Both groups appear to be similar, with no statistically significant difference regarding sex, BMI, duration of disease, other comorbidities (dyslipidaemia, type 2 diabetes mellitus and hypertension), and alcohol consumption, but with a significant difference in mean age (60 years for treated patients and 52 years for those not treated with MTX). The mean elasticity in treated patients was 7.38 (+ 7.81) kPa and in the control group was 5.97 (± 3.03) kPa (p = 0.160). The mean CAP was 270.66 (+ 7.014) dB/m in treated patients and 250.85 dB/m (+ 64.70) dB/m in non-treated (p = 0.170). We did not found a statistically significant correlation between the duration of the disease, or the cumulative MTX dose (less or more than 2 g) and the grade of steatosis or the stage of fibrosis. There was a statistically significant difference concerning steatosis in obese versus non-obese patients (p = 0.012)—including those treated with MTX (p = 0.001)—but not for fibrosis. There was no statistically significant difference for fibrosis or steatosis in the presence versus absence of type 2 diabetes mellitus, dyslipidaemia, or alcohol consumption in our psoriatic patients.

**Conclusion:** In our psoriatic patients, MTX has no significant effect in the stage of fibrosis or grade of steatosis. Obesity has a significant correlation with steatosis, but not with fibrosis, independently of MTX therapy. Type 2 diabetes mellitus and dyslipidaemia and alcohol consumption have no correlation with fibrosis or steatosis in all the patients. Studies with more patients and follow-up are needed to better clarify the impact of MTX therapy in the liver of psoriatic patients.
Data was stored and analyzed using IBM-SPSS version 25.0. Receiver operating characteristic curve (ROC) analysis was performed on PTAR and Meld Na scores to identify the cutoff of these parameters. The sensitivity and specificity were also estimated using ROC curve. After obtaining cutoff value for PTAR using ROC, all quantitative and qualitative parameters were assessed using Mann Whitney U test and Fisher’s exact test. The p value less than 0.05 was considered statistically significant.

**Results:** Out of a total 307 DCLD patients enrolled, male patients outnumbered female patients, 54.7% (n = 168) versus 45.3% (n = 139). The median age of the patients was 54 (45–61) years. Total number of deceased patients was 61 (19.9%). The ROC curve analysis showed the area under the curve for PTAR was 58%, with 95% confidence interval (0.51–0.66) and for Meld Na score it was 65% with 95% confidence interval (0.58–0.72). Both were found statistically significant with p <0.05. The cutoff value of PTAR suggested by the ROC curve was 0.25 for mortality. The sensitivity and specificity for PTAR was 95.1% and 3.7%. Upon further analysis, ROC curve showed that as the sensitivity increases, the value of 1-specificity also increase and the cut off value of PTAR for mortality decreases.

**Conclusion:** In our study PTAR showed significant positive correlation with MELD Na and high sensitivity in predicting mortality of DCLD patients. The PTAR is easily calculated through commonly available laboratory investigations. It can serve as a prognostic tool and can facilitate health care professionals to make early decisions regarding admission of these patients into high dependency units in a resource constraint medical centre. However, multicentric studies at larger scale need to be conducted to validate the results.

**FRI-498**

**Moving toward a more perfect liver function test: the next generation of HepQuant tests**

Michael McRae1, Steve Helmke2, Greg Everson2. 1Custom Diagnostic Solutions, LLC, United States; 2HepQuant, LLC, United States Email: michaelpmcrae@gmail.com

**Background and aims:** The HepQuant SHUNT Test (V1.0) uses stable isotopes of cholate administered both intravenously (13C-CA) and orally (d4-CA) to quantify liver function and physiology. The Test has been used in over 26 clinical trials and studies, encompassing a broad range of etiologies and stages of liver disease, where it has compared favorably to other liver diagnostic tests. However, the Test is sensitive to variability in the timing of collection of the 5-minute blood sample and difficulty in maintaining intravenous access. The aim of this study was to enhance the Test and its performance by simplifying the sampling procedure and shortening the time of testing. Herein we evaluate two new versions of the Test: V1.1 and V2.0.

**Method:** In V1.0, the volume of distribution (Vd) is calculated from ln-linear regression of 5- and 20-minute 13C-CA concentrations versus time. V1.1 estimates Vd based on body weight and height (Lemmens et al. 2006), eliminating the requirement for the 5-minute blood sample. V2.0 is based on our published compartmental analysis (McRae et al. 2022) and further simplifies sampling requirements to 2 timepoints at 20 and 60 minutes. To compare reproducibility, coefficients of variation (CV) and intraclass correlation coefficients (ICC) with one-sided test for lower acceptable limit of 0.7 were analyzed in a study of 16 controls, 16 NASH patients, and 16 HCV patients, each with 3 replicate tests conducted on 3 separate days (Burton et al. 2021). We assessed differences in areas under the receiver operator characteristic curve (AUROC) for predicting large esophageal varices (LEVs) in hepatitis C (HCV) subjects from the HALT-C study (N = 217) (Everson et al. 2012) by the DeLong method. Test outputs include a Disease Severity Index (DSI) and portal-systemic shunting (SHUNIT).

**Results:** For the measurement of DSI, V1.1 and V2.0 demonstrated similar ICCs but improved CVs relative to the V1.0 method. For the measurement of SHUNIT, the V1.1 and V2.0 test versions demonstrated improved reproducibility based on both ICC and CV. Diagnostic performance based on AUROCs for V1.1 and V2.0 was equivalent to V1.0 in most cases and improved in V1.1 for SHUNIT.

**Conclusion:** The next generation of HepQuant SHUNT tests V1.1 and V2.0 simplify the test administration by eliminating the 5-minute sample (V1.1), reducing the total samples required to 2 (V2.0), and shortening the time from 90 minutes to 60 minutes (V2.0). These improvements should enhance operator performance, resource utilization, and patient acceptance of the HepQuant testing procedure, allowing for greater utilization of HepQuant for measuring liver function and physiology.

**FRI-499**

**Liver elastography is a useful technique to assess the severity of liver congestion in patients with Budd-Chiari syndrome**

Marcos Andres Thompson1, Oana Nicoara-Farcău2, Ernest Belmonte1, Maria Angeles Garcia-Criado1, Anna Darnell1, Valeria Perez1, Lara Orts1, Pamela Vizarra1, M Ângels Falga1, Joana Codina Jane1, Fanny Turon1, Anna Baiges1, Pol Olivas1, Marta Magaz2, Giuseppe Grassi1, Sarah Shalaby1, Virginia Hernandez-Gea1, Juan Carlos Garcia Pagan1, 1Hospital Clinic Barcelona, Hepatic Hemodynamic Laboratory, Liver Unit, Hospital Clinic, Barcelona, Spain Email: thompsonmarcos86@gmail.com

**Background and aims:** In Budd-Chiari syndrome (BCS), hepatic congestion is the main cause of portal hypertension development. Liver congestion is a recognized cause of increase in liver stiffness (LS). Recent publications suggest that LS could be useful in assessing on congestion and the response to treatment in BCS. Our study aimed...
FRI-500
Fibrosis-4 score less than 2.67 and normal gamma-glutamyl transferase levels are associated with high negative predictive value for high-risk of liver stiffness in patients with primary biliary cholangitis

Alan Bonder1, Vilas Patwardhan1, Joanna MacEwan2, Benjamin Polo Lorduy1, Alvaro Yagüe1, Andres Castañeda1, Rocio Calvo Hernandez1, Juan Carlos Porres Cubero1.

Background and aims: Transient elastography (TE), an imaging test for liver stiffness and fibrosis, is a non-invasive alternative to liver biopsy that is predictive of liver outcomes in individuals living with primary biliary cholangitis (PBC). Here, we assess the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of biochemical markers and commonly used composite liver fibrosis scores versus liver stiffness measured by TE in people living with PBC.

Method: Liver biochemistries, commonly used fibrosis scores, and TE stiffness measurements were obtained from electronic health records of people living with PBC followed at Beth Israel Deaconess Medical Center through October 2022. The agreement between liver biochemistries/fibrosis scores and liver stiffness (TE >10 kPa) was evaluated by sensitivity, specificity, PPV, and NPV. Normal limits for biochemistries and commonly used thresholds for fibrosis scores were assessed.

Results: Data were analyzed from 74 patients (mean 54 years of age, 96% female). Mean ALP was 1.6 × ULN (±1.2; ULN = 120 U/L) and mean total bilirubin was 0.6 × ULN (±0.3; ULN = 1 mg/dL). The PPV of liver biochemistries and composite fibrosis scores ranged from 22% to 69%; the NPV for all individual labs and composite labs was >75% (Table).

Table: Agreement between liver biomarkers/composite fibrosis scores and liver stiffness assessed by transient elastography (TE) in patients with primary biliary cholangitis

<table>
<thead>
<tr>
<th>Threshold</th>
<th>TE Data</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>PPV</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albumin ≤4 g/dL</td>
<td>85</td>
<td>0.409</td>
<td>0.937</td>
<td>0.692</td>
<td>0.819</td>
</tr>
<tr>
<td>Gamma glutamyl ≥40 U/L</td>
<td>51</td>
<td>0.900</td>
<td>0.390</td>
<td>0.265</td>
<td>0.941</td>
</tr>
<tr>
<td>Transferrase ≥1600 mg/dL</td>
<td>48</td>
<td>0.154</td>
<td>0.943</td>
<td>0.500</td>
<td>0.750</td>
</tr>
<tr>
<td>Immunoglobulin G ≥250 mg/dL</td>
<td>50</td>
<td>0.846</td>
<td>0.622</td>
<td>0.440</td>
<td>0.920</td>
</tr>
<tr>
<td>Alkaline phosphatase ≥210 U/L</td>
<td>109</td>
<td>0.846</td>
<td>0.374</td>
<td>0.297</td>
<td>0.886</td>
</tr>
<tr>
<td>Total bilirubin ≥1 mg/dL</td>
<td>109</td>
<td>0.192</td>
<td>0.952</td>
<td>0.556</td>
<td>0.790</td>
</tr>
<tr>
<td>Aspartamine ≥30 U/L</td>
<td>109</td>
<td>0.731</td>
<td>0.566</td>
<td>0.346</td>
<td>0.870</td>
</tr>
<tr>
<td>Alamine transaminase ≥40 U/L</td>
<td>109</td>
<td>0.385</td>
<td>0.735</td>
<td>0.313</td>
<td>0.792</td>
</tr>
<tr>
<td>Platelet count ≥40 x 10^9/L</td>
<td>106</td>
<td>0.083</td>
<td>0.915</td>
<td>0.222</td>
<td>0.773</td>
</tr>
<tr>
<td>FIB-4 score ≤2.67</td>
<td>106</td>
<td>0.208</td>
<td>0.927</td>
<td>0.455</td>
<td>0.800</td>
</tr>
<tr>
<td>APRI score ≤0.5</td>
<td>106</td>
<td>0.458</td>
<td>0.768</td>
<td>0.367</td>
<td>0.829</td>
</tr>
</tbody>
</table>

*TE scores and liver biomarkers/fibrosis scores assessed within ± 60 days of each other.

1Probability of a positive TE test (liver stiffness ≥10 kPa).
2Probability of a negative TE test (liver stiffness ≤10 kPa).
3Composite of age, AST, ALT, and platelet count.
4Ratio of AST as a multiple of ULN to platelet count.

Conclusion: These findings indicate that these readily available liver biochemistries and commonly used fibrosis scores are excellent predictors of a low-risk liver stiffness value (TE <10 kPa) in people living with PBC. When TE testing is not available, healthcare providers can use standard liver biochemistries to further assess overall liver health.

FRI-501
Suitability of Fibroscan, APRI and FIB-4 indexes compared with liver biopsy in the evaluation of liver fibrosis: a single-centre retrospective study

Benjamin Polo Lorduy1, Alvaro Yagüe1, Andres Castañeda1, Rocio Calvo Hernandez2, Juan Carlos Porres Cubero1, Hospital Universitario Fundación Jiménez Díaz, Spain

Email: bpolo@fjd.es

Background and aims: The prognosis and management of liver diseases largely depend on the amount and progression of liver fibrosis and the possibility of developing cirrhosis. Liver biopsy has traditionally been considered the gold standard for the diagnosis of cirrhosis and staging of fibrosis. However, it is invasive and inaccurate technique with many drawbacks. In order to overcome the limitations of liver biopsy, a number of non-invasive markers have been developed over the past decade for the evaluation of liver fibrosis. The aim of this study is to evaluate the ability of FibroScan, APRI and FIB-4 indexes to predict liver fibrosis using liver biopsy as the reference standard.

Method: The case records of 204 patients who underwent liver biopsy from March 2019 until November 2022 were retrospectively reviewed. Those patients who had undergone FibroScan measurements and blood samples simultaneously or with a maximum difference of one month from liver biopsy were included in the study,
with a final number of 188 patients. Liver fibrosis stage was determined using the METAVIR system.

**Results:** 188 patients with a mean age of 51.8 ± 13.3 years were examined, being women the majority of them (72.9%). FibroScan liver stiffness results ranged from 4.50 to 8.30 kPa (median: 5.9 kPa), while serological marker values ranged from 0.85 to 2.01 (median: 1.34) for FIB-4 and from 0.36 to 1.11 (median: 0.54) for APRI. In liver biopsy, 81.4% of the patients presented F0–1, while mild fibrosis (F2–F3) was found in the remaining 18.6%. For the detection of F2–F3, FibroScan showed a sensitivity of 77% and a specificity of 80% with a positive predictive value of 47% and a negative predictive value of 94%. Its degree of concordance with the biopsy was moderate (kappa index: 0.45). Regarding FIB4 and APRI, both showed high sensitivity (91% for FIB4 and 86% for APRI) and low specificity (63% for FIB4 and 50% for APRI), with a kappa index of 0.35 and 0.20, respectively.

**Conclusion:** FIB-4 and APRI indexes had an acceptable ability to detect the presence or absence of mild fibrosis; this capacity is due for their high negative predictive values. However, the weak degree of agreement and the lack of specificity shown by these non-invasive methods indicates that liver biopsy is still necessary for the diagnosis of liver fibrosis stage. In the other hand, FibroScan is more accurate and comparable to liver biopsy with a moderate degree of agreement, but it also needs a specific device and a trained health practitioner that might not be available in some cases.

**FRI-502**

**Hepatobiliary manifestations in pediatric COVID-19**

Tetiana Stoieva1, Olga Dzhagiashvili1, Vira Dovzhyk2.

1Odessa National Medical University, Department of Pediatrics №2, Odessa, Ukraine; 2Odessa National Medical University, Faculty of Medicine №1, Odessa, Ukraine

Email: olga.dzhagiashvili@onmedu.edu.ua

**Background and aims:** Mechanisms of digestive damage in COVID-2019 are important. Possible factors include virus-induced influence, systemic inflammation, hypoxia, hypovolemia, drug-induced hepatotoxicity, etc. The aim of this study is analysing the digestive system and hepatobiliary tract in children who had COVID-19.

**Method:** We examined 27 children aged 11 to 16 who had COVID-19 and signs of digestive damage.

**Results:** The mean age of the examined children was (13.8 ± 1.6) years, with no gender differences. It was found that (71.4 ± 8.7)% children had a history of functional disorders: the cyclic vomiting syndrome- (4.8 ± 4.1)%, the overlap syndrome- (19.0 ± 7.5)%, functional disorders of the gallbladder and sphincter of Oddi- (47.6 ± 9.6)%.
A gastroesophageal reflux disease- (28.3 ± 8.7)% and chronic gastroduodenitis- (14.3 ± 6.7)% occurred among organic diseases. The infection was manifested by an increase in temperature from subfebrile (37.0 ± 9.3)°C to febrile (63.0 ± 9.3)°C with a severe disease course and such respiratory symptoms as dry cough, nasal congestion, rhinorrhea, hyperemia of the posterior pharyngeal wall. Gastrointestinal symptoms in children with a history of digestive diseases appeared on the 2nd–3rd days, in other children a little later by the 4–5th and were characterized by the following symptoms:

- abdominal pain- (70.4 ± 8.8)%
- nausea- (40.7 ± 9.5)%
- vomiting- (25.9 ± 8.4)%
- diarrhea- (33.3 ± 9.1)%

Along with gastrointestinal symptoms, some children (22.2 ± 8.0)% had changes in taste and eating behavior. Hepatobiliary symptoms were as follows: heaviness in the right hypochondrium (51.9 ± 9.6)%, bitter taste in the mouth (29.6 ± 8.8)%, stool acholia (40.7 ± 9.5)%, which were accompanied by dyspeptic disorders. The laboratory data revealed: a slight increase of transaminases (25.9 ± 8.4)%, an increase in alkaline phosphatase (7.4 ± 5.0)%, the presence of neutral fat in the coprogram (18.5 ± 7.5)% of children. Ultrasound revealed enlarged gallbladder (37.0 ± 9.3)% thickening of its wall (22.2 ± 8.0)%, a moderate enlargement of the liver (14.8 ± 6.8)%, microliths and gallbladder sludge (29.6 ± 8.8)%.

Gastrointestinal manifestations proceeded 10–32 days. A dynamic ultrasound revealed progression of gallbladder sludge in (18.5 ± 7.5)% children, which required administration of ursodeoxycholic acid preparations.

**Conclusion:** Among the digestive disorders, the hepatobiliary pathology often occurs in children with COVID-19. Liver damage takes place because of several mechanisms combination, and is characterized mainly by signs of cholestasis. Treatment should include hepatoprotectors and choleretic therapy along with antiviral therapy.
to those with no risk factors. We performed multivariable regression on age, gender, risk factors, predisposing illnesses, and social economic parameters.

**Results:** The cohort consisted of 6,444 individuals, with a median age of 57 (IQR 52–63), 52% female. The prevalence of behavioral risk factors for fibrosis was 1,852 (29%) alcohol overuse, 2,551 (40%) obesity, 621 (10%) T2D, and 3,456 (54%) MetS. 2,850 participants had two or more risk factors, 2,000 only had one risk factor and 1,594 had no risk factors. We performed biopsies on 203 individuals with elevated liver stiffness (165 Kleiner fibrosis stage F0–F2, 38 F3–F4). Obesity was the strongest predictor of poor HRQoL overall. Individuals with obesity reported lower physical health and energy, whilst having more pain than other groups. Individuals with alcohol overuse or obesity had lower emotional and social well-being. Individuals with MetS reported the highest HRQoL overall, only surpassed by the group with no risks. We found no significant differences in HRQoL between groups with fibrosis or cirrhosis on any of the domains. Obesity was the only risk factor significantly associated with all eight domains after multivariable regression e.g. general health –4.78 (95%CI –6.02 to –3.54). Alcohol overuse was more negatively associated in domains concerning emotional and social well-being, compared to no risks, emotional –4.25 (95%CI –5.31 to –3.19) vs. no risks (.01 95%CI –1.38 to 1.40).

**Conclusion:** Individuals with obesity report lower HRQoL than any other group at risk of liver fibrosis. This is independent of the fibrosis stage and the presence of other risk factors. Alcohol overuse correlates with lower emotional and social well-being.

**WEDNESDAY 21 JUNE**

**WED-477**

**Effectiveness of vaccine education on vaccine awareness and vaccine uptake in patients with cirrhosis of liver of a tertiary care center in South India**

K L Aje1, Arun Valsan2, A Athira1, Devika Menon1, S Devika1, Axwin Shaji1, K T Moly3, Priya Nair1. 1Amrita College of Nursing, Foundations of Nursing, Ernakulam, India; 2Amrita Hospital, Kochi, Gastroenterology, Kochi, India; 3Amrita College of Nursing, Principal, Ernakulam, India

Email: capt.ajeemail@gmail.com

**Background and aims:** Patients with cirrhosis of the liver are prone to bacterial or viral infections that can lead to increased morbidity and mortality. Many of these infections are vaccine preventable and the Centers for Disease Control (CDC) currently recommends vaccination for all susceptible chronic liver disease patients. It is observed that vaccination status of patients with liver disease is poor and currently there are no guidelines available in India for vaccination of patients with cirrhosis. Hence, we aimed to study the effectiveness of vaccine education on vaccine awareness and vaccine uptake in patients with cirrhosis of liver.

**Method:** A pilot study was undertaken among 100 adult patients with cirrhosis of liver who were vaccine naive except for Covid-19 from October 2022 to Dec 2022. We used one group pre-test post-test design with a total enumerative sampling technique. A validated questionnaire with a Cronbach's alpha of 0.81 was used to measure the level of vaccination awareness. The awareness questionnaire had twenty closed ended questions with maximum score of 60. The awareness level was categorized as lack of awareness (≤15), low level awareness (16–30), medium-level awareness (31–45) and high-level awareness (>45). After collecting information on vaccination status and state of awareness of adult vaccination from the eligible sample presenting at outpatient services using a direct interview technique, information about adult vaccination was given one-on-one basis by a trained nurse. After 7 days, a post-test (interview) was done to assess awareness, thereafter within 45 days after the first interaction, the immunization record was reviewed. Statistical analysis was done with SPSS 20.0. The study was approved by the institutional ethics committee ECASM-AIMS-2022-158 dated 11 October 2022.

**Results:** The mean age of the study population was 60 years with predominantly males (81%). All were vaccinated against Covid-19. About 65% had comorbidities like Diabetes (34%) and hypertension (31%). Seventy-six percent of patients had low-level awareness about vaccination. After the vaccine education module was administered, post-test interview revealed significant (p < 0.00) improvement in level of awareness from low to high (97%). Also, this led to significant vaccine uptake within day 45. The uptake of vaccination status improved from non-vaccinated to vaccinated in hepatitis B (95%), hepatitis A (76%), influenza (49%) and pneumococcal (40%).

This is of significance considering the fact that nearly half (49%) of them were diagnosed to have cirrhosis with a median diagnosis time of 3 years. About 5% of patients did not take hepatitis B vaccine due to increased bilirubin or CRP level by their treating physician’s advice. The most important reason for lesser vaccine uptake of hepatitis A, influenza and pneumococcal vaccine was cost (88%), lack of insurance coverage for preventive vaccinations (61%), accessibility (42%), lack of care-giver support (32%), fear or anxiety related to vaccination (18%).

**Conclusion:** Despite robust literature to support administration of vaccines in cirrhosis, the level of vaccine awareness and uptake is low. A structured nurse-led awareness campaign led to significant increase in vaccine knowledge and uptake. The lack of insurance coverage low awareness was the prime reasons for low vaccination status in our cohort.

**WED-478**

**Better strategies are needed to increase engagement of patients with cirrhosis with allied health and community services**

Elizabeth Powell1, Katherine Stuart1, Simon Finnigan1, Jan Hinson2, Christina Bernardes3, Gunter Hartel3, Patricia Valery1. 1Princess Alexandra Hospital, Woolloongabba, Australia; 2Australian Catholic University, Brisbane Campus, Banyo, Australia; 3QIMR Berghofer Medical Research Institute, Herston, Australia

Email: patricia.valery@qimrberghofer.edu.au

**Background and aims:** Psychosocial care needs are not routinely attended to during outpatient hepatology management, and relatively little is known about the category and effectiveness of support services accessed by patients with cirrhosis. We quantified the type
Better strategies to increase engagement of patients, team professionals and patient satisfaction with a psychologist, psychiatrist, social worker or mental health professional. 

**Results:** Although most patients (85.9%) used at least one community or allied health service for support with their liver disease, many reported requiring additional help with psychosocial (67.4%), lifestyle (34.3%) or practical needs (21.9%) that were not met by available services, or patients did not access services. In the 12 months prior to recruitment, a multidisciplinary care plan or case conference was accessed by 48% of patients and 56.2% self-reported the use of a GP for support with liver disease. The allied health clinician most commonly accessed by patients was a dietician (45.9%). Only a minority of patients reported accessing an exercise physiologist (4.4%) or physiotherapist (11.6%). Despite the high prevalence of ongoing psychosocial needs, there was relatively limited use of mental health and social work services. Only 14.1% of patients self-reported the use of a psychologist, confirmed by a low prevalence of use of mental health services (17.7%) in the linked MBS data. When comparing patients’ psychosocial needs with use of and satisfaction with self-reported consultation with relevant psycho-social health professionals, overall, 483 patients (85.9%) reported accessing at least one psychosocial need. As displayed in Figure and out of 562 patients, the need for additional help with at least one area of psychosocial challenge was reported by 125 (22.2%) patients who reported accessing relevant services and 254 (45.2%) patients who did not access relevant services. All psychosocial needs were met for 104 patients (18.5%), and 16 (2.9%) of patients reported accessing services. 

**Conclusion:** Better strategies to increase engagement of patients with cirrhosis who have unmet complex physical and psychosocial needs with allied health and community services are needed. 

**Reference**

Background and aims: As part of ongoing efforts to eliminate Hepatitis C in England and Wales, we undertook mass-testing of the inmates of HMP Full Sutton, a Category A prison in the East Riding of Yorkshire, UK. Micro-elimination in prisons through a combination of Hepatitis Intensive Test and Treat (HiTT) events and high-uptake reception testing is an important arm of the elimination programme. However, this had not previously been attempted in a Category A prison.

Method: A multiprofessional team was assembled comprising staff from the Humber and North Yorkshire Operational Delivery Network (ODN), The Hepatitis C Trust, Full Sutton prison healthcare staff, NHS England, and Spectrum Community Health. Regular planning meetings were established to coordinate between services. Prison peer-mentors were trained leading up to the event, who disseminated information to other prisoners. Two teams, each consisting of an ODN nurse, prison healthcare lead nurse, Spectrum member and a prison officer, offered testing throughout the prison across two days. Oral hepatitis C virus (HCV) antibody swabs were used to screen for HCV antibodies, sero-positive individuals received follow-up HCV RNA testing with results available same-day. HCV RNA-positive individuals were offered treatment with pangenotypic oral antiviral therapy.

Results: In total, 584 prisoners were offered HCV testing and 514 (88%) accepted a test, in addition to 161 prison staff, 15 prisoners and 1 staff member were HCV antibody positive. On HCV RNA testing, 3 prisoners were positive and 0 staff members. All three HCV RNA-positive individuals commenced oral antiviral therapy within one week of the test results.

Conclusion: Although the micro-elimination target of 95% testing uptake was not met, it was possible to test a high proportion of the prison population through a coordinated, multi-professional approach. Reasons for declining testing were related to concerns about the potential for DNA sampling or a belief that the individual did not want or deserve to be treated for this infection. Despite this, high uptake was achieved by early engagement with the prison population through peer-mentors, active participation of prison officers, and the existing good relationship between prison health-care staff and inmates. Learning has been disseminated to other ODNs for use in future Category A prison testing events.

Background and aims: Hepatitis C in England and Wales, we undertook mass-testing of the inmates of HMP Full Sutton, a Category A prison in the East Riding of Yorkshire, UK. Micro-elimination in prisons through a combination of Hepatitis Intensive Test and Treat (HiTT) events and high-uptake reception testing is an important arm of the elimination programme. However, this had not previously been attempted in a Category A prison.

Method: A multiprofessional team was assembled comprising staff from the Humber and North Yorkshire Operational Delivery Network (ODN), The Hepatitis C Trust, Full Sutton prison healthcare staff, NHS England, and Spectrum Community Health. Regular planning meetings were established to coordinate between services. Prison peer-mentors were trained leading up to the event, who disseminated information to other prisoners. Two teams, each consisting of an ODN nurse, prison healthcare lead nurse, Spectrum member and a prison officer, offered testing throughout the prison across two days. Oral hepatitis C virus (HCV) antibody swabs were used to screen for HCV antibodies, sero-positive individuals received follow-up HCV RNA testing with results available same-day. HCV RNA-positive individuals were offered treatment with pangenotypic oral antiviral therapy.

Results: In total, 584 prisoners were offered HCV testing and 514 (88%) accepted a test, in addition to 161 prison staff, 15 prisoners and 1 staff member were HCV antibody positive. On HCV RNA testing, 3 prisoners were positive and 0 staff members. All three HCV RNA-positive individuals commenced oral antiviral therapy within one week of the test results.

Conclusion: Although the micro-elimination target of 95% testing uptake was not met, it was possible to test a high proportion of the prison population through a coordinated, multi-professional approach. Reasons for declining testing were related to concerns about the potential for DNA sampling or a belief that the individual did not want or deserve to be treated for this infection. Despite this, high uptake was achieved by early engagement with the prison population through peer-mentors, active participation of prison officers, and the existing good relationship between prison health-care staff and inmates. Learning has been disseminated to other ODNs for use in future Category A prison testing events.
Background and aims: Advanced Practice Nurses (APN) have an increasing role in Switzerland to meet the needs of patients with liver diseases and their caregivers related to their physical, psychosocial, and practical problems. Although holding a master or PhD, their scope of practice is limited as e.g., by law, nurses are not allowed to prescribe or perform interventions (e.g., paracentesis). In Switzerland, two APNs at the Cantonal Hospital St. Gallen (KSSG) and University Hospital Zurich (USZ) provide in- and outpatient care within a liver transplant setting. Their roles were developed and implemented independently, depending on the clinical context and patients' needs. The APN at the KSSG provides outpatient therapies (HCV/HCC), counsels inpatients and performs, for example, hepatic encephalopathy (HE) assessments. The USZ implemented the APN role with a dedicated focus on case management in complex inpatient situations.

Method: We aimed to describe and compare the APNs' dedicated focus on case management in complex inpatient situations. The USZ implemented the APN role with a counsels inpatients and performs, for example, hepatic encephalopathy (HE) assessments. The USZ implemented the APN role with a dedicated focus on case management in complex inpatient situations. The KSSG provided outpatient therapies (HCV/HCC), counsels inpatients and performs, for example, hepatic encephalopathy (HE) assessments. The USZ implemented the APN role with a dedicated focus on case management in complex inpatient situations.

Conclusion: According to the study's findings, several perceived obstacles, including side effects, cost concerns, and a lack of motivation and support, deter patients from taking their medications as prescribed. Our findings highlight the necessity of modifying the perceived barriers and enhancing adherence in a population at risk by implementing prompt interventions.

WED-482
Advanced practice nurses' scope of practice in liver care: evaluation of two different Swiss settings
Patrizia Kuenzler1,2,3, Barbara Schoop2, David Semela1, Beat Müllerhaup2, Andreas E Kremer4, Sonja Beckmann3,5, 1Cantonal Hospital St.Gallen, Division of Gastroenterology and Hepatology, St. Gallen, Switzerland; 2Cantonal Hospital St.Gallen, Department of Nursing, St. Gallen, Switzerland; 3University of Basel, Institute of Nursing Science, Basel, Switzerland; 4University Hospital Zurich, Department of Gastroenterology and Hepatology, Zürich, Switzerland; 5University Hospital Zurich, Center of Clinical Nursing Science, Zürich, Switzerland

Background and aims: Advanced Practice Nurses (APN) have an increasing role in Switzerland to meet the needs of patients with liver diseases and their caregivers related to their physical, psychosocial, and practical problems. Although holding a master or PhD, their scope of practice is limited as e.g., by law, nurses are not allowed to prescribe or perform interventions (e.g., paracentesis). In Switzerland, two APNs at the Cantonal Hospital St. Gallen (KSSG) and University Hospital Zurich (USZ) provide in- and outpatient care within a liver transplant setting. Their roles were developed and implemented independently, depending on the clinical context and patients' needs. The APN at the KSSG provides outpatient therapies (HCV/HCC), counsels inpatients and performs, for example, hepatic encephalopathy (HE) assessments. The USZ implemented the APN role with a dedicated focus on case management in complex inpatient situations. We aimed to describe and compare the APNs' scope of practice.

Method: The APNs prospectively collected data from August-December 2022. The dataset included: patient data (e.g., characteristics, diagnosis, transplant status), process variables (e.g., type of contact, referral, setting), assessment (e.g., clinical, psychosocial, behavior) and interventions (e.g., counseling, self-management support, coordination of care). Data were descriptively analyzed on an organizational level.

Results: Both APNs provided 294 consultations in 123 patients. KSSG: The APN performed 168 consultations in 80 patients, mainly in the outpatient setting (68%). Patients' mean age was 59 years, 20% had HCC, 66% had liver cirrhosis with a mean MELD score of 12.6. 9% were pre-, and 9% post-transplant. USZ: The APN performed 126 consultations in 45 patients, mainly in the inpatient setting (80%). Patients' mean age was 57 years, 11% had HCC, 93% had liver cirrhosis with a mean MELD score of 18.5, 17% were pre-, and 9% post-transplant.

Scope of practice: Both APNs equally supported patients in symptom management (36% vs 32%) and provided education (24% vs 29%). At the KSSG, the APN interventions mostly addressed patients alone (73%) with self-management support (50%), psychosocial care (40%), decision-making (32%), outpatient medical treatment (24%), and HE assessment (18%). At the USZ, the APN interventions mostly addressed patients (65%) or caregivers alone (20%) with care coordination (44%), discharge planning (33%) and advanced care planning (22%).

Conclusion: Our results highlight the diverse scope of APN activity in relation to their main clinical context (in- or outpatient setting), thereby reflecting the divergent patient needs along the care continuum. Other clinics may use our findings to develop APN roles according to their specific context and available resources.

WED-483
Value based healthcare: patient perception of the liver cancer advanced practice nurse care at the Barcelona clinic liver cancer Neus Llarch1,2,3,4, Eva Palou5, Jessica Farre6, Gemma Iserte1,2,3, Nitia Grañes1,2, Marta Campos Gomez2,3, Joan Escarrabill3, Marília Reig1,2,4,7, BCLC group, Fundació Clínic per a la Recerca Biomèdica-IDIBAPS, Barcelona, Spain; 2CIBERehd, Madrid, Spain; 3Liver Oncology Unit. Institut de Malalties Digestives i Metbòliques, Hospital Clinic de Barcelona, Barcelona, Spain; 4University of Barcelona (UB), Barcelona, Spain; 3Patient Experience Unit. Hospital Clinic de Barcelona, Barcelona, Spain; 6Institut de Malalties Digestives i Metbòliques. Hospital Clinic de Barcelona, Barcelona, Spain; 7Liver Oncology Unit. Liver Unit. Hospital Clinic de Barcelona, Barcelona, Spain

Background and aims: Management of hepatocellular carcinoma (HCC) was traditionally based on the treatment's safety and efficacy. However, patient experience, which is the third pillar of the quality of Health Care was less evaluated. This study assesses the patient valued-heath care areas and experience of the liver cancer patients in the outpatient clinic at the BCLC. The interview was based on the patients' experience with the Advanced Practice Nurse (APN) program at BCLC.

Method: Liver cancer patients included in APN-led-educational programs were recruited and were purposefully selected based on gender, age and disease stage. Individual interviews were conducted between September and October 2020. From September to October, a qualitative study through interview techniques were carried out. The interviews, which lasted on average 22.4 minutes. (Range 13–50) were audio-recorded and transcribed verbatim and analyzed by MAXQDA software. Patients were divided into two groups according to their knowledge of the APN program (with and without knowledge).

Results: Twenty-one interviews were performed. From the transcription analysis, 306 considerations were obtained which were
grouped into 34 categories and 8 meta-categories (Figure 1). Although ‘nurses’ duties and ‘humanely’ were the main themes in all patients, other different topics were in the top-third category in each group: ‘Expectations’ in patients without knowledge and ‘emotions’ in patients who were already familiar with the APN program. Under ‘emotions’ some patients mentioned that nurses bring peace of mind, reassurance, others nervousness, regarding ‘expectations’, the patients mentioned that what they expected from the nurses is to be treated well and professionalism, which was the case. Surprisingly, punctuality (4% and 5% in patients with and without previous contact with BCLC-APN; respectively) and administrative support (6% in both groups) were less mentioned than the nurses expected.

Figure:

Conclusion: In qualitative studies results are not generalizable to all patients. Their needs/priorities can be interpreted as areas of the BCLC-APN program which need to be covered or the reflection of patients’ needs according to their knowledge of the program. These results are the rationale for developing a Value Based-APN program which includes the patients’ perceptions.

WED-484
Hepatitis C education and training for community pharmacists in Ireland
Miriam Coghlan1, Nessa Quinn1, Declan Bradley2, James Kee2, Jennifer McCartan2, Clare Fitzell2, Aiden McCormick4, Bernard Carr1, Gail Melanophy1, 1St. James’s Hospital, Pharmacy Department, Dublin, Ireland; 2Health Service Executive, Primary Care Reimbursement Service, Ireland; 3Irish Pharmacy Union, Ireland; 4National Hepatitis C Treatment Programme, Ireland
Email: coghlanm@tcd.ie

Background and aims: The availability of highly effective direct acting antivirals (DAAs) has made the elimination of Hepatitis C (HCV) a realistic goal. Simplified and devolved models of HCV care are needed to reach patients most in need of treatment. In 2019, the National Hepatitis C Treatment programme (NHCTP) in Ireland initiated a pilot programme for treatment in the community by general practitioners (GPs). DAAs prescribed could then be dispensed via a patient’s local community pharmacy. Community pharmacists are well positioned to participate in the HCV treatment process. To provide community pharmacists with the right tools to enable them to successfully participate in the HCV treatment process we needed to devolve the knowledge gained in the hospital setting in an innovative and accessible way.

Method: An online training module was developed by a hospital HCV specialist pharmacist in collaboration with the NHCTP, the Irish Pharmacy Union (IPU) and the Primary Care Reimbursement Service (PCRS). This module was hosted on the IPU website. The online module delivery was complimented by a virtual question and answer session between community pharmacists and the above stakeholders prior to patients initiating treatment. Module evaluation and feedback was captured electronically at the end of the online module. Rates of uptake and completion of the module were captured. Data on the number of patients started on HCV treatment via the community pathway was obtained from the PCRS.

Results: Since initiation of the pilot in July 2019, 110 pharmacists working across 87 pharmacies have completed the community pharmacist training module. Treatment has been commenced by 98 patients to date in the community setting. Among pharmacists who completed the online training module, 99% agreed that the training made them more competent in the area of Hepatitis C patient care with 99% agreeing that they will use the knowledge they gained to develop new workplace practices or services. Participants identified that the training increased their confidence in engaging and working with GPs and hospital-based colleagues to treat patients with HCV infection in their communities.

Conclusion: The online module has facilitated the involvement of community pharmacists in the processes of medication reconciliation, drug-drug interaction review, dispensing new medication and adherence counselling as related to DAAs in a patient’s local community setting. The online module has allowed specialist HCV pharmacists to disseminate knowledge and learnings to community pharmacists in a standardised way. This training model has also supported greater inter-professional working among GPs and pharmacists across primary and secondary care settings.

WED-485
Quality improvement project: improving early identification of liver disease in diabetic patients in a district general hospital with opportunistic FibroScan®
Amy Thatchert1, Catherine Mitchell2, Vijay Grover2, 1Hillingdon Hospital, United Kingdom; 2The Hillingdon Hospital, United Kingdom
Email: amy.thatcher@nhs.net

Background and aims: The vast majority of liver disease is preventable, early detection is imperative to manage the disease and prevent complications. Despite diabetes being well recognised as a risk factor for fatty liver disease, diabetic patients are not routinely screened for liver fibrosis. The aim of this quality improvement project (QI) is to improve early identification of liver disease in patients with diabetes in both in and out patient district general hospital setting using FibroScan.

Method: Inpatients admitted to hospital and out-patients attending the diabetic clinic with type 1 and 2 diabetes were offered a FibroScan by the Hepatology Clinical Nurse Specialist (CNS). Patients were provided with information prior to the FibroScan and those who consented were scanned. If the FibroScan was suggestive of liver fibrosis (>8 kPa), the Hepatology CNS collected data on patients Alanine Transaminase (ALT), Liver Stiffness Measurement (LSM), Controlled Attenuation Parameter (CAP), Body Mass Index (BMI) and Metabolic Risk Factors (MRF) (Hypertension and Dyslipidemia). Patients were excluded if they were known to have liver fibrosis, acute hepatitis, alcohol excess (>14 units per week) or raised inflammatory markers.

Results: 40 patients were offered a FibroScan, 21 outpatients and 9 inpatients, 10 outpatients declined. 30 patients accepted a FibroScan, of which 14 had Type 1 Diabetes Mellitus (T1DM) (age range 26–65) and 16 Type 2 Diabetes Mellitus (T2DM) (age range 30–86). 14% of T1DM had fibrosis with 7% CAP score of >Steatosis grade 1 (S1). 78% BMI >25, 35% had one or more MRF with an average ALT of 19. 56% with T2DM had fibrosis with 50% CAP score of >S1, 62% BMI >25, 81% one or more MRF with an average ALT of 29. 19% of T2DM had newly diagnosed cirrhosis.
Conclusion: This opportunistic screening QI project identified a significant number of T2DM patients with previously undiagnosed liver fibrosis, with majority having unremarkable liver enzymes. This has demonstrated the importance for this cohort of patients to be screened for liver fibrosis to prevent the complications of advanced liver disease.

WED-486 Changes in frailty as a predictor of readmission risk in patients with liver cirrhosis. Preliminary results

Martina Perez1,2, Marta Cervera1,3, Marta Carol1,2, Ana Belén Rubio2, Ruth Nadal1, Jordi Gratacos1,3, Anna Soria1,3, Ana Arslanow4, Adria Juanola1,3, Elisa Roose1,2, Isabel Graupera1,2,3, Pere Ginès2,1,2,3, Núria Fabrellas2,4,1 Liver Unit, Hospital Clinic de Barcelona, Spain; 2University of Barcelona, Spain; 3Institut d’Investigacions Biomèdiques August Pi i Sunyer (IDIBAPS), Spain
Email: maperezgu@clinic.cat

Background and aims: In addition to the complications of cirrhosis, the decompensated phase of the disease is characterized by the presence of sarcopenia, physical deterioration and/or malnutrition, all of which are associated with the concept of frailty. Recent studies have shown that frailty is a poor prognostic factor in patients with liver cirrhosis. Elevated frailty is also associated with an increase in unplanned hospitalizations, regardless of the severity of liver disease. The most frequently used tool to assess frailty is the Liver Frailty Index (LFI), designed specifically for patients with cirrhosis. Most published studies have assessed frailty at a single point; however, decompensated cirrhosis is a dynamic disease and patients’ status can vary over a short period of time. The evolution of LFI changes in this population could be of interest as a tool to predict disease prognosis. The aim of this study is to investigate the relationship between changes in frailty and disease progression in patients with decompensated cirrhosis after hospital discharge.

Method: Prospective observational study in patients with decompensated cirrhosis who had been discharged after admission for a complication of cirrhosis. Frailty was measured by LFI at two points: at hospital discharge and at 7 days, and correlated with hospital readmissions within 28 days after inclusion. The cohort was divided into two groups, patients who had been readmitted within 28 days after inclusion and those who had not. The delta value of the LFI was calculated (taking into account the baseline and day 7 values) and the patients were classified into two groups, those who had improved and those who had remained the same or worsened.

Results: A total of 52 patients have been included so far, 38 of whom have completed a follow-up of 28 days. The baseline characteristics of the cohort are: mean age 62 years, mean 7 days of admission, 52% of the patients were alcoholic, and the most frequent complication was ascites, present in 63% of the patients. Considering a 28-day period, 8 patients were readmitted and 30 were not. The association between the readmission group and the LFI delta value was calculated. Of the group of patients who were readmitted, 5 patients (62% of the total of this group) had worsened LFI and 3 (38%) had improved LFI. Of the group of patients who were not readmitted, 11 (37%) had worse LFI and 19 (63%) had better LFI.

Conclusion: Although the N of this study does not allow affirmation, the analysis provides crucial evidence to suggest that the delta value of the LFI may be a useful tool to predict the risk of readmission in patients with decompensated cirrhosis. Another added value of these data lies in demonstrating the importance of improving frailty status in this population.

WED-487 Mental health, quality of life, and stigmatization in Danish patients with liver disease

Nadja Østberg1, Birgitte Jacobsen1, Mette Lauridsen1, Lea Ladegaard Grønkjær1, 1University Hospital of Southern Denmark, Department of Gastroenterology and Hepatology, 6700 Esbjerg, Denmark
Email: ns_atlive.dk

Background and aims: Understanding the patient perspective is pivotal in the achievement of concordance with care and treatment. However, the mental health of patients with liver diseases is often overlooked when assessing their overall health and planning liver care, although the presence of mental health disorders are associated with poor patient outcomes, including symptom progression, increased hospitalization burden, and mortality. Thus, the aim of this study was to assess anxiety, depression, hopelessness, quality of life, and the perception of stigmatization in a large cohort of patients with chronic liver disease of different aetiologies and severity, as well as identify predictors associated with mental health disorders.

Method: A total of 340 patients completed a survey assessing mental health using the Beck Anxiety Inventory, the Beck Hopelessness Scale, and the Major Depression Inventory. Quality of life was measured with the Chronic Liver Disease Questionnaire and the European Quality-of-Life visual analogue scale. To assess stigmatization, eight validated questions from the Danish nationwide survey of patient experiences were used. Predictors associated with anxiety, hopelessness, and depression were analysed using univariable and multivariable logistic regression analyses.

Results: Fifteen percent of the patients had moderate or severe anxiety, 3% had moderate or pronounced hopelessness, and 8% had moderate or severe depression. The prevalence of all three was highest in patients with cirrhosis and was associated with a low quality of life. More patients with cirrhosis had experience stigmatization compared to patients with liver disease without cirrhosis, and more than one third of the patients, regardless of aetiology and severity, refrained from telling others about their liver disease.

Conclusion: Mental health disorders were present and associated with low quality of life in patients with liver disease and worst in patients with fully developed cirrhosis. In addition, patients experienced stigmatization. Our results emphasize the need for increased focus on mental health problems, development of intervention studies to explore the effect of therapy on quality of life and disease outcomes, and awareness on preventing discrimination and stigmatization of patients with liver disease.
WED-488
Clinical interdisciplinary development of a home-based enteral nutrition initiation and refeeding monitoring model of care for patients with chronic liver disease
Erin Russell1, Suong Le2,3,4, Patricia Anderson2, Anita Figredo3, Sheree Phillips1, Sally Bell2,4, Thomas Worland2. 1Monash Health, Nutrition and Dietetics Department, Australia; 2Monash Health, Gastroenterology Department, Australia; 3Monash Digital Therapeutics and Innovation Laboratory (MoTIL), Australia; 4Monash University, School of Clinical Sciences, Australia; 5Monash Health, Hospital in the home, Australia
Email: russell.ee@hotmail.com

Background and aims: Malnutrition and sarcopenia are prevalent in 20 to 70% of adults with chronic liver disease (CLD) and are independently associated with increased mortality. Enteral nutrition (EN) can promote muscle mass restoration and improve objective liver function markers including Child-Pugh score. Malnourished CLD patients, and those with alcohol abuse, are at risk of refeeding syndrome on commencing EN. Inpatient capacity for EN initiation and monitoring was reduced during the COVID-19 pandemic. We developed an interdisciplinary home-based model of care to safely commence EN and monitor for complications in CLD patients.

Method: Monash Health is the second largest Australian tertiary healthcare network. Between February and June 2022, an inter-disciplinary team of dietitians, gastroenterologists, general physicians, pharmacists, and nurses developed a home-based model of care. The protocol was derived from existing internal protocols and international guidelines for enteral feeding and refeeding management. Key elements include initiating, progressing, monitoring, escalation and ceasing enteral nutrition.

Results: We created an organisation-wide framework for supportive and collaborative patient care between multiple hospital departments (Hepatology, Hospital in the Home [HITH] and Dietetics). Our protocol includes roles and responsibilities, escalation pathways, instructions for initiating enteral feeding, precautions for refeeding management and a checklist for HITH nurses. Training for monitoring of these patients was completed at regular intervals to optimise stakeholder engagement. Communication pathways were developed to streamline inter-disciplinary collaboration. Our measures of success for this model of care include preventing hospital admissions, adverse events (including severe electrolyte requiring IV replacement or tube dislocation), patient tolerance, weight restoration and improvement in Child-Pugh score. Two CLD patients successfully completed the feeding program without requiring inpatient admission. There was one tube dislodgement and one IV electrolyte replacement, successfully managed as outpatients.

Conclusion: We have developed and piloted a new model of care for home-based EN initiation program within a large tertiary healthcare network. This provided safe and effective EN therapy to a vulnerable group without requiring hospitalisation. The safety, efficacy, acceptability, and cost effectiveness of this model of care compared to traditional inpatient management will be evaluated as part of our feasibility study.

WED-489
Hepatology nursing consultation in a tertiary hospital without liver transplantation: initial experience
Alia Martín1, Sandra Borrego1, Sandra Diez1, Irene Latras1, Isabel González2, Víctor Blázquez2, Carolina Broco1, Verónica Patiño1, Raisa Quiñones1, Ruben Diez1, Francisco Jorquera1, Pilar Moreno1, Yolanda Méndez1. 1University Hospital of León, León, Spain
Email: amartiniz@saludcastillayleon.es

Background and aims: Patients with chronic liver disease require continuous monitoring in order to detect complications or decompensations of their pathology. It is in this context that hepatology units, and therefore their patients, benefit from having an advanced practice nurse. The proposal was to set up a nursing practice to carry out intermediate follow-ups of patients with compensated chronic liver disease who are being followed up according to specific protocols for each disease. The objective was to analyse the activity of the hepatology nursing practice at the beginning of its activity in a tertiary care centre without liver transplantation.

Method: We retrospectively analysed the activity data of the nursing consultation at Complejo Asistencial Universitario de León from 1st January 2022 to 28th November 2022. The patient’s express approval was required for referral to this care modality.

Results: Data from 211 patients assessed in the nursing consultation were analysed. Mean age was 63 years (SD 13.1) and 60% of patients were male. 98.6% (208/211) of the appointments were scheduled and 77.3% were on-site (163/211). After the nursing consultation it was necessary to consult a hepatologist on 13 occasions (6.2%). The main reasons for consultation were: control of B-blockers (23.2%), follow-up of HBV infection (without previous liver disease) 41 (19.4%), chronic liver disease due to HCV 28 (13.3%), alcohol 22 (10.4%) and MAFLD 10 (4.7%) and follow-up of PBC without liver disease 17 (8.1%). The nurse performed a total of 299 interventions in the consultation. She provided advice on diet, exercise and lifestyle modification guidelines 134 times, adjusted medication 74 times, gave test results to 145 patients and referred 5 patients to the doctor’s office. During the consultation the following tests were requested: blood tests in 176 patients, serology in 9, abdominal ultrasound in 110, MRI in 4, Fibroscan in 19 and gastroscopy in one patient. Thirty-four patients (16.1%) did not have any tests ordered.

Conclusion: The consultation of a hepatology nurse allows efficient follow-up of the patient with chronic liver disease, emerging as a key figure in bringing the hepatology unit closer to the patient.

WED-490
Development of a web-based mobile health application (ReLiver-N App) for patient activation, self-efficacy, and quality of life in patients with liver cirrhosis
Ferya Celić1, Hicran Bektas1, 1Akdeniz University, Internal Medicine Nursing, Turkey
Email: feryacelic@gmail.com

Background and aims: Liver cirrhosis is an important health problem that increases morbidity and mortality. Utilizing accessible and sustainable mobile health applications could help provide patient education and enhance activation. When the level of patient activation gets higher, patients’ self-efficacy and quality of life get higher. Achieving this can be contributed to hepatic rehabilitation. To develop a web-based mobile health application (ReLiver-N App) led by a nurse for patient activation, self-efficacy, and quality of life support in patients with liver cirrhosis.

Method: This study was the first stage of our randomized controlled trial registered in clinical trials (ClinicalTrials.gov Identifier: NCT05658393). The development process included creating the content and designing the ReLiver-N App. We developed the ReLiver-N App-based ADDIE which is an instructional design framework and created its contents of it. After preparing the content, 10 experts evaluated the quality of the contents through “Evaluation of the Written Materials Appropriateness,” and “Teaching Materials Evaluation Form.” We evaluated the readability of the contents through Atesman Readability Formula. After that, we conducted a feasibility test with three patients to assess the usability of the ReLiver-N App. The patients evaluated ReLiver-N App through the “System Usability Scale” and “Rate Us” tabs.

Results: Our content included patient education information about liver cirrhosis and patient activity tasks and measurement questionnaires. Patient education information topics included “healthy lifestyle, let’s learn about liver cirrhosis, complications of liver cirrhosis, diagnosis, and treatment methods.” Patient activity tasks are divided into two groups, “daily activity tasks,” and “weekly activity tasks.” Daily activity tasks included “weight measurement, edema evaluation, fluid balance, bleeding check, and taking
medications." Weekly activity tasks included "taking blood pressure, heart rate, and body temperature." Patients can access the contents at this website “https://kcsiroz.com/.” The score obtained from the experts was high (20.20 ± 3.01). The high score indicated that the readability level of the ReLiver-N App was easy. In line with expert opinions, the content of the ReLiver-N App was found to be reliable (Cronbach’s alpha score: 0.83). According to the experts’ opinions, we also did some changes to the content. The score obtained from the patients was 67 points. This score indicated the usability of the ReLiver-N App was acceptable. The patients rated the ReLiver-N App three out of five points. 

**Conclusion:** We created a reliable web-based mobile health application for free. We estimate that the ReLiver-N App could help patients with liver cirrhosis to enhance their patient activation level, self-efficacy, and quality of life, and have healthier life at their homes.

**WED-491**

**Analysis of health-related quality of life in the liver transplant patient conducted more than 10 years ago, statewide study**

Sara Román Serrano, Fernando García Pérez, Spanish Federation of Liver Patients and Transplants (FNETH), Spain

**Background and aims:** To determine the health-related quality of life of patients who have undergone liver transplantation more than 10 years ago.

**Method:** Quantitative pilot study, in the form of an online survey, which was distributed through the website and social networks of the Spanish Federation of Liver Patients and Transplants (FNETH), and with the dissemination of our federated associations distributed throughout the national territory, after approval of the questionnaire by the Spanish Society of Liver Transplantation (SETH). To determine the health-related quality of life of patients who underwent liver transplantation more than 10 years ago. 10 questionnaire was used as the basis for the cross-cultural adaptation of the specific quality of life questionnaire for chronic liver diseases for use in the Spanish population. Statistical analysis of the data was performed with the Statistical Package for Social Sciences program (SPSS, version 28.0).

**Results:** The survey was open between 1 January 2021 and 31 October 2021, receiving a total of 114 surveys, of which 68 were finally valid for analysis. Socio-demographic characteristics: 58.8% of the participants were men and 41.2% were women, the age of the participants ranged from 27 to 79 years, and the average age was 58 years. The study showed a wide national demographic variety in terms of the place of origin of the participants. Immunosuppressant: 88.2% of respondents said they had all the information they needed to know about their immunosuppressant treatment, while 11.8% said they did not. Mainly the information about all aspects related to immunosuppressant is given by the doctor in 86.8%, in 7.4% of the cases the information has been provided by the nursing staff and it is striking that 5.9% say that they have to find out this information themselves. Psychological aspects: It is worth noting the low percentage of people who have received psychological help at some point (26.5%), compared to a large majority of participants who have never sought this type of support (73.5%). 82.3% of respondents consider psychological help to be quite or very important for the recovery of a transplant patient effect of the Covid-19 health crisis on health-related quality of life: These data are quite relevant since, treatment for more than 10 years now say that they lack information and knowledge about it has made us realize that this is an area that needs to be covered and improved. COVID-19 has increase in the number of people who have needed psychological support. However, we have seen that the majority of participants do not end up seeing a psychological professional.

**Conclusion:** There is a need to provide more training and information to patients by healthcare staff on immunosuppressive treatments. It could be promoted with this type of professionals in order to resolve these doubts and acquire all the necessary information on immunosuppressive treatments. The fact that people who have been receiving treatment for more than 10 years now say that they lack information and knowledge about it has made us realize that this is an area that needs to be covered and improved. COVID-19 has increase in the number of people who have needed psychological support. However, we have seen that the majority of participants do not end up seeing a psychological professional.
practical and theoretical knowledge regarding nursing care and medical treatment.

**Conclusion:** Increased awareness through Fellowship for nurses in hepatology in combination with sharing expertise and networking should potentially lead to equal nursing care for the patient suffering of liver diseases.

---

**Public Health Except viral hepatitis**

**WEDNESDAY 21 TO SATURDAY 24 JUNE**

**TOP-094**

Global, regional, and national burdens of cirrhosis in children and adolescents aged under 19 years from 1990 to 2019: a systematic analysis based on the global burden of disease study 2019

Chi Zhang¹, Yiqi Liu¹, Hong Zhao¹, Gui-Qiang Wang¹, ¹Peking University First Hospital, Department of Infectious Disease, Center for Liver Disease, China

Email: john131212@126.com

**Background and aims:** Cirrhosis and other chronic liver diseases (collectively referred to as cirrhosis) were the leading cause of morbidity and mortality in adults, but data on the burden and trends were sparse in children and adolescents. We aimed to assess the trends in 204 countries and territories over the past 30 years in children and adolescents aged 0–19 years.

**Method:** Data on cirrhosis was collected by the Global Burden of Disease (GBD) 2019 database from 1990 to 2019. We reported on the number, rates, and average annual percentage changes (AAPCs) of incidence and disability-adjusted life-years (DALYs) of cirrhosis at global, regional, and national level. Joinpoint regressions were used to calculate the AAPC of cirrhosis.

**Results:** Globally, the incident numbers of cirrhosis in children and adolescents increased from 204,767 in 1990 to 241,364 in 2019, an increase of 17.9%, with an AAPC 0.13 (0.10 to 0.16). Substantial change in incidence of cirrhosis in 1996, 2006, 2009, and 2017. Prevalence (AAPC = −2.27[−2.39 to −2.15]), mortality (AAPC = −1.68[−1.86 to −1.5]), and DALYs rate (AAPC = −1.72[−1.88 to −1.56]) of cirrhosis have decreased significantly. Cirrhosis incident rates varied between sex and age groups. Rates of cirrhosis caused by alcohol use (AAPC = 0.8 to 1.1); incidence cases increased most obvious (48%), hepatitis C (AAPC = 0.4[0.4 to 0.5]), NAFLD (AAPC = 0.5 [0.3 to 0.6]) have been increasing, while only hepatitis B (−0.3[−0.4 to −0.2]) decreasing.

Incidence cases of cirrhosis were increased in low (101.6%) and low-middle sociodemographic index (SDI 21.1%) areas, while decreasing in middle and above SDI areas. At the regional level, the largest increases count was observed in Sub-Saharan Africa.

**Conclusion:** Global incidence rate of cirrhosis has been increasing, while the DALYs rate has been decreasing in children and adolescents. Morbidity of cirrhosis caused by hepatitis B declined, while hepatitis C, NAFLD, and alcohol use increased. We appealed for that in low SDI regions and countries, promoting the widespread vaccination of hepatitis B vaccine and reducing HCV infection were prominent; in middle and high SDI regions and countries, reducing cirrhosis caused by NAFLD and alcohol use were urgent.

**TOP-095**

A systematic review of interventions for alcohol use disorder in patients with cirrhosis or alcohol-related hepatitis

Christopher Oldroyd¹,², Olivia Greenham¹, Graham Martin³, Michael Allison¹,², Caitlin Notley³, ¹Liver Unit, Cambridge University Hospitals NHS Foundation Trust, Cambridge, United Kingdom; ²NIHR Biomedical Research Centre, Cambridge University Hospitals NHS Foundation Trust, Cambridge, United Kingdom; ³THIS Institute, University of Cambridge, Cambridge, United Kingdom; ⁴Faculty of Medicine and Health Sciences, Norwich Medical School, University of East Anglia, Norwich, United Kingdom

Email: christopher.oldroyd@nhs.net

**Background and aims:**

The incidence rate of cirrhosis in children and adolescents at countries and regions level in 2019.

**Results:**

- Globally, the incident numbers of cirrhosis in children and adolescents increased from 204,767 in 1990 to 241,364 in 2019, an increase of 17.9%, with an AAPC 0.13 (0.10 to 0.16).
- Prevalence (AAPC = −2.27[−2.39 to −2.15]), mortality (AAPC = −1.68[−1.86 to −1.5]), and DALYs rate (AAPC = −1.72[−1.88 to −1.56]) of cirrhosis have decreased significantly.
- Cirrhosis incident rates varied between sex and age groups.
- Rates of cirrhosis caused by alcohol use (AAPC = 0.8 to 1.1); incidence cases increased most obvious (48%).
- Hepatitis C (AAPC = 0.4[0.4 to 0.5]), NAFLD (AAPC = 0.5 [0.3 to 0.6]) have been increasing, while only hepatitis B (−0.3[−0.4 to −0.2]) decreasing.
- Incidence cases of cirrhosis were increased in low (101.6%) and low-middle sociodemographic index (SDI 21.1%) areas, while decreasing in middle and above SDI areas.
- At the regional level, the largest increases count was observed in Sub-Saharan Africa.

**Conclusion:**

Global incidence rate of cirrhosis has been increasing, while the DALYs rate has been decreasing in children and adolescents. Morbidity of cirrhosis caused by hepatitis B declined, while hepatitis C, NAFLD, and alcohol use increased. We appealed for that in low SDI regions and countries, promoting the widespread vaccination of hepatitis B vaccine and reducing HCV infection were prominent; in middle and high SDI regions and countries, reducing cirrhosis caused by NAFLD and alcohol use were urgent.
**Background and aims:** Continued alcohol use is the most important factor in determining the prognosis of patients with alcohol-related cirrhosis and alcohol-related hepatitis. Previous systematic reviews of interventions for alcohol use disorder (AUD) have not been specifically targeted at patients with cirrhosis or alcohol related hepatitis. This review addresses this evidence gap.

**Method:** We followed the PRISMA guidelines for systematic reviews. Five databases were searched (MEDLINE, Web of Science, Embase, CINAHL and PSYcinfo) between inception of the database until November 2022. We included randomised trials and cohort studies which assessed the impact of an intervention to reduce alcohol intake with and without an active comparator. Only studies which included data specific to patients with cirrhosis or alcohol related hepatitis were included. We present a narrative synthesis of the results.

**Results:** 23 studies were included in the final analysis. The study population was dominated by two, large, retrospective, database-derived cohorts which included 101,745 patients with cirrhosis. The remaining 21 studies included 2574 patients, including 7 randomised controlled trials (RCTs) with 293 patients (Table 1). The most frequently assessed intervention was attendance at addiction therapy or alcohol rehabilitation (7 studies). Other interventions were pharmacological (baclofen, acamprosate, naltrexone, faecal transplant), psychological (motivational therapy, educational sessions) and attendance at specialist clinics. Two studies looked generically at the impact of any intervention for AUD. One retrospective cohort examined the impact of using low alcohol drinks. Studies variably reported outcomes related to liver disease (decompensation of cirrhosis, mortality and hospital admissions) (n = 6), alcohol use only (n = 10) or both outcome categories (n = 6). All of the studies which recorded alcohol outcomes reported that the intervention was beneficial in reducing intake or preventing relapse. In studies with control groups which reported on mortality, addiction treatment, attendance at outpatient clinics and (in a large database derived cohort) any AUD treatment had a statistically significant beneficial effect (p < 0.05). Three studies with control groups examined readmissions with only one finding a statistically significant reduction, this being associated with addiction therapy. Seven studies looked at new episodes of hepatic decompensation or change in MELD score. Of these, five of the interventions were found to have a statistically significant beneficial effect.

**Figure:** RCTs in the review

<table>
<thead>
<tr>
<th>Reference</th>
<th>Country</th>
<th>Age (Mean or Median)</th>
<th>Males n</th>
<th>Intervention</th>
<th>Outcomes</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sussman 2005</td>
<td>USA</td>
<td>44</td>
<td>75%</td>
<td>25 Educational sessions</td>
<td>Alcohol only</td>
<td>3 months</td>
</tr>
<tr>
<td>Addolorato 2007</td>
<td>Italy</td>
<td>56</td>
<td>64%</td>
<td>Baclofen</td>
<td>Alcohol only</td>
<td>3 months</td>
</tr>
<tr>
<td>Bajaj 2021</td>
<td>USA</td>
<td>65</td>
<td>100%</td>
<td>20 Faecal transplant</td>
<td>Alcohol only</td>
<td>6 months</td>
</tr>
<tr>
<td>DeMartini 2018</td>
<td>USA</td>
<td>50.8</td>
<td>73%</td>
<td>15 Text based - intervention</td>
<td>Alcohol only</td>
<td>8 weeks</td>
</tr>
<tr>
<td>Proeschold-Bell 2020</td>
<td>USA</td>
<td>54.9</td>
<td>71.3%</td>
<td>58 Alcohol intervention</td>
<td>Alcohol only</td>
<td>12 months</td>
</tr>
<tr>
<td>Weinrieb 2011</td>
<td>USA</td>
<td>49.2</td>
<td>84%</td>
<td>91 Alcohol treatment</td>
<td>Alcohol only</td>
<td>24 months</td>
</tr>
</tbody>
</table>

**Conclusion:** Interventions for alcohol use disorder can be effective in improving clinical outcomes of patients with cirrhosis and alcohol related hepatitis. The evidence base is dominated by large database derived cohorts and the interventions are not well defined, indicating the need for further research in this area.
Background and aims: Higher ultra-processed food intake was associated with higher odds of NAFLD in both adolescents (OR Quintile 5 vs Quartile 1 = 2.34, 95% CI = 1.01–5.41, Ptrend = 0.15) and adults (OR Quintile 5 vs Quartile 1 = 1.78, 95% CI = 1.04–3.03, Ptrend = 0.002). In adults, about 68% and 71% of the association between UPF intake and NAFLD was mediated by BMI and waist circumference (all P values <0.001), respectively. We also found higher UPF intake was positively associated with serum levels of albumin and C-reactive protein in adults. Results were similar for adolescents though not statistically significant.

Conclusion: Higher UPF intake was associated with higher odds of having NAFLD among both adolescents and adults. These associations are largely mediated by elevated body fatness. Further prospective studies are needed to confirm our findings. If confirmed, reducing UPF intake might help prevent NAFLD in both adolescents and adults.
SAT-115
Healthcare resource use and costs among patients with primary sclerosing cholangitis in Sweden—a retrospective population-based cohort study
Annika Bergquist1, 2, Nandita Kachru3, Martina Aldvén4, Oskar Ström4, Douglas Knutsson5, Emilie Toresson Grip2,4, Hannes Hagström1,2. 1Department of Medicine, Huddinge, Karolinska Institutet, Stockholm, Sweden; 2Division of Hepatology, Department of Upper GI Diseases, Karolinska University Hospital, Stockholm, Sweden; 3Gilead Sciences Inc., Foster City, United States; 4Quantify Research AB, Sweden; 5Quantify Research AB, Sweden

Background and aims: Primary sclerosing cholangitis (PSC) is a rare, chronic, cholestatic liver disease characterized by biliary inflammation and fibrosis of both small and large bile ducts, that can potentially lead to cholestasis and cirrhosis. This study characterized the baseline comorbidities, healthcare resource utilization (HRU) and costs among PSC patients in Sweden.

Method: Using the Swedish National Patient Register which captures all hospitalizations and outpatient hospital visits, PSC patients (≥18 years) were identified via ICD-10 codes from 01/01/2002 to 12/31/2020 using diagnosis of PSC (K83.0A) and/or combination of cholangitis (K83.0) and inflammatory bowel disease (IBD) (K50 or K51). Those with prior diagnosis of biliary atresia, cystic fibrosis, human immunodeficiency virus or primary biliary cholangitis were excluded. First date of PSC diagnosis within this period defined the index date. Patients were required to have ≥360 days look-back (baseline) period and ≥30 days of follow-up. Incident patients (with no PSC diagnosis 1 year prior to index date) were followed from the baseline (4.6% had compensated or decompensated cirrhosis, 4.7% had hepatobiliary or pancreatic malignancy and 1.0% had been transplanted). 73% patients had IBD and 16.4% showed use of ursodeoxycholic acid. The mean length of inpatient stay, number of hospitalizations and outpatient visits were found to significantly increase from baseline to follow-up period (5.1 ± 12.9 vs. 15.5 ± 43.1, 0.9 ± 1.7 vs. 1.8 ± 3.8, 4.9 ± 7.5 vs 6.6 ± 9.6 respectively; p < 0.0001). Similarly, total all-cause healthcare costs reported a significant increase by 117% (from € 9424.4 to € 20,487.2; p < 0.0001), hospitalization costs were the primary driver (Figure).

Conclusion: Although PSC is considered a rare disease, the impact on HRU and costs are reported to be substantial. Early identification and effective therapies are needed to reduce the risk of disease progression and subsequent healthcare costs.

SAT-116
Health economics of the enhanced liver fibrosis test in the detection of advanced liver fibrosis in patients with non-alcoholic fatty liver disease in the UK
Zobair Younossi1,2,3, Maria Stepanova4, James Paik2,3, Fatema Nadir4, Linda Henry4, Richard Pollock2. 1Inova Health System, Medicine Service Line, United States; 2Beatty Liver and Obesity Research Program, Inova Health System, United States; 3Inova Health System, Department of Medicine, Center for Liver Diseases, United States; 4Center for Outcomes Research in Liver Disease, United States; 5Covalence Research Ltd, Harpenden, United Kingdom

Background and aims: The enhanced liver fibrosis (ELF) test is a non-invasive blood test to assess the risk of advanced fibrosis in patients with non-alcoholic fatty liver disease (NAFLD). The aim of the present study was to evaluate the cost-effectiveness of a diagnostic pathway including the Fibrosis-4 (FIB-4) index plus ELF for patients with an indeterminate FIB-4 index (1.30–2.67), compared versus FIB-4 alone, FIB-4 plus Transient Elastography (TE), and standard of care (SoC), in the detection of advanced fibrosis in patients with NAFLD from the perspective of a UK healthcare payer.

Method: A cost-utility model was developed with two modules: a diagnostic pathway module which distributes patients between true and false positive and negative diagnoses of advanced fibrosis, and then a long-term extrapolation based on a Markov model. The performance of the FIB-4/ELF, FIB-4/TE and FIB-4 alone pathways was based on published literature. UK standard of care was based on Srivastava et al. (J Hepatol 2019). The long-term Markov model captured transitions through fibrosis stages, cirrhosis, decompensated cirrhosis, hepatocellular carcinoma, liver transplant, and death. UK-specific cost data were obtained from the literature and utility values were derived from patients with NAFLD using EQ5D or equivalent instrument. Future cost and effectiveness outcomes were discounted at 3.5% per annum and the long-term model was run over a 20-year time horizon.

Results: The decision tree reported that, with FIB-4/ELF, 5.6% of patients with NAFLD had a false positive diagnosis of advanced fibrosis versus 6.0% with FIB-4/TE, 22.1% with FIB-4 alone, and 29.8% with SoC. The model showed that the costs of a FIB-4/ELF pathway...
would be the lowest of the four options; the higher initial cost of the FIB-4/ELF diagnostic pathway was more than offset by a reduction in resource utilisation arising from false positive diagnoses. The long-term extrapolation showed that FIB-4/ELF would be dominant versus SoC, reducing costs while increasing quality-adjusted life-years gained.

**SAT-117**

**Influence of the COVID-19 pandemic on liver cancer-related mortality in the United States**

Zhu Zhan,1, Dan Shi,1, Chengchen Zhang,1, Yujing Shi,1, Na Wu,1, Hong-Gang Ren,1, Hong Ren,1, 1Key Laboratory of Molecular Biology for Infectious Diseases (Ministry of Education), Institute for Viral Hepatitis, Department of Infectious Diseases, the Second Affiliated Hospital of Chongqing Medical University, China; 2Department of Nutrition and Food Hygiene, School of Public Health, Chongqing Medical University, China; 3Center of Clinical Research, Shanghai Children's Medical Center Affiliated with Shanghai Jiao Tong University School of Medicine, China.

Email: renhong0531@cqmu.edu.cn

**Background and aims:** The COVID-19 pandemic has caused a diverse and extensive impact on the public health system. This study attempted to examine the influence of the pandemic on liver cancer (LC)-related mortality in the United States (U.S.).

**Method:** We reviewed data from the National Vital Statistic System from the Center for Disease Control and Prevention Wide-Ranging Online Data for Epidemiologic Research (CDC WONDER) platform and ICD-10 codes, and screened for LC-related deaths. We also analyzed the actual event versus estimated mortality rate for 2020–2021, according to the patterns from 2010 to 2019 using joinpoint and prediction modelling analysis.

**Results:** We identified 322,698 LC-related deaths in the U.S. from 2010 to 2022. Hepatocellular carcinoma (HCC) and intrahepatic cholangiocarcinoma (ICC) are the most prominent LC types, accounting for 61% and 38% of all cases, respectively. The HCC age-standardized mortality rate (ASMR, per 100,000) revealed an overall upward trend from 2010 to 2019, with a mean annual percentage change (APC) of 3.7%. However, the HCC ASMR remained unchanged in 2020, and showed a sharp increase since January 2021, with a peak in December 2021, compared to the levels predicted from pre-pandemic trend (ASMR of 4.36 vs. 4.35 in 2020, 6.45 vs. 4.48 in 2021). This delayed rise in mortality during the COVID-19 pandemic was also found in ICC and other LC types. Although the older population (≥65 years) contributed to over half of the deaths among people with LC, the younger population (25–44 years) revealed the highest APC for HCC (11.6%) and ICC (6.4%) during the COVID-19 pandemic. In addition, female, American Indian/Alaska Native (AI/AN), Asian, and Pacific Islanders (API) were more susceptible to the COVID-19 pandemic, compared to their counterparts.

**Conclusion:** A pathway combining FIB-4/ELF to detect advanced fibrosis in patients with NALFD in the UK would be cost saving relative to SoC, FIB-4/TE and FIB-4 alone. FIB-4/ELF would also dominate SoC over a 20-year extrapolation and would therefore be considered a cost-effective use of UK healthcare resources.

**SAT-118**

**Acceptability and feasibility of a multimodal early detection pilot study for liver disease in high risk groups:** “Alright My Liver?”

Ann Archer1,2, Sally Tilden1, Tom May2,3, Jo Kesten2,3,4, Jane Gitahi1, Lucy Yardley2,3,4,5,6, Matthew Hickman1,2, Kushala Abeysekera1,2, Fiona Gordon1, 1University Hospitals Bristol and Weston NHS Foundation Trust, Bristol, UK, Liver Medicine, Bristol, United Kingdom; 2Bristol Medical School, University of Bristol, Bristol, UK, Population Health Science, Bristol, United Kingdom; 3University of Bristol, NIHR Health Protection Research Unit (HPRU) in Behavioural Science and Evaluation, Bristol, United Kingdom; 4University Hospitals Bristol and Weston NHS Foundation Trust, UK, NIHR Applied Research Collaboration West (NIHR ARC West), Bristol, United Kingdom; 5University of Bristol, School of Psychological Science, Bristol, United Kingdom; 6University of Bristol, Centre for Academic Primary Care, Bristol, United Kingdom.

Email: ann.archer@uhb.nhs.uk

**Background and aims:** 75% of people with cirrhosis are diagnosed during an emergency admission to hospital, at which point mortality is 1 in 6. Cirrhosis prevalence is <1% in the general population, making a targeted approach to case finding desirable. In 2022, NHS England funded the Bristol and Severn hepatitis C operational delivery network to broaden its existing outreach work as part of the “Piloting Community Liver Health Checks” scheme. The aim of this study is to report disease detection and acceptability outcomes of the “Alright My Liver?” service, developed in collaboration with service users, to screen and detect advanced liver fibrosis from alcohol, viral hepatitis and metabolic syndrome in those deemed high risk.

**Method:** Liver health screening events were co-located with existing services that serve vulnerable and high risk groups. These included drug and alcohol services, primary care services in areas with a high index of deprivation and with Caafi Health, an organization providing health outreach to black and ethnic minority communities in the region. A health history, transient elastography (TE) using FibroScan® and capillary blood borne virus testing if indicated were collected. All patients received personalized advice including brief alcohol reduction interventions and cessation service signposting if indicated. To encompass multiple aetologies of liver disease, commissioners advocated a liver stiffness measurement (LSM) by TE of ≥11.5 kPa for advanced fibrosis, 8.5–11.4 kPa for moderate fibrosis and <8 kPa normal. Clients identified with advanced fibrosis were booked directly into hepatology clinic with an offer of funded transport and telephone reminders. Semi-structured interviews were conducted with service users.
Background and aims: Non-alcoholic fatty liver disease (NAFLD) affects an estimated 15–25% of the adult population worldwide. Obesity and metabolic syndrome are among the most important risk factors for the disease, but evidence in children and youth has been less examined. This study aimed to quantify the population-attributable risk (PAR) for NAFLD due to lifestyle-related factors in youth.

Method: We included data from the 2017–2018 U.S. National Health and Nutrition Examination Survey (NHANES) cycle on youth aged 12 to <21 years who underwent vibration-controlled transient elastography with controlled attenuation parameter (CAP). Liver steatosis (NAFLD) was defined as a CAP score of ≥248 dB/m. PAR %, i.e., the prevalence of NAFLD attributed to each factor under study, was investigated for exposures previously shown to be independently associated with liver steatosis in adolescents, namely body mass index (BMI), systolic blood pressure, waist-to-height ratio (WHR), and the homeostatic model assessment for insulin resistance (HOMA-IR). The Dietary Approaches to Stop Hypertension (DASH; higher scores = higher adherence) and the Alternative Healthy Eating Index (AHEI; 0 = low adherence, 110 = highest adherence) were also included as measures of diet quality, a domain seldom studied in relation to NAFLD in this age group. Survey-weighted, z-transformed PARs were calculated (adjusting for age, sex, ethnicity, BMI [when applicable], total energy intake, household income, and education) by comparing an unhealthier vs. healthier scenario for each factor (namely, having a BMI ≥30 vs. a BMI <25; having a BMI ≥25 <30 vs. a BMI <25; no physical activity vs. practicing physical activity for at least 60 minutes during the week/vigorous recreational activities during the week; highest vs. lowest quartile of WHR; highest vs. lowest quartile of HOMA-IR; and lowest vs. highest quartile of diet quality adherence).

Results: A total of 972 participants (mean age 15.7 ± 2.4; male 51.0%) with complete data were included in this study. The prevalence of liver steatosis was 28.3%. The adjusted risks of liver steatosis attributable to overweight and obesity were 3.3% (95% confidence interval [CI]: 2.1, 4.7) and 10.1% (CI: 7.9, 12.4), respectively. The PAR associated with NAFLD was 7.2% for higher systolic blood pressure (CI: 3.9, 10.6), and 4.4% for lower DASH adherence (CI: 0.2, 8.5). The risks attributable to a higher WHR, lack of physical activity and low AHEI adherence were not statistically significant.

Conclusion: NAFLD in adolescents and youth from the U.S. is highly prevalent. Obesity, overweight, systolic blood pressure, and diet quality are important contributors to the disease among youth. As the DASH diet has a recognized benefit in the control of overweight and hypertension, improving its adherence during adolescence may contribute to reducing the burden of NAFLD.
Method: We analyzed the French, nationwide, cohort of all newly recorded adult inpatients with primary liver cancer between January 1, 2018, and September 30, 2022. The primary exposure was the period of first diagnosis: Pre-pandemic (January 1, 2018 to December 31, 2019), COVID-19 Pandemic (January 1, 2020 to June 30, 2021), and COVID-19 Post-pandemic (July 1, 2021, to September 30, 2022) periods. The outcomes were access to a curative treatment (defined as liver resection, liver transplantation and/or percutaneous ablation) and mortality. Independent associations were analyzed in multivariate logistic and Cox models.

Results: Out of 51,572 patients [median (IQR) age, 71 (63.0; 78.0) years; 74% men], 13,873 (27%) had a curative treatment. The incidence of primary liver cancer [median (IQR), 907 (857; 946) new cases per trimester] remained stable (p = 0.08). Compared with [Pre-pandemic] patients, and adjusted for age, sex, malnutrition, cancer stage, decompensated cirrhosis, severe comorbidities, and deprivation, the odds ratios (95% CI) for access to a curative treatment were 0.90 (0.86–0.95, p < 0.001) and 0.69 (0.66–0.73, p < 0.001) for [Pandemic] and [Post-pandemic] patients, respectively. Probabilities of 6-month survival for [Pandemic] and [Post-pandemic] patients were 60.3% (59.5–61.1; p = 0.91) and 55.5% (54.5–56.5; p < 0.001), respectively.

Conclusion: COVID-19 crisis decreased access to curative treatment for primary liver cancer. The risk of dying without a curative treatment was highest in the [Post-pandemic] period.

S121
Identify, screen and treat via electronic pathway (I-STEP): an innovative approach to wait list management for general liver hospital outpatient referrals
Eliza Flanagan1,2, Stephen Pianko1,2, Julianne Grant1, Edward Saxby1, Sally Bell1,2, Suong Le1,2, 1Monash Medical Centre, Gastroenterology, Clayton, Australia; 2Monash University Clayton Campus, Department of Medicine, Clayton, Australia
Email: elizaflanagan2@gmail.com

Background and aims: Wait times for hospital specialist outpatient clinics are long, with patients often triaged incorrectly due to incomplete clinical information. We developed a multifaceted intervention to semi-automatically prioritise patients with untreated hepatitis C virus (HCV) and or advanced liver disease, awaiting an initial liver appointment at Monash Health (MH), an Australian tertiary hospital network.

Method: Our novel triage intervention consisted of 1) semi-automated electronic re-triage of patients based on new pathology results, 2) reflexive HCV polymerase chain reaction (PCR) testing in those with positive antibodies, and 3) a liver care guide (LCG) to augment patient uptake.

We excluded patients who were deceased, non-residents (due to additional costs), and those without mobile phone numbers. Eligible patients received a short message service (SMS) that explained the initiative (with a website link for further information) and were invited to participate by completing a blood test. The LCG conducted a follow-up phone call to answer questions. Our pathology panel included a full blood count, urea, electrolytes and creatinine, liver function tests, international normalised ratio, HCV antibody testing, and if positive, reflexive PCR testing. An AST to Platelet Ratio Index (APRI) and Fibrosis-4 (FIB4) score was auto-calculated. Patients with an APRI ≥ 1, FIB4 ≥ 3.25, or positive HCV PCR were flagged and re-triaged for urgent review.

Results: In May 2022, MH had 1026 adult patients on the waitlist for an initial liver clinic appointment. 20 patients were excluded due to no mobile phone (n = 9), non-residents (n = 6) and deceased (n = 5). The median historical waitlist time for eligible patients was 283 days (IQR 183–450.25). The median age was 51 years (IQR: 40–61) and 527 (52.29%) were male. 690 patients (68.59%) responded ‘yes’ to the SMS: 387 (56.09%) required a prompting call from the LCG before responding, 51 patients (5.07%) responded ‘No’, and 265 patients (26.34%) did not respond. 490 patients (71.01%) completed pathology testing and 40 (8.16%) were re-triaged based on APRI/FIB4/HCV PCR results (table 1). 26/40 of the re-triaged patients underwent a fibroscan with a median stiffness of 15.4 kilopascals (IQR 7.5–26.55).

Sub analysis of 120 patients demonstrated increased engagement through implementation of the LCG. Over a two-week period, 60 patients received a text followed by phone call, whilst the other 60 only received a SMS. There was a higher uptake of pathology testing in those who had LCG and SMS compared to those who received SMS only (42 vs 27 (45%), p value 0.03).

Conclusion: We successfully piloted a novel semi-automated method for identifying patients with advanced liver disease and/or active HCV awaiting a general liver clinic appointment. There were high levels of engagement with this approach augmented by the LCG.
which may be scaled to other clinics or repeated longitudinally to screen for and proactively manage high risk liver patients.

SAT-122
Socio-economic disparities drive the prevalence of non-alcoholic Fatty Liver Disease (NAFLD) among teenagers in the United States

Zobair Younossi1,2,3, James Paik1,2,4, Shira Zelber-Sagi5, Jeffrey Lazarus6, Pegah Golabi2,7,8,9, Leyla Deavila4, Jillian Price8, Janus Ong10, Saleh Alqahtani11, Linda Henry1,2,3,8.

1Inova Health System, Betty and Guy Beatty Center for Integrated Research, Falls Church, United States; 2Inova Health System, Inova Medicine, Falls Church, United States; 3The Global NASH Council, Washington, United States; 4The Global NASH Council, Falls Church, United States; 5Barcelona Institute for Global Health (ISGlobal), Barcelona, Spain; 6The Global NASH Council, Washington, United States; 7Inova Fairfax Medical Campus, Center for Liver Disease, Department of Medicine, Falls Church, United States; 8Inova Health System, Betty and Guy Beatty Center for Integrated Research, Falls Church, United States; 9University of the Philippines, College of Medicine, Manila, Philippines; 10University of Haifa, School of Public Health, Haifa, Israel. 11King Faisal Specialist Hospital and Research Center, Riyadh, Saudi Arabia

Email: zobair.younossi@inova.org

Background and aims: Socio-economic factors and obesity have driven NAFLD to become the most common cause of liver disease among adults. Given the increasing rate of obesity in younger population, we assessed the prevalence of NAFLD among teenagers.

Method: National Health and Nutrition Examination Survey (2017–2018) data was used. NAFLD and Significant Fibrosis (SF) were defined by transient elastography (TE) as controlled attenuation parameter (CAP) of ≥285 dB/m and stiffness of >8.0 kPa without other causes of liver disease. Obesity was defined as age-sex-specific body mass index (BMI) ≤95th percentile. Central obesity was defined by age-sex-specific waist circumference. Low-income household was defined as household income ≤138% federal poverty level. Low household education was defined as the head of the household without college education.

Results: 712 teenagers (age 13–18) were included [mean age 15.3 ± 0.6; 53.0% male; 50.0% white, 13.9% Black, 16.4% Mexican American, 6.9% Hispanic and 5.2% Asian; 22.2% obesity; 45.8% central obesity; 10% diabetes]. The prevalence of NAFLD and SF were 11.5% (95% CI 11.1% to 11.9%) and 3.5% (95% CI 3.2% to 3.8%), respectively. There were disparities according to sex, race/ethnicity, household income and education. The prevalence of NAFLD was higher among teenage boys (13.7% vs. 9.1%); Mexican Americans (21.9% vs. 7.1% whites); living in low income (17.1% vs. 8.6%) and low education (14.0% vs. 4.4%) households (all p values <0.03). The prevalence of NAFLD was higher in those with obesity (according to BMI 42.2% vs. 2.9% and waist circumference 24.3% vs. 1.1%); SF was more common in Black Americans (7.2% vs. 1.9% white); those with low household education (2.8% vs. 0.5%); and those with obesity (71.1% vs. 13.3%). After adjustment for demographic factors, living in a low-income (odds ratio [OR] = 2.05, 95% CI: 1.16–3.62) and low education (OR = 3.14, 1.40–7.04) households were associated with a higher risk of NAFLD. However, the addition of obesity to the model made this risk no longer significant. On the other hand, low household education remained a significant predictor of SF (OR = 4.67, 2.15–10.15) even after adjustment for demographics and obesity.

Conclusion: NAFLD and SF were found to be more common among teenagers living in low income/education households. Targeting obesity prevention interventions to such settings should become an important aspect of all policies that address the burden of fatty liver disease.

SAT-123
Non-alcoholic fatty liver disease prevalence has increased in Australia, particularly amongst women

Karl Vaz1,2, William Kemp3,2, Ammar Majeed1,2, John Lubel1,2, Dianna Magliano3,4, Kristen Glenister3,5, Linda Henry1,2,6,7,8,8, Leyla Deavila9, Jillian Price9, Zobair Younossi1,2,3, James Paik1,2,4, Shira Zelber-Sagi5, Jeffrey Lazarus6, Pegah Golabi2,7,8,9, Janus Ong10, Saleh Alqahtani11, Linda Henry1,2,3,8.

1Inova Health System, Betty and Guy Beatty Center for Integrated Research, Falls Church, United States; 2Inova Health System, Inova Medicine, Falls Church, United States; 3Inova Fairfax Medical Campus, Center for Liver Disease, Department of Medicine, Falls Church, United States; 4Inova Health System, Betty and Guy Beatty Center for Integrated Research, Falls Church, United States; 5Inova Health System, Betty and Guy Beatty Center for Integrated Research, Falls Church, United States; 6The Global NASH Council, Falls Church, United States; 7Inova Health System, Betty and Guy Beatty Center for Integrated Research, Falls Church, United States; 8University of Pennsylvania, College of Medicine, Philadelphia, Pennsylvania; 9University of Melbourne, Department of Rural Health, Australia; 10University of Melbourne, Department of Population Health, Australia; 11University of Melbourne, Department of Clinical School, Australia. 12University of Sydney, Macarthur Clinical School, Australia

Email: karlvpaz@hotmail.com

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is the most prevalent liver condition globally. Despite Australia having one of the highest rates of obesity worldwide, epidemiological data on NAFLD is scant. The aim of this study was to evaluate the change in age- and sex-standardised prevalence of NAFLD in regional Australia over a 15-year period and explore the underlying factors associated with differences over time.

Method: Repeat cross-sectional studies with equivalent methodology conducted in regional Victoria, Australia between 2001 and 2003 and 2016–2018 (CrossRoads I and II [CR-1 and CR-2] respectively). Households were randomly selected from residential address lists from local government organisations, with a single adult member of each household randomly selected to undertake a clinic sub-study. Detailed information collected included baseline demographics, anthropometric, and health-related clinical and laboratory data including alcohol use. NAFLD was defined by Fatty Liver Index (FLI) > 60 in absence of excess alcohol consumption and viral hepatitis.

Results: In total, 1048 and 747 participants enrolled into CR-1 and CR-2, respectively, with sufficient data evaluable for FLI in n = 1040 (99%) and n = 721 (97%), respectively. Crude and age-/sex-standardized prevalence for NAFLD significantly increased from 32.7% and 32.4% to 38.8% and 35.4% (95% CI 31.3–39.5) (p = 0.009 and p < 0.001), respectively, over the 15-year study period (Figure 1). Crude and age-standardized NAFLD prevalence remained stable for men (crude: 41.7% to 43.3%, p = 0.66; standardized: 38.2% [95% CI 33.9–42.4] to 38.4% [95% CI 31.9–44.8], p = 0.52 but significantly rose for women (crude: 25.5% to 35.1%, p = 0.01; standardized: 27.2% [95% CI 23.1–31.4] to 33.0% [95% CI 28.0–38.1], p < 0.001) (Figure 1). There was also a rise in prevalence of obesity (crude: 27.8% to 35.5%, p < 0.01; standardized: 29.5% [95% CI 27.1–32.7] to 33.5% [95% CI 29.4–37.6], p < 0.01), elevated waist circumference (crude: 48.2% to 60.1%, p < 0.01; standardized: 50.3% [47.3–53.4] to 54.8% [50.9–58.7], p < 0.01) and consumption of takeaway food one or...
more times per week (crude: 26.1% to 30.7%, p = 0.04; standardized: 24.6% [95% CI 22.1–27.2] to 39.1% [34.9–43.3], p < 0.01).

**Conclusion:** Prevalence of NAFLD has risen significantly over a 15-year period in a regional part of Australia, paralleling rising obesity prevalence and most significantly in women. Public health programs to curb this trend are urgently required.

**SAT-124**

**Multiple vitamin co-exposure and mortality risk in metabolic dysfunction-associated fatty liver disease**

Wang Zilong1, Linxiang Huang1, Xiaoxiao Wang, Rui Jin1, Baiyi Liu1, Feng Liu1, Huiying Rao2. 1Peking University People’s Hospital, Peking University Hepatology Institute, China; 2Peking University People’s Hospital, China

**Background and aims:** Metabolic-associated fatty liver disease (MAFLD) has emerged as a growing health burden worldwide. Existing studies have explored the associations between individual vitamin effects and disease progression in patients with NAFLD, and controversial findings were obtained. However, the effect of multiple vitamin co-exposure on MAFLD has not been fully elucidated. This study aims to elucidate the associations of multiple circulating vitamin co-exposure with mortality risks in MAFLD.

**Method:** The National Health and Nutrition Examination Survey (NHANES) III from 1988 to 1994 and NHANES III-linked mortality data through 2019 were used. MAFLD was defined as ultrasonically diagnosed hepatic steatosis in combination with metabolic dysfunction. We prospectively evaluated the concentrations of four kinds of vitamins (A, C, D, and E) in serum with mortality risk among U.S. adults. An unsupervised K-means clustering was used to cluster the participants into several vitamin co-exposure patterns. The logistical and cox proportional hazard model were used for statistical analysis.

**Results:** Three co-exposure patterns were generated based on the vitamins (A, C, D, and E), as follows: low-level exposure (cluster 1), vitamin D exposure (cluster 2), and vitamin A/C/E exposure (cluster 3) (Figure A, B). Compared with those in cluster 1, participants in cluster 2 and 3 had a lower risk of MAFLD (p < 0.01). In MAFLD patients, participants in cluster 2 have lower all-cause mortality risks, with hazard ratios (95% confidence intervals [CIs]) of 0.73 (0.58, 0.92), while cluster 3 was not associated with a decreased risk of all-cause mortality, with hazard ratios (95% confidence intervals [CIs]) of 0.87 (0.70, 1.09). Going one step further, we then performed a specific analysis for the 4 kinds of vitamins. Vitamin A and D at moderate levels have lower all-cause mortality risks, with hazard ratios (95% confidence intervals [CIs]) of 0.63 (0.47, 0.83) and 0.63 (0.48, 0.81). Vitamin D at moderate levels has lower cardiovascular mortality risks, with hazard ratios (95% confidence intervals [CIs]) of 0.52 (0.31, 0.87) (Figure C). Furthermore, a J-shaped nonlinear exposure-response relationship was observed between all studied vitamins and all-cause mortality risk (except for vitamin D) (Figure D).

**Conclusion:** Our findings indicated that high levels of circulating vitamin D levels have a lower risk of illness and death in MAFLD. Thus, the detection of Vitamin D levels may have a prognostic value in MAFLD patients.
SAT-125

Prevalence and predictors of clinically significant pruritus in patients with non-alcoholic fatty liver disease (NAFLD): data from the global NASH registry (GNR)**

Zobair Younossi1,2, Yusuf Yilmaz3,4, Ming-Lung Yu5, Yasily Isakov6, Marien Ivan Castellanos Fernandez7, Vincent Wai-Sun Wong8, Yuichiho Eguchi9, Nahum Méndez-Sánchez10, Ajay Kumar Duseja11, Jacob George12, Elisabetta Bugianesi13, Ashwani Singal14, Saeed Sadiq Hamid15, Jian-Gao Fan16, Khalid Alswat17, George Papatheodoridis18, Mohamed El Kassas19, Wah-Kheong Chan20, Stuart C Gordon21, Manuel Romero Gomez22, Stuart Roberts23, Brian Lam24, Issah Younossi25, Andrei Racila12,24,25, Linda Henry12,24,25, Saleh Alqahtani2,25, Maria Stepanova2,24,25,1 Inova Health System, Medicine Service Line, Falls Church, United States; 2Inova Health System, Department of Medicine, Center for Liver Diseases, Falls Church, United States; 3Institute of Gastroenterology, Marmara University, Liver Research Unit, Istanbul, Turkey; 4School of Medicine, Recep Tayyip Erdogan University, Department of Gastroenterology, Rize, Turkey; 5Kaohsiung Medical University Hospital, Kaohsiung Medical University, National Sun Yat-sen University, Kaohsiung, Taiwan; 6Federal Research Center of Nutrition, Biotechnology and Food Safety, Department of Gastroenterology and Hepatology, Moscow, Russian Federation; 7University of Medical Sciences Havana, Instituto de Gastroenterología, Havana, Cuba; 8The Chinese Institute of Hong Kong, Department of Medicine and Therapeutics, Hong Kong, Hong Kong; 9Locomedical Medical Cooperation, Locomedical General Institute, Ogi, Sase, Japan; 10National Autonomous University of Mexico, Liver Research Unit, Medica Sur Clinic and Foundation, Mexico City, Mexico; 11Postgraduate Institute of Medical Education and Research, Department of Hepatology, Chandigarh, India; 12Westmead Institute for Medical Research, Westmead Hospital and University of Sydney, Storr Liver Centre, Sydney, Australia; 13University of Torino, Division of Gastroenterology, Department of Medical Sciences, Torino, Italy; 14University of South Dakota and Avera Transplant Institute, Sioux City, United States; 15Aga Khan University, Department of Medicine, Karachi, Pakistan; 16Xinhua Hospital, Shanghai Jiao Tong University School of Medicine, Department of Gastroenterology, Shanghai, China; 17King Saud University College of Medicine, Liver Disease Research Center, Department of Medicine, Saudi Arabia; 18National and Kapodistrian University of Athens, Athens, Greece; 19Helwan University, Endemic Medicine Department, Faculty of Medicine, Cairo, Egypt; 20University of Malaysia, Gastroenterology and Hepatology Unit, Department of Medicine, Faculty of Medicine, Kuala Lumpur, Malaysia; 21Henry Ford Hospital, Department of Hepatology and Gastroenterology, Detroit, United States; 22Virgen del Rocio University Hospital, Institute de Biomedencia de Sevilla, Digestive Diseases Department- Cibermed, Seville, Spain; 23The Alfred, Department of Hepatology and Gastroenterology, Melbourne, Australia; 24Beatty Liver and Obesity Research Program, Inova Health System, Falls Church, United States; 25Center for Outcomes Research in Liver Disease, Washington DC, United States

Email: zobair.younossi@inova.org

Background and aims: Pruritus is an important but under-appreciated symptom of chronic liver diseases. We assessed factors associated with pruritus among patients with NAFLD.

Method: Patients with NAFLD seen in real-world clinical practices were prospectively enrolled in the Global NAFLD/NASH Registry (GNR)**. Clinical parameters and patient reported outcomes (PROs; FACT-F, CLDQ-NASH, WPAI) were collected. Clinically significant pruritus was defined as score ≤4 in the respective item of CLDQ-NASH (range 1–7; lower score indicates more severe pruritus).

Results: We included 4203 NAFLD subjects from 17 countries: age 52 ± 13 years, 48% male, 48% employed, 23% advanced fibrosis and 14% cirrhosis (by biopsy or non-invasive Fib-4), 44% type 2 diabetes (T2D), 21% history of depression and 45% clinically overt fatigue. Furthermore, 78% of those with a biopsy had NASH. The prevalence of clinically significant pruritus among NAFLD was 28%. The highest prevalence of significant pruritus was in patients enrolled in Middle East/North Africa and Latin America (36–29%), the lowest in South Asia (7%). NAFLD patients with pruritus were less commonly employed (42% vs. 51%), more commonly female (61% vs. 49%) and obese (69% vs. 63%). Also, they more commonly had T2D (51% vs. 41%), advanced fibrosis (27% vs. 22%), anxiety (47% vs. 31%), depression (30% vs. 18%), fatigue (58% vs. 40%), abdominal pain (37% vs. 20%), and sleep apnea (27% vs 21%) (all p < 0.01) than those without pruritus, despite similar age (p > 0.05). NAFLD patients with pruritus experienced significantly lower PRO scores (FACT-F, CLDQ-NASH, WPAI) ranging from −4% to −19% of a PRO score range (all p < 0.0001). All CLDQ-NASH domain scores were lower in NAFLD patients with pruritus as compared to those without (Figure). In multivariate analysis adjusted for the regions of enrollment, independent predictors of an increased risk of pruritus included female sex, T2D, depression, clinically overt fatigue, abdominal pain, and the lack of regular ≥3/times week; ≥30 min/time) exercise (odds ratios range 1.30 to 1.96, all p < 0.01). Among patients with 1-year follow-up, lower pruritus scores and higher prevalence of clinically significant pruritus were still observed in patients who had experienced pruritus at baseline: mean pruritus score increased from 3.1 to 4.6 in those with baseline pruritus vs. decreased from 6.4 to 6.0 in those without baseline pruritus while the prevalence of clinically significant pruritus at 1-year follow-up was 52% vs 19%, respectively (all p < 0.0001).

Conclusion: Pruritus is a common and persistent symptom among patients with NAFLD, especially those with T2D and female subjects. Presence of pruritus negatively affects all PRO scores and is impacted by non-hepatic comorbidities.

SAT-126

Relationships between education and non-alcoholic fatty liver disease

Florian Koutny1, Bernhard Paulweber2, Elmar Aigner2, Christian Datz2, Sophie Geslukner5, Andreas Maieron1, Stefano Novati1, Bernhard Iglizeder5, Patrik Langthaler2, Vanessa Frey5, Eugen Trinka5, Bernhard Wernly5, 3University Hospital St. Pölten, Department for Gastroenterology, Hepatology and Rheumatology, Sankt Pölten, Austria; 4Gemeinnützige Salzburger Landeskliniken Betriebsges.m.b.H. First Department of Medicine, Salzburg, Austria; 5General Hospital Oberndorf, Teaching Hospital of the Paracelsus Medical University, Department of Internal Medicine, Austria; 6Boziano Regional Hospital, Gastroentrology, Italy; 7Christian-Doppler-Klinik, Department of Gericatric Medicine, Austria; 8Christian-Doppler-Klinik, Department of Neurology, Austria

Email: bernhard.wernly@pmu.ac.at

Background and aims: Low socioeconomic status (SES) is associated with associated with adverse health outcomes, including metabolic syndrome and NAFLD. However, it has remained enigmatic whether the association of NAFLD with SES is independent of age, sex and
metabolic syndrome. Therefore, the aim of this study was to investigate an independent relationship between NAFLD and degree of education as measured by the International Standard Classification of Education (ISCED) as a surrogate marker for SES.

**Method:** This study evaluated 8,315 participants from the Paracelsus 10,000 study. Anthropomorphic, clinical and laboratory parameters were collected from all participating subjects. To assess the association between NAFLD and ISCED, multivariable logistic regression models and multivariable linear regression were calculated. The primary end points were an increased fatty liver index (FLI) score ≥30 as a surrogate marker for NAFLD and liver fibrosis as indicated by an elevated fibrosis-4 index (FIB-4) score ≥1.3 as a surrogate marker. In a subgroup analysis of 789 participants the end point NAFLD was specified by liver stiffness measurement data. Trichotomized ISCED categories (low, middle and high) were chosen as an independent fixed variable with a lower ISCED as the reference category. MetS was defined according to the National Cholesterol Education Program (NCEP) Adult Treatment Panel III.

**Results:** Participants with a high education level had a significantly lower odds ratio (FLI score ≥30, odds ratio 0.41, 95% CI 0.34–0.50, p < 0.01) for liver steatosis compared to those in the low-ISCED group independent of age, sex, MetS and alcohol consumption (g/d). Univariate linear regression analysis showed that liver fibrosis defined by the FIB-4 Score was also associated with a lower ISCED. Further subgroup analysis has shown that participants in the high-ISCED group exhibited lower rates of liver stiffness compared to those in the low-ISCED group (r: –1.73 [–3.06 to –0.40]; p < 0.01). The same applied for patients in the intermediate-ISCED group compared to participants with the lowest education levels (r: –1.44 [–2.66 to –0.22]; p < 0.01). Significance of the linear regression coefficient remained after forcing sex, age MetS and daily alcohol consumption into the system.

**Conclusion:** Results of our study suggests that a low ISCED is associated with a higher risk for liver steatosis and fibrosis. These liver parenchymal damages have a significant impact on morbidity and may even lead to hepatocellular carcinoma. Thus, the outcome of the current study is of importance in clinical practice and highlights the need for considering socioeconomic factors in the prevention and management of NAFLD. We therefore advocate prevention strategies tailored to socioeconomic groups. Further studies are needed to evaluate the impact of socioeconomic interventions on NAFLD.

**SAT-127**

**A pilot study to improve the uptake of hepatocellular carcinoma surveillance**

Maria Qurashi1, Nina Stafford2, Laith Al-Rubaiy2, Shahid Khan1, Robini Sharma1, 1Imperial College London, United Kingdom; 2London North West University NHS Trust, United Kingdom

Email: maria.qurashi0@imperial.ac.uk

**Background and aims:** Ninety percent of HCC cases arise on a background of liver cirrhosis (1). EASYL and other international guidelines recommend six-monthly ultrasound surveillance for patients with cirrhosis, advanced fibrosis or high risk hepatitis B (2). Surveillance for HCC has been shown to lead to earlier diagnosis and improved survival (3). However, surveillance uptake is less than 25% internationally; a US study suggests the most common reason for this is a failure to order surveillance in those who are eligible (4). We aimed to improve surveillance uptake by implementing an automated system to issue reminders to healthcare professionals about which patients were due surveillance imaging.

**Method:** We created a database of patients at three district general hospitals in London who are regularly seen in specialist hepatology clinics and eligible for HCC surveillance. We implemented an automated “call-recall” system which notified clinicians about which of their patients required surveillance imaging booking.

**Results:** 243 patients eligible for surveillance were included. Baseline characteristics were: 65% male; median age 58 years; 60% alcohol related liver disease (ALD); 26% viral hepatitis, 10% NAFLD. In July 2022, prior to the automated recall system being activated, 19% (45 patients) were up-to-date with their HCC surveillance. The automated “call-recall” system was initiated in August 2022. Two months later (September 2022), 38% (93 patients) were up-to-date with their HCC surveillance.

**Conclusion:** HCC surveillance uptake is low. An automated “call-recall” system aims to flag to clinicians when individual patients need surveillance imaging. In a pilot study, this system doubled HCC surveillance attendance in three district general hospitals in London. Further work will look at the long-term efficacy of an automated recall system on surveillance rates, HCC diagnosis and clinically relevant outcomes, as well as exploring patient-related barriers to HCC surveillance.

**References**


**SAT-128**

**Non-alcoholic fatty liver disease awareness, misperception, and their association with healthcare access in Korean general population: a nationally representative survey**

Jun-Hyuk Lee1, Eileen Yoon1, Dae Won Jun1, Sang Bong Ahn2, Joo Hyun Oh3, Hyunwoo Oh4, Hyo Young Lee5, Jihyun An5, Joo Hyun Sohn5, Eun Chul Jang5.

1Nowon Eulji Medical Center, Eulji University College of Medicine, Internal Medicine, Seoul, Korea, Rep. of South; 2Hanyang university college of medicine, Internal medicine, Seoul, Korea, Rep. of South; 3Recall system aims to flag to clinicians when individual patients need surveillance imaging. 4Uijeongbu Eulji Medical Center, Eulji University College of Medicine, Korea, Rep. of South; 5Soonchunhyang University College of medicine, Korea, Rep. of South. Email: noshin@hanyang.ac.kr

**Background and aims:** Non-alcoholic fatty liver disease (NAFLD) is the most common chronic liver disease in Korea. Health check-up examinations are extensively conducted in Korea, almost all adults (esp. >40 years) receive health examinations, but systematic management of NAFLD is not effective. This study conducted to investigate the hurdles of the NAFLD treatment cascade through a nationwide survey in Korea.

**Method:** This cross-sectional study was conducted using an online survey. A total of 1,000 panels was finally selected according to distribution of sex, age group, and residential area in Korean adult. The survey consisted of a 3-domain and 18-item questionnaires. Content validity of questionnaire was measured by a total of 14 experts including medical doctors, nutritionists, and a methodologist who did not participate in the development of the questionnaire. Content validity index (CVI) for each item was rated above 0.80.

**Results:** A total of 27.2% responded that they had never heard of NAFLD terminology. Approximately half of responders (60.2%) heard of NAFLD through medical staff. A total 42.9% of the respondents (esp. >40 years) received health examinations, but systematic management of NAFLD is not effective. This study conducted to investigate the hurdles of the NAFLD treatment cascade through a nationwide survey in Korea.
recognized that angina pectoris, myocardial infarction, ischemic stroke associated with NAFLD. Only 40.2% who diagnosed with NAFLD visited clinic for the further evaluation and management of NAFLD. The most common reason for not visiting the medical facility after diagnosis of NAFLD was ‘I could manage the disease on my own’ (50.6%), followed by ‘never been told from my physician that I need disease management’ (32.9%). The most common response by gender was ‘lack of time to visit the hospital’ in men (84.6%) and ‘I could manage the disease on my own’ in women (45.0%). Most 20s–40s thought they could manage the disease on my own, and fatty liver disease management significantly according to gender and age.

Conclusion: Only 40% visited the clinic after diagnosis with NAFLD. Reasons for not visiting the clinic after diagnosis of NAFLD differed significantly according to gender and age.

SAT-129 Sub-optimal global public health policies and strategies to combat hepatocellular carcinoma

Luis Antonio Diaz1,2, Blanca Norero1, Oscar Corsi1, Gustavo Ayares1, Francisco Idalosaga1, Sergio García3, Valeria Vázquez4, Lucas Lacle5, Mariana Lazo6, Catterina Ferreccio6, Manuel Mendoza7, Federico Piñero8, Edmundo Martinez9, Ifeorah Ijeoma8, Alexandre Louvet10, Salvatore Piano11, Helena Cortez-Pinto12, Vincent Wai-Sun Wong14, Anand Kulkarni15, Thomas Cotter16, Mayur Brahmania17, Juan Pablo Arab18,93,94,94, Melisa Dirchwolf19, P. Martin Padilla20, Javier Diaz-Ferrer21, Martin Tagle22, Uchenna Simon Ezenkwa23, Ifeoma Joy Okoye24, Sven Francque25, Patricia Guerra26, Claudia Oliveira27, Mohamed El Kassas28, Abdelmajeed Mahmoud29, Anthony Ocanit30, Steven Masson31, Winston Dunn32, Marco Sánchez33, Einar S. Björnsson34, Massimo Iavarone35, Katherine Emilia Maldonado Cardona36, Abel Sanchez36, Saeed Sadiq Hamid37, Julissa Lombardo Quezada38, Marcos Girala39, Michele Kukla40, Emuobor Odeghe41, Rasheed mumini wemimo42, Michał ł Kukla71, Emuobor Odeghe72, Rasheed mumini wemimo73, Daniela Reis74, Sergey Mozgovoi75, Mona Ismail76, Tomas Koller77, Wendy Seymour78, Moawia Elhassan79, Per Stal80, Swaleh Pazi81, Anthony Ocanti82, Steven Masson83, Winston Dunn84, Patrick S. Kamath85, Ashwani Singal86, Jose Debes87, Maria Reis88, Rohit Loomba89, Ramon Bataller90, Jeffrey Lazarus91,92, Marco Arrese93, Juan Pablo Arab93,94,94.

Department of Gastroenterology, Escuela de Medicina, Pontificia Universidad Católica de Chile, Santiago, Chile; 2Observatorio Multicéntrico de Enfermedades Gastrointestinales (OMEGA), Santiago, Chile, Chile; 3Escuela de Medicina, Pontificia Universidad Católica de Chile, Santiago, Chile, Chile; 4Escuela de Medicina, Instituto Tecnológico de Monterrey, Monterrey, México, Mexico; 5Departamento de Ciencias de la Salud, Facultad de Medicina, Pontificia Universidad Católica de Chile, Santiago, Chile, Chile; 6Advanced Center for Chronic Diseases, ACCDis, Santiago, Chile, Chile; 7Hepatology and Liver Transplant Unit, Hospital Universitario Austral, Buenos Aires, Argentina, Argentina; 8Servicio de Gastroenterología, Hospital Dr. Sótero del Río, Santiago, Chile, Chile; 9Microbiology Unit, Department of Medical Laboratory Sciences, College of Medicine, University of Nigeria Nsukka Enugu Campus, Nsukka, Nigeria, Nigeria; 10Hôpital Claude Huriez, Services des Maladies de l’Appareil Digestif, CHRU Lille, and Unité INSERM 995, Lille, France, France; 11Department of Internal Medicine and Hepatology (UIHM), Department of Medicine — DIMED, University of Padua, Padova, PD, Italy, Italy; 12Clínica Universitaria de Gastroenterología, Laboratorio de Nutrición, Facultad de Medicina, Universidad de Lisboa, Portugal, Portugal; 13Department of Medicine and Therapeutics, Chinese University of Hong Kong, Hong Kong Special Administrative Region, China, China; 14Department of Hepatology, Asian Institute of Gastroenterology, Hyderabad, India. 15Department of Hepatology, Asian Institute of Gastroenterology, Hyderabad, India; 16Division of Digestive and Liver Diseases, UT Southwestern Medical Center, Dallas, Texas, USA, United States; 17Univesity of Calgary, Cumming School of Medicine, Calgary, Alberta, Canada, Canada; 18Sección Gastroenterología, Hospital Clínico Universidad de Chile, Escuela de Medicina Universidad de Chile, Santiago, Chile, Chile; 19Unidad de Hígado, Hospital Privado de Rosario, Rosario, Argentina, Argentina; 20Sección Hepatología, Hospital de Gastroenterología Dr. Carlos Bonorino Udíaondo, Buenos Aires, Argentina, Argentina; 21Storr Liver Centre, Westmead Millennium Institute, Westmead Hospital and University of Sydney, Sydney, Australia, Australia; 22Department of Internal Medicine, Medical University of Graz, Graz, Austria, Austria; 23Department of Gastroenterology and Hepatology, Antwerp University Hospital, Edegem, Belgium, Belgium; 24Instituto de Gastroenterología Boliviana-Japónés, Cochabamba, Bolivia; 25Department of Gastroenterology, University of Sao Paulo School of Medicine, Sao Paulo, Brazil, Brazil; 26Gastroenterology Division, Ribeiró Preto Medical School, University of Sao Paulo, Ribeiró Preto, SP, Brazil, Brazil; 27Hospital de Clínicas de Porto Alegre, Porto Alegre, Brazil, Brazil; 28Centre Hospitalier Universitaire, Caenports, France; 29Division of Gastroenterology, Liver Unit, University of Alberta, Edmonton, Canada, Canada; 30MAFLD Research Center, Department of Hepatology, the First Affiliated Hospital of Wenzhou Medical University, China, China; 31Hepatology and Liver Transplant Unit, Hospitala de San Vicente Fundacion de Medellin y Rionegro, Colombia, Colombia; 32Unidad de Hepatología del Hospital Pablo Tobon Uribe, Grupo de Gastrohepatología de la Universidad de Antioquia, Medellin, Colombia, Colombia; 33Gastroenterología, Hospital Eduardo Nef, Buenos Aires, Argentina, Argentina; 34Department of Medicine, Faculty of Medicine, University of Kinshasa, Kinshasa, Democratic Republic of the Congo, Congo, Dem. Republic of (formerly known as Zaire); 35Servicio de Gastroenterología-Hepatitis, Hospital Eugenio Espejo, Universidad San Francisco de Quito, Quito, Ecuador, Ecuador; 36Endemic Medicine Department, Faculty of Medicine, Helwan University, Cairo, Egypt, Egypt; 37Chronic Liver Disease and Gastroenterology Department, Cairo University, Cairo, Egypt; 38Division of Gastroenterology, University of Connecticut, Connecticut, USA, United States; 39Public Health Department, Collaborative, Dornsife School of Public Health, Drexel University, Philadelphia, Pennsylvania, United States; 40University Health Department, School of Medicine, Pontificia Universidad Católica de Chile, Santiago, Chile, Chile; 41Instituto de Gastroenterología Boliviano-Japonés, Cochabamba, Bolivia; 42Department of Gastroenterology, Hospital Universitario de la Capital Federal, Buenos Aires, Argentina, Argentina; 43St. Paul’s Hospital Millennium Medical College, Addis Ababa, Ethiopia, Ethiopia; 44Centre de Recherche sur l’Inflammation, Faculté de
Public health policies and strategies for Hepatocellular carcinoma (HCC) worldwide

Asunción, Asuncion, Paraguay, Paraguay; 68 Unidad de Trasplante Hepático, Hospital Nacional Guillermo Almenara, Lima, Peru, Peru; 69 Hospital Nacional Edgardo Rebagliati Martins–Es up Satud, Lima, Peru, Peru; 70 Clínica Anglo Americana, Lima, Peru, Peru; 71 Department of Internal Medicine and Geriatrics, Faculty of Medicine, Jagiellonian University Medical College, Cracow, Poland, Poland; 72 Lagos University Teaching Hospital, Lagos, Nigeria; 73 Federal Medical Center, Birnin Kudu, Jigawa State, Nigeria; 74 Hospital de Egas Moniz-Centro Hospitalar de Lisboa Ocidental, Lisboa, Portugal; 75 Omsk State Medical University, Omsk, Russian Federation; 76 King Fahd Hospital of the University, Alkhobar, Saudi Arabia; College of Medicine, Imam Abdulrahman bin Faisal University, Saudi Arabia; 77 Subdivision of Hepatology and Gastroenterology, 5th Department of Internal Medicine, Comenius University Faculty of Medicine, University Hospital Bratislava, Slovakia; 78 Division of Hepatology, Department of Medicine, Faculty of Health Sciences, University of Cape Town, Cape Town, South Africa; 79 Oncology Department, National Cancer Institute, University of Gezira, Wad Madani, Sudan; 80 Department of Gastroenterology and Hepatology, Karolinska University Hospital, Karolinska Institutet, Stockholm, Sweden; 81 Muhimbili National Hospital, Dar es-Salam, Tanzania; 82 Kiruddu National Referral Hospital, Uganda; 83 Faculty of Medical Sciences, Newcastle University Medical School, Framlington Place, United Kingdom; 84 University of Kansas Medical Center, KS, USA, United States; 85 Division of Gastroenterology and Hepatology, Mayo Clinic, Minnesota, United States; 86 Department of Medicine, University of South Dakota Sanford School of Medicine, Division of Transplant Hepatology, Avera Transplant Institute, Sioux Falls, SD, United States, United States; 87 Department of Medicine, Division of Gastroenterology and Division of Infectious Diseases, University of Minnesota, Minnesota, United States; 88 Barcelona Clinic Liver Cancer group, Liver Unit, IDIBAPS, Hospital Clinic, University of Barcelona, Barcelona, Spain; 89 NAFLD Research Center, Division of Gastroenterology, Department of Medicine, University of California at San Diego, California, United States; 90 Liver Unit,

Figure: (abstract: SAT-129) Policies, strategies, and treatments for hepatocellular carcinoma (HCC) in 66 countries. The data reflects the existence of a national cancer plan, existence of a specific national plan/strategy on HCC, a national or subnational disease registry including HCC, a national clinical guideline on HCC, and availability of liver transplantation.
Background and aims: Hepatocellular carcinoma (HCC) is the third most common cause of cancer-related deaths worldwide. The aims of the study were to explore HCC-related population-wide public health policies (PHP) in terms of prevention, treatments availability, epidemiological surveillance, and awareness campaigns worldwide.

Method: We conducted a 43-item survey about HCC: policies and civil society (18 questions), clinical guidelines (5 questions), epidemiology (7 questions), and care management (13 questions). We invited 249 gastroenterologists, hepatologists, oncologists, surgeons, radiation therapists, and public health experts from 74 countries/territories. The survey was administered using an electronic form between May 14, 2022, and January 24, 2023. Data were collected in a spreadsheet, reviewed by two independent reviewers, and verified with governmental institutions, regulatory agencies, scientific societies, and scientific publications.

Results: We obtained 132 responses from 66 countries/territories (Africa N = 16, the Americas N = 18, Asia N = 10, Europe N = 21, and Oceania N = 1). A total of 46 (69.7%) countries had a written national cancer strategy or action plan (including solid and haematological neoplasms). However, only 5 (7.6%) had a specific written national strategy or action plan on HCC (Figure). Thirty-two (48.5%) countries had national clinical practice guidelines on HCC, mainly focused on prevention (84.4%), screening (93.8%), diagnosis (93.8%), treatment (93.8%), and palliative care (68.8%). Fifty-four (84.4%) countries had a national disease registry that included HCC. Several providers are involved in management of HCC: oncologists (33.3%), gastroenterologists (75.8%), hepatologists (74.2%), surgeons (60.6%), and palliative medicine specialists (33.3%). The most common strategies for staging of HCC were Barcelona Clinic Liver Cancer (BCLC) (85%) and TNM classification (10%). The survey reflects important differences in the availability of treatments, including surgery (98.4%), tyrosine kinase inhibitors (95.1%), chemoembolization (85.2%), radiofrequency or alcohol ablation (82%), immune checkpoint inhibitors (anti-VEGF (82%), liver transplant (74.2%), stereotactic body radiation therapy (42.6%), and radioembolization (36.4%).

Conclusion: Existence of PHP on HCC is insufficient worldwide. The most common strategy for staging is BCLC, but there are important differences on treatment availability across countries, especially regarding curative therapies.

SAT-130
Exploring attitudes towards non-invasive liver fibrosis tests in secondary care pathways: comparing national surveys between 2014 and 2021
Kushala Abeyesekera1,2, Ankur Srivastava3, Ian Rowé4, Helen Jarvis5, Stephen Ryder6, Andrew Yeoman1, John Dillon1, William Rosenberg8,1
1University of Bristol, United Kingdom; 2University Hospitals Bristol and Weston NHS Foundation Trust, Department of Liver Medicine, United Kingdom; 3North Bristol NHS Trust, United Kingdom; 4University of Leeds, United Kingdom; 5University of Newcastle, United Kingdom; 6University of Nottingham, United Kingdom; 7Amerin Bevan University Health Board, United Kingdom; 8University of Dundee, United Kingdom
Email: k.abeyesekera@bristol.ac.uk

Background and aims: Increasing availability of non-invasive liver tests (NITs) has created the opportunity to apply them to improving early detection and risk stratification of advanced liver disease. This study aimed to determine changes in attitudes and practices of secondary care specialists involved in managing liver disease in the UK, focusing primarily on attitudes to fibrosis assessment and the use of NITs. Secondary aims included exploring knowledge of NITs, use of designated early detection and risk stratification pathways, and barriers to implementing NITs in practice.

Method: Specialists managing patients with liver disease were invited to complete web-based surveys between 1st Oct 2014 to 1st Oct 2015 (Survey 1), and again between 1st Nov and 24th Dec 2021 (Survey 2) in the UK via the British Society of Gastroenterology, the British Association for the Study of the Liver, and using Twitter®. The second survey was closed early due to national clinical pressures from the COVID19 Omicron wave.

Results: Two hundred and fifteen healthcare professionals (HCPs) completed Survey 1 (49.5% hepatologists). The repeat survey was completed by 112 HCPs (64.3% hepatologists). Respondents represented 71 acute services in Survey 1 compared to 60 in 2021. Between the surveys the proportion of HCPs performing fibrosis assessment in all or nearly all cases rose by almost two-thirds from 45.1% to 74.1% ($\chi^2 = 25.01; p = 0.0001$). The proportion of respondents who considered FIB-4 to be useful in fibrosis assessment doubled from 40.7% (n = 87/215) 83.0% (n = 93/112; $\chi^2 = 53.93; p < 0.0001$). In 2014 87.0% (n = 187/215) considered transient elastography useful for fibrosis assessment, rising to almost all respondents (95.5%; n = 107/112; $\chi^2 = 5.96, p = 0.148$). Enhanced Liver Fibrosis (ELF) test was more favourably viewed amongst respondents for fibrosis assessment, increasing from 25.3% (n = 54/215) to 43.7% (n = 49/112; $\chi^2 = 11.85; p = 0.0006$) usage in 2021. A further 49.1% of respondents considered ELF useful but did not use it in their practice in 2021. Of the acute services represented by respondents, 46.5% (n = 33/71) respondents in acute services reported the use of NITs in clinical pathways, rising to 70.0% (n = 42/60) in Survey 2 ($\chi^2 = 7.35; p = 0.007$). Availability of tests has increased but is not universal. The proportion reporting availability as a barrier to uptake has fallen from 57.2% of responses in Survey 1 to 38.4% in 2021 ($\chi^2 = 11.01; p = 0.0009$).

Conclusion: Between 2014 and 2021, there has been a substantial increase in the use of NITs for fibrosis assessment accompanied by their use in clinical pathways to guide the management of people at risk or with liver disease. Poor access to NITs remains the predominant barrier. There is a pressing need for a simple, coordinated national strategy for testing individuals at risk of cirrhosis in primary care to ensure that cases can be identified and provided with prompt specialist care.

Figure:
SAT-131
Evidence of significant alcohol-associated mortality in a large population cohort in Uganda
Cori Campbell1, Joseph Mugisha2, Elizabeth Waddilove1, Ronald Makanga2, Tingyan Wang1, Beatrice Kimono2, Florence Nambaziira Muzaale2, Philippa Matthews3, Eleanor Barnes1.
1University of Oxford, Nuffield Department of Medicine, United Kingdom; 2Medical Research Council/Uganda Virus Research Institute/London School of Hygiene and Tropical Medicine (MRC/UVRI/LSHTM) Uganda Research Unit, Entebbe, Uganda, Uganda; 3The Francis Crick Institute, 1 Midland Way, London, UK, United Kingdom
Email: cori.campbell@ndm.ox.ac.uk

Background and aims: Liver function tests (LFTs) can be used as prognostic biomarkers of all-cause mortality, however few investigations have been undertaken in African populations despite a high burden of liver disease in these settings. Previous analysis of the General Population Cohort (GPC) in Uganda suggested high prevalence of alcohol-related liver disease, HIV infection, HBV and associated primary liver cancer. We aimed to investigate how LFTs associated with risk of all-cause mortality in the GPC.

Method: The prospective GPC was established in 1989 in Kalungu District in rural south-western Uganda. In the 22nd survey round (years 2010/11), selected participants underwent measurement of biophysical and blood parameters to investigate disease risk factors and outcomes. Outcomes were ascertained via presentation to health clinic. Descriptive statistics were used to summarise parameters and compare correlations between LFTs, blood lipids (including low density lipoprotein, LDL), AST:ALT ratio (values >2 indicate alcoholic hepatitis), Haemoglobin A1C (HbA1c). We investigated characteristics/biomarkers associated with hazards of death via Cox proportional hazards modelling.

Results: In 7896 individuals with median age 30 years (IQR 17–46), 43.8% were male (n = 3455). Minorities of individuals had confirmed chronic hepatitis B virus (HBV) (n = 216, 2.7%) or human immunodeficiency virus (HIV) (n = 582, 7.4%) infections throughout follow-up. Over 6.30 mean years (SD 3.26) of follow-up, 629 (7.8%) individuals died from any cause. Fisk factors for all-cause mortality included increasing age, male sex, HIV positivity (Figure 1). Nearly a quarter (23.3%, n = 147) of participants who died had an AST:ALT value >2, as compared to 9.8% (n = 710) of individuals who survived. A one-unit increase in AST:ALT ratio was associated with 17% higher hazards of death, and a 10 unit increase in gamma-glutamyl transference (GGT) with a 1% increase in hazards. Other cardiometabolic factors associated with death included HbA1c and LDL.

Conclusion: Understanding of liver disease in the WHO Africa region must urgently improve. Using AST:ALT ratio cutoff (established in Western populations) suggests an association of alcoholic hepatitis with mortality, which is substantiated by elevated GGT. Clinical and public health programmes should be informed by data suggesting high alcohol consumption is a significant contributor to mortality.

SAT-132
Detection of potential subjects at risk of liver fibrosis in general population in Spain
María Del Barrio Azaceta1, Paula Iruzubieta1, Armando Raúl Guerra Ruíz1, Marta Alonso-Peña1, María Teresa Arias Loste1, Aitor Odriozola1, Ángela Antón1, Sara Alonso1, Bernardo Alio Lavin1, Javier Crespo1.
1Gastroenterology and Hepatology Department, Marqués de Valdecilla University Hospital, Clinical and Translational Digestive Research Group, IDIVAL, Santander, Spain; 2Análisis Clínicos y Bioquímica. Hospital Universitario Marques de Valdecilla, Santander, Spain
Email: javiercrespo1991@gmail.com

Background and aims: A two-step assessment with fibrosis index-4 (FIB-4) and transient elastography has been established as an appropriate screening strategy for liver fibrosis in >50 years old with metabolic risk factors. However, a screening program needs to guarantee the greatest accessibility for the population at risk. Our aim was to determine the prevalence of high risk of advance fibrosis (AdF) by FIB-4 in the general population and, therefore, subjects susceptible to undergo a second fibrosis assessment.

Figure: (abstract: SAT-132).
Method: Cross-sectional study in Spain based on general population that included subjects aged 50–70 from: A) Cantabria Cohort (volunteers and random sampling of the entire population of Cantabria –585,222 inhabitants-) enrolled from October 2021 to April 2022; B) Santander health area (315,000 inhabitants) who had an analysis from Primary Care between August-October 2021. The risk of AfD was determined using FIB-4: low risk (FIB-4 <1.3/2.0 in >65 years), intermediate risk (1.3–2.67/2.0–2.67 in >65 years) and high risk (>2.67).

Results: From Cantabria cohort, 6,687 subjects were included (mean age 58.7 ± 5.8; 41.0% men; 23.6% obese), 2,545 subjects (38.1%) had an intermediate risk, and 155 subjects (2.3%) had a high risk. No differences were found in the prevalence of high risk of AfD between obese and non-obese subjects (2.0% vs. 2.3%; p = 0.4). FIB-4 could be calculated in 16,263 of the subjects in the Santander health area (mean age 60.4 ± 6.0; 41.7% men). Intermediate risk was observed in 5,185 cases (31.9%) and high risk in 498 (3.1%), similar to the general population cohort (Fig).

Conclusion: In a health area of 315,000 inhabitants, a two-step fibrosis screening strategy in subjects aged 50–70 years, without considering metabolic factors, would entail the application of a second test in approximately 1500 subjects/month and, therefore, this implies that approximately 150 subjects/month need to be referred to a specialized consultation; which is a number of patients that can be assumed by the Hepatology unit service of a tertiary referral hospital.

SAT-133
Comparison of the opt in vs opt out policy and its impact on the donation rate of liver transplantation in the Colombian healthcare system
Andres Gomez Aldana1,2, Diana Carolina Gomez3, 1Fundación Santa Fe de Bogotá, Bogotá, Colombia; 2McMaster University, Canada; 3Sanitas EPS, Colombia
Email: andresgomezmd@hotmail.com

Background and aims: The organ donation process around the world is supported by two systems denominated opt-in (the patient agrees to be a donor) and opt-out (it is presumed that the person consents to the donation unless they have registered their contrary decision); This last policy was pursuing to bolster donations rate. Given the lack of potential donors and our low donor rate (8 per million inhabitants), Colombia promulgated some laws (823 in 2015 and 714 in 2016), seeking to expand the legal presumption of donation of anatomical components for transplant purposes or other therapeutic uses, designing a legal framework to increase the donation rate to all those people who had not expressed the refusal to do so while alive.

Method: This is a retrospective study comparing two years before and two years after the establishment of this new law in terms of the number of liver transplants.

Results: The absolute number of organ donations in Colombia (This organ donation and distribution in 6 different geographical regions across the country), was assessed during the period of 2015–2016. Therefore, this time will be known as the opt–in period. Moreover, the period 2017–2018 was covered during the opt-out policy period. Overall, the national donation rate increases reach up to 11.6%.

Alternatively, the refusal rate of family members, before and after the enacted legislation, shows a decrease of 61%, which suggests a favorable outcome. Moreover, the liver transplant rate during the opt–in period (2015–2016), showed a slight increase in the number of transplants, reaching 3.44% in the absolute number. By contrast, during the period 2017–2018, a decrease of 17% is observed in the number of transplants compared.

Conclusion: In summary, the new legislation switching to the “opt-out” policy has been a favorable strategy for transplants of different solid organs. Unfortunately, the liver transplant rate has shown an unfavorable trend with this intervention, which would make it necessary to carry out more studies to identify which other causes are inducing this negative impact on this population. Otherwise, there is still more research required to assess the impact of COVID-19 on this policy.

SAT-134
Global burden of common cancers attributable to metabolic risks from 1990 to 2019
Qing-Qing Xing1, Jing-Mao Li2, Chen Chen Zhi-Jian1, Xiaoyun Lin1, You You Yan-Ying3, Mei-Zhu Hong4, Shangeng Weng5, Jin-Shui Pan1. 1First Affiliated Hospital of Fujian Medical University, Department of Hepatology, Fuzhou, China; 2Xiamen University, Department of Statistics, School of Economics, Xiamen, China; 3First Affiliated Hospital of Fujian Medical University, Department of Hepatology, Fuzhou, China; 4Mengchao Hepatobiliary Hospital of Fujian Medical University, Department of Traditional Chinese Medicine, Fuzhou, China; 5First Affiliated Hospital of Fujian Medical University, Hepatopancreatobiliary Surgery Department, Fuzhou, China
Email: 363111396@qq.com

Background and aims: Non-alcoholic fatty liver disease (NAFLD) is usually accompanied by metabolic syndrome, which is associated with increased risk of cancer. To inform a tailored cancer screen in patients at higher risks, we estimated the global burden of cancer attributable to metabolic risks.

Method: Data of common metabolism-related neoplasms (MRNs) were derived from the Global Burden of Disease (GBD) 2019 database. Age-standardized, disability-adjusted life year (DALY) rates and death rates of patients with MRNs were extracted from the GBD 2019 database and stratified by metabolic risk, sex, age, and level of socio-demographic index (SDI). The annual percentage changes of age-standardized DALYs and death rates were calculated.

Results: Metabolic risks, consisting high body-mass index and fasting plasma glucose, contributed substantially to the burden of neoplasms, including colorectal cancer (CRC), tracheal, bronchus, and lung cancer (TBLC), etc. Globally, in 2019, there was an estimated age-standardized DALY rates and death rates were calculated.

Conclusion: These findings further underpin the correlation between NAFLD and intrahepatic and extrahepatic cancers and highlight the possibility of tailored cancer screening for the NAFLD population at higher risks.
**SAT-135**

**Impact of coronavirus disease pandemic on hospitalizations due to chronic liver disease in Belgrade, Serbia**

Ivana Pantić¹, Nina Rajović², Sofija Lugonja³, Svetlana Miltenovic⁴, Tamara Milovanovic¹,⁵. ¹Clinic of gastroenterology and hepatology, University clinical center of Serbia, Belgrade, Serbia; ²Institute for medical statistics and informatics, Faculty of medicine, University of Belgrade, Belgrade, Serbia; ³General hospital “Djordje Joanovic”, Serbia; ⁴Institute of public health of Belgrade, Serbia; ⁵Faculty of medicine, University of Belgrade, Serbia

**Email:** tamara.alempijevic@med.bg.ac.rs

**Background and aims:** The consequences of severe and worldwide health-care disruption as a result of coronavirus disease (COVID-19) pandemic still have to be dealt with. Besides the decreased availability of health-care services during the lockdown, it is also hypothesized that patients detained themselves from seeking help. Additionally, an increase in alcohol consumption during that period is well documented. The aforementioned mechanisms contributed to higher morbidity and mortality of patients suffering from all chronic diseases-including the chronic diseases of the liver. The aim of our study was to evaluate whether there are any differences in hospital admissions due to chronic liver disease (CLD) and outcomes during the pandemic in Belgrade, Serbia, compared to the previous years.

**Method:** Hospital admissions due to alcohol-related, viral, autoimmune, and overlapping liver disease were identified using primary and secondary discharge diagnosis codes, based on the 10th revision of the International Statistical Classification of Diseases and Related Health Problems. All hospitalization reports (including re-hospitalizations) which included adult subjects on the territory of Belgrade, between 2016 and 2021, and contained pre-defined principal discharge codes were selected. We compared the period of pandemic (2020 and 2021) with previous years (2016–2019).

**Results:** A total of 6789 hospitalizations due to CLD were noted during the study period. The mean age of patients was 52.5 ± 15.9 years, and majority were male (65.5%). Median hospital stay of the patients was 4 days (25th-75th percentile: 1–12). Number of hospitalizations due to CLD per year from 2016 to 2021 was as follows: 1395 (20.5%), 1259 (18.5%), 1268 (18.7%), 1533 (22.6%), 800 (11.8%), and 534 (7.9%), respectively. Average number hospitalizations per year before COVID-19 pandemic was 1364 ± 129, while during COVID-19 pandemic, average number of hospitalizations per year was 667 ± 188 (p = 0.005). During COVID-19 pandemic hospitalized patients were more often female (p < 0.001), younger (p = 0.006), and more often had autoimmune liver disease than patients admitted due to CLD before COVID-19 pandemic (p < 0.001). During COVID-19 pandemic, shorter hospital stay (4 days vs. 1 day; p < 0.001) was reported, while mortality rate increased (7.6% vs. 8.8%; p = 0.048) compared to patients admitted for CLD before COVID-19 pandemic. Before COVID-19 pandemic, patients with alcohol-related/overlapping liver disease had the highest mortality rate (15.1%; p < 0.001). During COVID-19 pandemic, mortality rate for alcohol-related/overlapping liver disease increased to 21.2% (p < 0.001). In both groups (before and after COVID-19 pandemic), male (p < 0.001) and older (p < 0.001) patients were at increased risk for overall mortality (p < 0.001 and p < 0.001, respectively).

**Conclusion:** During COVID-19 pandemic less hospital admissions due to CLD was noted. Overall length of stay was shorter, overall mortality increased, while a significant increase in mortality was...
SAT-136
SIRIUS project: sensing probe exploring liver fibrosis in Slovakia
Lubomír Škladány,1 Daniel Jan Havaj,1 Svetlana Adamcová Selcanova,1 Janka Vnenčaková,1 Natalia Bystrianska,1 Daniela Zlinčanová,1 Karolina Sulejova,1 Beata Skvarkova,1 Marek Rac,2 Sylvia Dražílová,3 Martin Janičko,3 Peter Jarcuska,3 Tomáš Koller,4 1E D. Roosevelt University Hospital in Banská Bystrica, Slovakia; 2Faculty Hospital Nitra, Martin Janic
Karolina Sulejova, Beata Skvarkova, Marek Rac, Sylvia Dražílová, Martin Janičko, Peter Jarcuska, Tomáš Koller. E D. Roosevelt University Hospital in Banská Bystrica, Slovakia; Faculty Hospital Nitra, Nitra, Slovakia; Louis Pasteur University Hospital Kosice, Slovakia; Faculty of Medicine (University of Comenius), Bratislava, Slovakia
Email: lubomir.skladany@gmail.com

Background and aims: In Slovakia, liver cirrhosis is the most prevalent of all the countries in the world and it is the number-one cause of death in young adults (25–45 y/o). One of the responses on the side of the professional liver community was the launch of country-wide screening project SIRIUS. SIRIUS Project was aimed primarily at detecting liver fibrosis in general population and to try to find its associations with the most common risk factors for chronic liver diseases. This is the first interim analysis, aimed at the prevalence of liver fibrosis as detected by transient elastography (TE) with the threshold for increased stiffness as proposed by the LiverScreen project.

Method: In this community-outreach project, SIRIUS teams composed of physicians, nurses, volunteers and liver patient organization members travelled to pre-selected sociomes of six types from cities to remote villages and roma communities in all the regions of the country and recorded: brief medical history, demography, anthropometry, capillary blood chemistry, TE and, in a subset of participants gut microbiome samples. Liver stiffness was considered increased if the result of standardized TE (FibroScan®) measurement was above 8 kPa. We included only consenting adult community dwellers without known (ICD registered) liver disease apart from trivial NAFLD, and without active/unstable/life-threatening extrahepatic comorbidity. In the case TE, or laboratory parameters suggested liver disease, recall policy was two-pronged: 1) patients were offered on-site consultation by a physician from the liver unit and they were issued 2) Green Card with SIRIUS personal identifier serving as a passport for the subsequent in-depth examination in the respective regional liver outpatient clinic. In the case local show-up exceeded the capacity of SIRIUS day, unserved interested persons were issued Orange Card with SIRIUS personal identifier allowing for the SIRIUS exam in the future. SIRIUS has been granted Institutional Ethics committee approval and NCT registration number.

Results: Between August 23, 2022 and January 31, 2023, SIRIUS team visited nineteen sites and completed the data collection in 1 663 adult participants. Issued were 560 Green Cards and 332 Orange Cards, respectively. We detected liver stiffness >8 kPa in 243 participants (15%).

Conclusion: In this country-wide endeavour, the prevalence of increased liver stiffness was considerably higher than in other regions of Europe. Before we claim the prevalence is concordant with staggering prevalence of end-stage liver disease in Slovakia, we have to exclude self-selection bias by continuing enrollment until tsunami of interest to be screened levels off.
WEDNESDAY 21 TO SATURDAY 24 JUNE

TOP-096
Trends in hepatitis B and hepatitis C related hepatocellular carcinoma, 2015 to 2030
Devin Razavi-Shearer1, Sarah Blach1, Ivane Gamkrelidze1, Kathryn Razavi-Shearer1, Alexis Voeller1, Homie Razavi1. 1Center for Disease Analysis Foundation, Lafayette, United States
Email: drazavishearer@cdafound.org

Background and aims: Hepatocellular carcinoma (HCC) secondary to hepatitis B (HBV) and/or hepatitis C (HCV) virus infection is an important cause of morbidity and mortality. We aimed to estimate the change in incident HCC cases from 2015 through 2030 under the current HBV and HCV treatment paradigms.

Method: To estimate the number of HCC cases attributed to HBV or HCV, first the annual number of incident liver cancer cases was collected (by country for all available years) from national cancer registries. If registry data were unavailable, estimates from local hospitals or clinics were collected and extrapolated to the country level in consultation with local experts. Next, incident liver cancer cases were adjusted for type (HCC), etiology (HBV or HCV) and underreporting (if indicated by local experts). Proportions used to adjust for type, etiology, and underreporting were retrieved from published literature, local databases, or expert input.

In parallel, country-specific models for HBV (PRoGReS Model) and HCV (Bright Model) were developed using epidemiological data and expert input. These estimated the natural history (from 1950 to 2050) of HBV or HCV disease and future burden, including HCC. After calibration, model calculated incident HCC cases were validated against reported cases, where available.

Finally, the modeled numbers of HBV- or HCV-related incident HCC cases from 2015 to 2030 were retrieved by country. If country-specific data were not available, regional averages were used. Country data were summed, by disease, to estimate the global number of incident HBV- or HCV-related HCC. Finally, the number of viral hepatitis-related HCC cases was calculated by summing HBV-related and HCV-related cases. Incidence rates were calculated per 100,000 population (adults 18+).

Results: At the country level, the incidence of viral hepatitis-related HCC in 2022 was generally correlated with viral hepatitis prevalence in the same year. Given current prophylaxes and treatment trends, the global number of incident viral hepatitis-related HCC cases would increase from 860,000 (16.9 per 100,000) in 2015 to 1.08 million (17.5 per 100,000) by 2030. HCV-related incident HCC cases would increase 3% (from 210,000 in 2015 to 216,000 in 2030), while the incidence rate would decrease 15% (from 4.1 to 3.5 per 100,000). Meanwhile, HBV-related incident HCC would increase (33% for cases, 10% for rate), from 652,000 (12.8 per 100,000) in 2015 to 864,000 (14.0 per 100,000) by 2030. Due to the changing trends by disease area, the proportion of viral hepatitis-related HCC cases attributed to HBV would increase from 76% in 2015 to 80% in 2030.

Conclusion: HBV-related HCC was the major driver of increasing trends in incident HCC cases. Prevention and treatment of HBV and HCV should be pursued not only for the elimination of viral hepatitis, but also as a strategy for cancer prevention.

TOP-097
Engagement of patients with viral hepatitis diagnosed by opt-out universal emergency department testing
Amy Teague1, Jingwei Zeng2, Tanzina Haque2, Douglas Macdonald1,3, Kathleen Bryce1,4. 1Department of Hepatology, Royal Free London NHS Foundation Trust, London, United Kingdom; 2Department of Virology, Royal Free London NHS Foundation Trust, London, United Kingdom; 3Institute of Liver and Digestive Health, University College London, London, United Kingdom; 4Institute for Global Health, University College London, London, United Kingdom
Email: kathleenbryce@doctors.org.uk

Background and aims: We report on the engagement and assessment outcomes of adults diagnosed with viral hepatitis through a recently implemented universal opt-out blood-borne virus testing program across two emergency departments (ED) in London.

Method: Opt-out blood-borne virus (BBV) testing (HCV Ab, HBsAg and HIV) commenced for all adults attending ED at the Royal Free London NHS Trust from 15th April 2022. Reflex testing of HCV RNA and HBV DNA were performed in positive HCV Ab and HBsAg samples. Patient engagement was nurse-led and managed by a bespoke patient management system from which data was extracted to 24th January 2023. Patients were initially contacted by phone and then by letter if this was unsuccessful after two separate attempts. All patients contacted were offered assessment in a hospital outpatient setting.

Results: A total of 52 new hepatitis C and 195 new hepatitis B diagnoses were made during the study period. The subsequent engagement and treatment cascade is shown in Table 1. The proportion of those not under care that have since been assessed are the same for both groups (56%) but the non-attendance rate of...
patients after successful contact was higher in those with hepatitis B than those with hepatitis C (21% vs 9%). 13% of those with hepatitis B spoke English as a first language compared with 65% of those with hepatitis C (p < 0.0001, Fisher’s exact test). Of those assessed in clinic with hepatitis B, 15.8% had an HBV DNA >2000 and 13.9% had F2 or greater fibrosis. 14% (n = 16) have been commenced on nucleotide therapy. 2 new HCC diagnoses were made at baseline imaging. Of those assessed with hepatitis C, 22% had F3 or greater fibrosis and 62.5% (n = 20) had been commenced on treatment by the censor date. A further 5 patients with hepatitis C who were not contactable or disengaged after assessment have been successfully engaged and treated by a mobile Find-and-Treat service.

**Conclusion:** We have shown that opt-out ED BBV testing is feasible at scale and can identify large numbers of new cases of viral hepatitis, particularly hepatitis B. However, subsequent engagement presents challenges which differ between hepatitis B and C cohorts. In implementation of opt-out ED testing appropriate resource allocation to subsequent engagement, assessment and treatment is essential if patients are to benefit from diagnosis.

### Table 1:

<table>
<thead>
<tr>
<th>Total tests</th>
<th>54509</th>
<th>54398</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total positives (% of all tests)</td>
<td>64 (0.117%)</td>
<td>253 (0.465%)</td>
</tr>
<tr>
<td>– New diagnoses (% of all positives)</td>
<td>52 (81%)</td>
<td>195 (77%)</td>
</tr>
<tr>
<td>– Lost to follow-up (% of all positives)</td>
<td>8 (13%)</td>
<td>32 (13%)</td>
</tr>
<tr>
<td>– Already under follow-up (% of all positives)</td>
<td>4 (6%)</td>
<td>26 (10%)</td>
</tr>
<tr>
<td>Total requiring assessment (% of all positives)</td>
<td>57 (89%)</td>
<td>204 (81%)</td>
</tr>
<tr>
<td>– Contacted (% of total requiring assessment)</td>
<td>42 (74%)</td>
<td>177 (87%)</td>
</tr>
<tr>
<td>– Attended (% of all appointments booked before censor date)</td>
<td>32 (83%)</td>
<td>115 (76%)</td>
</tr>
<tr>
<td>Commenced on treatment (% of all attended)</td>
<td>20 (62.5%)</td>
<td>16 (13.9%)</td>
</tr>
</tbody>
</table>

**FRIDAY 23 JUNE**

**FRI-113**

Estimating the economic value allocation of the social surplus generated by the utilization of second-generation direct-acting antivirals for hepatitis C in the United States, 2015–2019

Louis Garrison1,2, Boshen Jiao1,3, Zizi Elsisi1,2, Alon Yehoshua4, Roy Koruth4, Bruce Kreter4, Jens Grueger2,5. 1University of Washington, United States; 2VeriTech Corporation, Mercer Island, United States; 3Harvard School of Public Health, United States; 4Gilead Sciences, Inc., United States; 5Boston Consulting Group, United States

Email: jens.grueger@t-online.de

**Background and aims:** While the rising costs for innovative medicines are discussed widely, they are rarely put in context of the total social surplus that is generated for health systems and society. Between 2014 and 2019, several innovative direct-acting anti-viral therapies (DAAs) were introduced with the potential to cure patients with hepatitis C (HCV). They generate surplus in the form of the value of the health gains for patients as well as the cost-savings for health systems. As an incentive for innovation, manufacturers of patent-protected medicines are rewarded with a share of this social surplus in the form of the revenues that they accrue over the life cycle of a product—from initial launch through eventual patent expiry and perhaps beyond. This analysis focuses on the U.S. during this period and addresses the question: what share of the aggregate economic value generated by DAA utilization from 2015 to 2019 was allocated to manufacturers versus the rest of society?

**Method:** This analysis took a national healthcare system perspective. We projected the impact of DAAs on health outcomes and costs compared with the counterfactual scenario using the pre-DAA standard of care (SOC). Analyses are based on CDAF-Polaris database on the utilization of HCV treatments from 2011 to 2019. Projections

**Figure:** (abstract: FRI-113).
Predictors of late diagnosis were analyzed using multiple logistic regression adjusting for demographics, social/material deprivation and comorbidities. Results are shown as adjusted odds ratio (aOR), 95% CI, and p value.

Results: Among 40,667 individuals diagnosed with HCV from 1990 to 2016, 67% were male, with a mean age of 44.2 years (standard deviation 14.9); 56% were born in 1945–1965, 46% were PWID, and 13% immigrants. Overall, 17% of all HCV diagnoses were late, with an increase of 4.5%/year (95% CI, 2.2–6.7, p < 0.001) between 1998 and 2004, 9.0%/year (7.3–10.7, p < 0.001) between 2005 and 2012, and then with a decrease of –9.3%/year (–15.5–3.1, p = 0.001) between 2013 and 2016. The rate of late diagnosis/100 HCV cases was higher among immigrants compared to non-immigrants (20.9 vs. 16.3; RR 1.28, 95% CI 1.18–1.40, p < 0.001) with highest rates among those from Sub-Saharan Africa (25.8, 1.58, 1.22–2.04, p = 0.001). Overall predictors of higher risk of late diagnosis in adjusted analysis included alcohol use disorder (aOR 1.40, 95% CI 1.32–1.47, p < 0.001), being born <1945 compared to >1965 (1.38, 1.29–1.47, p < 0.001), social deprivation (1.12, 1.03–1.23, p = 0.012), male sex (1.11, 1.07–1.14, p < 0.001), and immigrant status (1.10, 1.05–1.16, p < 0.001). Factors associated with a lower risk of late diagnosis included PWID status (0.78, 0.75–0.81, p < 0.001), mental health diagnosis (0.93, 0.89–0.96, p < 0.001), being born in 1945–1965 compared to >1965 (0.94, 0.90–0.98, p = 0.007), and rural residence (0.95, 0.92–0.99, p < 0.008). Among immigrants, those from Sub-Saharan Africa compared to High Income regions (1.40, 1.03–1.92, p = 0.034) and women (1.10, 1.01–1.19, p = 0.023) were at higher risk of late diagnosis.

Background and aims: Timely diagnosis and treatment of all individuals infected with HCV is needed to prevent poor outcomes such as decompensated cirrhosis (DC), hepatocellular carcinoma (HCC), and liver-related deaths. We estimated annual rates and predictors of late HCV diagnosis in Quebec, Canada.

Method: A population-based cohort of all reported HCV cases in Quebec (1990–2018) were linked to several health administrative databases including the landed immigrant database (1980–2018). People who inject drugs (PWID) and liver related outcomes (DC/HCC) were defined using published algorithms. Missing data were addressed with multiple imputation by chained equations. Late diagnosis was defined as the occurrence of DC or HCC any time before up until 2 years after HCV diagnosis. Annual crude rates of late diagnosis per 100 HCV diagnoses were estimated until 2016 to avoid truncation bias. Rate ratios (RR), yearly percent change, and 95% confidence intervals (CI) were estimated using Poisson regression. Predictors of late diagnosis were analyzed using multiple logistic regression.
An international coalition to eliminate hepatitis B virus (ICE-HBV) survey confirms inadequate HBV/HDV screening and diagnosis diminishing elimination targets in resource limited settings

Daryl Lau1, Anna Kramvis2, Camila Picchio3, Kathy Jackson4, Alice Lee5, Gail Matthews6, Jess Howell7, Carla Coffin8, Maud Lemoine9, Peter Revill10, Mark Sonderup11,12, Fatou Fall13, Vonthanak Saphonn14, Margaret Hellard15, David Anderson16, Wendy Spearman11,17, Capucine Penicaud18, Manal Hamdy El-Sayed19.

1Liver Center, Department of Medicine, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, United States; 2Hepatitis Virus Diversity Research Unit, Department of Internal Medicine, University of the Witwatersrand, South Africa; 3Barcelona Institute for Global Health (ISGlobal), Hospital Clinic, University of Barcelona, Spain; 4Section of Molecular Microbiology, Doherty Institute, Australia; 5World Gastroenterology Organization, Australia; 6The Kirby Institute, University of New South Wales, Australia; 7Department of Gastroenterology, Burnet Institute, Australia; 8Cumming School of Medicine, University of Calgary, Canada; 9Division of Digestive Diseases, Department of Metabolism, Digestion, and Reproduction, Imperial College London, United Kingdom; 10Department of Microbiology and Immunology, Doherty Institute, Australia; 11Faculty of Health Sciences, University of Cape Town, South Africa; 12University of Cape Town Faculty of Health Sciences, Division of Hepatology, Cape Town, South Africa; 13Dakar University Hospital, Senegal; 14University of Health Sciences (UHS), Cambodia; 15Burnet Institute, Australia; 16Global Health Diagnostics Laboratory, Burnet Institute, Australia; 17Université Claude Bernard Lyon, Hospital de la Croix-Rousse, France; 18The Hepatitis Fund, Switzerland; 19Department of Pediatrics, Ain Shams University, Egypt

Email: dlau@bidmc.harvard.edu

Background and aims: The availability of diagnostic tools and technologies in resource limited settings (RLS) is critical to achieve the WHO 2030 goal to eliminate hepatitis B virus (HBV) as a public health challenge. HBV/hepatitis Delta virus (HDV) coinfection is associated with rapid liver disease progression and is under-diagnosed. Our objective was to assess the perceived priorities for HBV elimination among healthcare providers and to evaluate the availability of diagnostic tests for HBV and HDV in RLS.

Method: Between Jan–Dec 2022, ICE-HBV launched a global online survey in three languages (English, French, Spanish) to better understand the challenges in delivering HBV care in RLS. The survey had 53 items addressing the priorities to reach the goal for HBV elimination, and the accessibility to diagnostic tests and therapies.

Results: Among the 178 health care worker (HCWs) survey respondents, specialists made up 50%; hepatologists (33%), gastroenterologists (6.9%), and infectious disease physicians (12.2%). The majority of the respondents worked in sub-Saharan Africa (sSA) (37%), South/South East Asia (SEA) (22%), and Europe (EU) (15%). Increasing HBV screening, diagnosis, and optimizing strategies to prevent mother-to-child-transmission (MTCT) were considered the highest priorities in achieving HBV elimination by 80% of responders. Universal HBV screening of pregnant women at antenatal visit were only routinely practiced in 59% of sSA and 66% of SEA settings. HBsAg ELISA testing was reported to be available in all regions, but in only 45% of sSA settings. Unlike HBsAg ELISA, HBsAg rapid diagnostic tests (RDT) were accessible in >90% of sSA regions. Similarly, HBV-DNA quantification with PCR were available in >80% of SEA and EU regions but only in 54% of sSA settings. More than 55% of all responders strongly agreed that an affordable point-of-care (POC) HBV DNA test is necessary in their locations if HBV DNA is in the treatment algorithm. HDV serological (36%) and molecular (34%) testing were the least frequently available diagnostic tests and were particularly low in sSA (Figure). Only 20% of all the respondents reported routine screening for anti-HDV among HBsAg-positive persons and the rates were even lower in sSA (3%) and SEA (12%). HDV-RNA PCR testing was least available in sSA (13%), SEA (20%), and South America (30%). Seventy-one (45%) of respondents reported inadequate training and resources available to HCWs for hepatitis B management in their settings.

Conclusion: Increased HBV screening and optimizing strategies to prevent MTCT were considered the highest priorities in achieving the WHO 2030 goal for HBV elimination. sSA has high HBV prevalence.

Figure: (abstract: FRI-115): Reported available HBV and HDV diagnostic tools in resource limited settings by regions.
but least access to essential HBV screening assays. While effective HDV therapies are becoming available, RLS are not equipped to appropriately screen and diagnose HBV/HDV co-infection, particularly in regions where HDV infection is prevalent. Improved HBV and HDV screening strategies, resources to increase antenatal HBV screening of pregnant women and training for HCWs are urgently needed in RLS to accelerate progress towards the WHO elimination targets.

**FRI-116**

**Population adjusted prevalence of hepatitis delta virus in 21 countries and territories**

Devin Razavi-Shearer1, Kathryn Razavi-Shearer1, Homie Razavi1.

1Center for Disease Analysis Foundation, Lafayette, United States

Email: drazavishearer@cdafound.org

**Background and aims:** The hepatitis delta virus (HDV), a satellite RNA virus, requires the hepatitis B virus (HBV) for assembly and propagation. Individuals co-infected with HDV progress to advanced liver disease at a faster rate than HBV mono-infected. Recent studies have estimated the global prevalence of anti-HDV among the HBV-infected population at 5–15%. This study aimed to better understand HDV prevalence at the population level in 21 countries and territories.

**Method:** A comprehensive literature review was conducted for anti-HDV and HDV-RNA-positive prevalence for all countries/territories. Virtual meetings were held with experts from each setting to discuss the literature search findings, collect unpublished data/reports, and weight data for patient segments and regional heterogeneity to estimate the adjusted prevalence in the HBV-infected population. The findings were then combined with The Polaris Observatory HBV data to estimate the overall anti-HDV and HDV-RNA prevalence in each country/territory at the population level.

**Results:** After adjusting for geographical distribution, disease stage and special populations, the anti-HDV prevalence among the HBsAg+ population changed from the literature estimate in all but three countries. The highest anti-HDV prevalence was in Israel at 6.8% (Table 1). However, once adjusted for HBV+ population and HDV-RNA+, China had the highest absolute number of HDV-RNA+ cases.

**Conclusion:** We found significantly lower HDV prevalence than previously reported as prior meta-analyses primary focused on studies conducted in groups/regions that have a higher probability of being positive. When available data were weighted appropriately, the anti-HDV prevalence decreased by >50% in many countries. The implementation of reflex testing would result in more accurate estimates while allowing earlier linkage to care for HDV-RNA+ individuals. The burden of reflex testing would be limited as it would only screen HBV+ cases. Cost effectiveness studies of reflex testing will be needed in East Asia where the hepatitis B prevalence is high and HDV prevalence is relatively low.

**FRI-117**

**Prevalence and incidence of delta hepatitis in HIV-HBV coinfected patients in the Da’AIDS cohort**

Dulce Alfaiate1, Pierre Pradat2, Isabelle Poizot Martin3, Eric Billaud4, David Rey5, Christine Jacomet6, Alain Makinson7,8,9, Laurent Cotte1.

1Hospices Civils de Lyon, Service des Maladies Infectieuses-Hôpital de La Croix Rousse, France; 2Hospices Civils de Lyon, Centre de Recherche Clinique-Hôpital de La Croix Rousse, France; 3Assistance Publique des Hôpitaux de Marseille, Service des Maladies Infectieuses-Hôpital Sainte Marguerite, France; 4Centre Hospitalier Universitaire de Nantes, Service des Maladies Infectieuses, Nantes, France; 5Hôpitaux Universitaires de Strasbourg, Trait d’Union, Strasbourg, France; 6Centre Hospitalier Universitaire de Clermont Ferrand, Clermont Ferrand, France; 7Centre Hospitalier Universitaire de Montpellier, Service des Maladies Infectieuses, Montpellier, France; 8INSERM, U1175, Montpellier, France; 9Université de Montpellier, Montpellier, France

Email: dulce.alfaiate@chu-lyon.fr

**Background and aims:** The epidemiology of delta hepatitis (HDV) remains largely unknown and there is to date no large multicentric study of its incidence at a country level. We report HDV prevalence,

**Table 1. Prevalence of HDV among the HBsAg+ Population in 21 countries/territories**

<table>
<thead>
<tr>
<th>Country/Territory</th>
<th>2020 HBsAg+</th>
<th>Literature % anti-HDV</th>
<th>Adjusted % anti-HDV+</th>
<th>% RNA+</th>
<th>Adjusted RNA+ HDV Prevalence</th>
<th>Adjusted RNA+ HDV Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>1,057,700</td>
<td>3.2%</td>
<td>1.7%</td>
<td>75.3%</td>
<td>1.3%</td>
<td>13,600</td>
</tr>
<tr>
<td>Canada</td>
<td>223,200</td>
<td>1.6%</td>
<td>1.2%</td>
<td>64.8%</td>
<td>2.6%</td>
<td>2,480</td>
</tr>
<tr>
<td>China, Mainland</td>
<td>83,083,000</td>
<td>1.2%</td>
<td>1.2%</td>
<td>66.6%</td>
<td>0.8%</td>
<td>664,000</td>
</tr>
<tr>
<td>Colombia</td>
<td>329,000</td>
<td>5.2%</td>
<td>5.2%</td>
<td>69.9%</td>
<td>1.5%</td>
<td>2,730</td>
</tr>
<tr>
<td>Germany</td>
<td>261,900</td>
<td>5.2%</td>
<td>5.2%</td>
<td>50.9%</td>
<td>1.8%</td>
<td>1,650</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>347,200</td>
<td>1.0%</td>
<td>1.0%</td>
<td>49.0%</td>
<td>0.6%</td>
<td>2,040</td>
</tr>
<tr>
<td>Israel</td>
<td>134,400</td>
<td>6.5%</td>
<td>6.5%</td>
<td>60.5%</td>
<td>1.9%</td>
<td>5,100</td>
</tr>
<tr>
<td>Italy</td>
<td>315,100</td>
<td>8.3%</td>
<td>8.3%</td>
<td>60.5%</td>
<td>2.3%</td>
<td>1,420</td>
</tr>
<tr>
<td>Japan</td>
<td>562,000</td>
<td>0.2%</td>
<td>0.2%</td>
<td>60.5%</td>
<td>0.2%</td>
<td>100</td>
</tr>
<tr>
<td>Korea, Republic of</td>
<td>1,409,400</td>
<td>0.3%</td>
<td>0.3%</td>
<td>54.0%</td>
<td>0.2%</td>
<td>2,100</td>
</tr>
<tr>
<td>Mexico</td>
<td>122,200</td>
<td>2.4%</td>
<td>2.4%</td>
<td>69.9%</td>
<td>0.2%</td>
<td>200</td>
</tr>
<tr>
<td>Portugal</td>
<td>116,600</td>
<td>12.6%</td>
<td>12.6%</td>
<td>29.0%</td>
<td>2.3%</td>
<td>1,200</td>
</tr>
<tr>
<td>Romania</td>
<td>622,100</td>
<td>21.3%</td>
<td>21.3%</td>
<td>29.0%</td>
<td>2.3%</td>
<td>14,400</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>560,500</td>
<td>8.6%</td>
<td>8.6%</td>
<td>29.0%</td>
<td>2.3%</td>
<td>14,400</td>
</tr>
<tr>
<td>Spain</td>
<td>249,400</td>
<td>5.2%</td>
<td>5.2%</td>
<td>29.0%</td>
<td>2.3%</td>
<td>14,400</td>
</tr>
<tr>
<td>Sweden</td>
<td>30,000</td>
<td>3.8%</td>
<td>3.8%</td>
<td>29.0%</td>
<td>2.3%</td>
<td>14,400</td>
</tr>
<tr>
<td>Taiwan</td>
<td>963,400</td>
<td>6.0%</td>
<td>6.0%</td>
<td>29.0%</td>
<td>2.3%</td>
<td>14,400</td>
</tr>
<tr>
<td>USA</td>
<td>1,834,600</td>
<td>6.0%</td>
<td>6.0%</td>
<td>66.0%</td>
<td>2.0%</td>
<td>36,300</td>
</tr>
</tbody>
</table>

Figure: (abstract: FRI-116).
incidence and risk factors in a large cohort of people living with HIV (PLWH).

**Method:** A retrospective analysis was performed in the DatAIDS cohort, a nationwide cohort representing roughly half of PLWH in-care in France. Demographics, HBV, HDV and HCV serology and individual risk factors were collected. HDV prevalence was determined in patients with chronic hepatitis B infection (CHB) and a known HDV serology result. HDV incidence was determined in patients with at least one consecutive serology following a first negative one.

**Results:** HBV serology was available in 62473 of 74550 PLWH (83.8%), among whom 3737 had CHB (6.0%). HDV serology was available in 2406 patients with CHB (64.4%), of whom 376 had a positive HDV serology (HDV prevalence rate 15.6%). Among HIV-HBV coinfected patients, HDV prevalence rate reached 56.5% in IV drug users (IVDU), 38.2% in patients from Eastern Europe and 42.4% in patients coinfected with HCV. Among HDV-infected patients, blood contact was reported more frequently in patients born outside Africa than in patients from Africa (70.8% vs 10.0%, p < 0.001). In a multivariable analysis, male gender (OR 1.5, p = 0.02), HIV risk factor IVDU (OR 7.0, p < 0.001) or heterosexual sex (OR 1.8, p = 0.02), country of origin in Eastern Europe (OR 3.2, p = 0.002) or in Africa (OR 2.8, p < 0.001) and HCV coinfection (OR 2.9, p < 0.001) were positively associated with HDV infection. Conversely, age at HBV diagnosis (OR 0.96/year, p < 0.001) and duration of HBV infection (OR 0.84/year, p < 0.001) were negatively associated with HDV infection. HDV serology was positive at first determination in 349 patients (prevalent HDV 92.8%) while 27 patients acquired HDV during follow-up (incident HDV 7.2%). Repeated HDV serology results were available in 1827 patients for a total follow-up of 21006 patient-years (PY). HDV incidence rate was 0.12/100 PY (95% CI 0.08–0.18)-see Figure. For incident HDV infections, the median time separating HBV and HDV diagnoses was 11.4 years and these patients had similar demographics and characteristics than patients with prevalent HDV apart from older age at HDV diagnosis (48.0 years vs 37.3 years, p < 0.001).

**Conclusion:** HDV coinfection is common in HIV-HBV coinfected patients in France. Most HDV infections are prevalent infections, but some incident infections occurred during follow-up indicating that HDV transmission is still present in this population. Patients born in Africa or in Eastern Europe, IVDU and HBV–HCV coinfected patients are high-risk populations for HDV infection and should be targeted for systematic screening.

**FRI-118**

**Patients with persistently abnormal liver biochemistry are under-investigated and can be rapidly identified using a novel case-finding database**

Almuthana Mohamed1, Christina Owen1, Sarah Gormley1, Waqas Khan1, Emma Wesley1, Timothy Jobson1. 1Musgrove Park Hospital, Somerset NHS Foundation Trust, Gastroenterology, Taunton, United Kingdom

**Email:** almuthana700@gmail.com

**Background and aims:** Chronic liver disease (CLD) continues to increase in prevalence. However, it remains underdiagnosed, with many patients missing opportunities for treatment. Guidelines state that patients with persistently abnormal liver chemistry should have a non-invasive liver screen (NILS) to identify potentially treatable causes of CLD. Unfortunately, in practice, these guidelines are often

---

**Figure:** (abstract: FRI-117).
not followed. We have developed a novel case-finding database in Somerset, UK, currently with data on 560,000 individuals. We used this system to identify patients with persistently abnormal liver chemistry and quantify the completeness of subsequent investigation.

**Method:** Using data up to 31/12/2020, the case finding database was configured to identify patients between the ages of 30 and 75 with persistently abnormal liver chemistry (last ALT >40 IU/L and abnormal for at least the preceding 90 days). Within that cohort we further risk stratified to identify those with more concerning results (ALT >80; ALP >90; ALP >130; both ALT >80 and ALP >130). The number of patients in each group with a complete liver chemistry (last ALT >40 IU/L and 90 days). Within that cohort we determined. The screen was considered complete if these tests were found within a six-month period (based on ferritin date as the commonest test). A sample of cases was reviewed manually to confirm the accuracy of the results. We also assessed which age cohorts were more likely to have persistently abnormal liver chemistry and if there was any difference in age and likelihood of having had the ‘basic’ NIFS.

**Results:** 8224 males and 2537 females were identified as having persistently elevated liver biochemistry. Only 11% of males and 16% of females had a complete ‘basic’ NIFS using our definition. 5% of men and 6% of women were deceased, with no difference in the investigation rate. Persistently abnormal LFTs were most likely to be identified in the age 50–59 cohort for both men and women. There was no significant difference in the likelihood of having a NIFS when different age groups were compared. In the higher risk group (abnormal tests at least 90 days, last ALT >80, last ALP >130), there were a total of 547 patients identified, of whom 442 had never had a NIFS (81%). The slight trend towards improved investigation in higher-risk groups was not statistically significant (Figure 1).

**Conclusion:** Our data confirm that patients with persistently abnormal liver chemistry are frequently not investigated, with a high likelihood of missed opportunities for treatment. Our novel case-finding database can rapidly identify in seconds nearly 9000 individuals who may benefit from further investigation. Furthermore, the system can be used to easily risk stratify these patients for more targeted interventions. Further work is needed to implement processes to identify those needing specialist treatment.

**Background and aims:** An estimated 3.26 million children and adolescents are living with hepatitis C virus (HCV) globally. The World Health Organization (WHO) recommends simplification of HCV care pathways to overcome low rates of detection and linkage among children with HCV. The United States (US) Centers for Disease Control and Prevention (CDC) has proposed simplified draft recommendations for ribonucleic acid (RNA) testing at ≥2–6 months for infants who are perinatally exposed to HCV. Current US guidelines for perinatally exposed infants recommend antibody testing at age 18 months. However, this approach is associated with high rates of loss to follow-up. Our objective was to characterize infant HCV testing patterns, linkage to care, and possible impact of the CDC draft recommendations.

**Method:** From TriNetX, a network of electronic health record data with approximately 90 million individuals from US healthcare organizations, we identified a cohort of children born 2010–2020 with an International Classification of Diseases (ICD) code for exposure to viral hepatitis (Z20.5). We defined presumed HCV exposure by excluding children with only hepatitis B virus testing. We calculated the number of children with any testing, complete HCV care, and HCV treatment. Testing was considered complete if one of the following criteria were met: negative antibody test at any age, positive antibody test at 18 months or greater followed by at least 1 RNA test, two positive RNA tests, or two negative RNA tests.

**Results:** Our cohort included 8517 children with presumed HCV exposure. Of those, 3899 (46%) had any HCV testing: 2041 (52%) had antibody testing, 980 (25%) had RNA testing, and 878 (23%) had both. Among those with complete testing, 125 (4%) children were identified with HCV infection, of whom 9 (7%) were linked to treatment. Of those with incomplete testing, 51 children had one positive RNA test among children with HCV. The United States (US) Centers for Disease Control and Prevention (CDC) has proposed simplified draft recommendations for ribonucleic acid (RNA) testing at ≥2–6 months for infants who are perinatally exposed to HCV. Current US guidelines for perinatally exposed infants recommend antibody testing at age 18 months. However, this approach is associated with high rates of loss to follow-up. Our objective was to characterize infant HCV testing patterns, linkage to care, and possible impact of the CDC draft recommendations.

**Method:** From TriNetX, a network of electronic health record data with approximately 90 million individuals from US healthcare organizations, we identified a cohort of children born 2010–2020 with an International Classification of Diseases (ICD) code for exposure to viral hepatitis (Z20.5). We defined presumed HCV exposure by excluding children with only hepatitis B virus testing. We calculated the number of children with any testing, complete HCV care, and HCV treatment. Testing was considered complete if one of the following criteria were met: negative antibody test at any age, positive antibody test at 18 months or greater followed by at least 1 RNA test, two positive RNA tests, or two negative RNA tests.

**Results:** Our cohort included 8517 children with presumed HCV exposure. Of those, 3899 (46%) had any HCV testing: 2041 (52%) had antibody testing, 980 (25%) had RNA testing, and 878 (23%) had both. Among those with complete testing, 125 (4%) children were identified with HCV infection, of whom 9 (7%) were linked to treatment. Of those with incomplete testing, 51 children had one positive RNA test among children with HCV. The United States (US) Centers for Disease Control and Prevention (CDC) has proposed simplified draft recommendations for ribonucleic acid (RNA) testing at ≥2–6 months for infants who are perinatally exposed to HCV. Current US guidelines for perinatally exposed infants recommend antibody testing at age 18 months. However, this approach is associated with high rates of loss to follow-up. Our objective was to characterize infant HCV testing patterns, linkage to care, and possible impact of the CDC draft recommendations.

**Method:** From TriNetX, a network of electronic health record data with approximately 90 million individuals from US healthcare organizations, we identified a cohort of children born 2010–2020 with an International Classification of Diseases (ICD) code for exposure to viral hepatitis (Z20.5). We defined presumed HCV exposure by excluding children with only hepatitis B virus testing. We calculated the number of children with any testing, complete HCV care, and HCV treatment. Testing was considered complete if one of the following criteria were met: negative antibody test at any age, positive antibody test at 18 months or greater followed by at least 1 RNA test, two positive RNA tests, or two negative RNA tests.

**Results:** Our cohort included 8517 children with presumed HCV exposure. Of those, 3899 (46%) had any HCV testing: 2041 (52%) had antibody testing, 980 (25%) had RNA testing, and 878 (23%) had both. Among those with complete testing, 125 (4%) children were identified with HCV infection, of whom 9 (7%) were linked to treatment. Of those with incomplete testing, 51 children had one positive RNA test
with no follow-up testing. These children would have been identified for early linkage by CDC draft recommendations but were lost to follow-up under current guidelines for antibody testing at 18 months.

Figure: Current testing and treatment rates for children with presumed HCV exposure in the United States.

Percentage of total with HCV exposure.
Percentage of those with complete HCV testing.
Percentage of those with HCV infection.

Conclusion: Fewer than half of children identified with ICD codes for presumed HCV exposure in this cohort were tested, and very few children with HCV were treated. This analysis shows that some physicians are already offering early HCV RNA testing in exposed infants, and that this could capture more cases when compared to waiting until 18 months to complete antibody testing per current guidelines. The CDC’s draft recommendation for RNA testing could improve identification of perinatal HCV and advance efforts towards HCV elimination in alignment with WHO goals.

FRI-120
Opt-out testing for hepatitis B and C infections in adults attending the emergency department of a London Hospital
Jingwei Zeng1,2, Douglas Macdonald3, Russell Durkin4, Dianne Irish1, Jennifer Hart1, Tanzina Haque1. 1Royal Free Hospital, Department of Virology, London, United Kingdom; 2Royal Free London NHS Foundation Trust, Department of Virology, London, United Kingdom; 3Royal Free Hospital, Department of Hepatology, London, United Kingdom; 4Royal Free Hospital, Emergency Department, London, United Kingdom
Email: thaque@nhs.net

Background and aims: The National Health Service in England commissioned opt-out testing in all London emergency departments (ED) to allow early identification and management of hepatitis B (HBV) and hepatitis C virus (HCV) infection in patients unaware of their HBV or HCV status. This retrospective study evaluates the effectiveness of this new ED hepatitis virus screening programme at the Royal Free Hospital in northwest London.

Method: All adults over the age of 16 undergoing blood tests in the ED at the Royal Free Hospital were tested for HBV surface antigen (HBsAg) and anti-HCV IgG antibody unless they opted out. A streamlined screening protocol was developed with input from ED, Virology and Hepatology departments to ensure follow-up of patients with positive results. Data was collected from the 12th of April 2022 to the 22nd of August 2022.

Results: Of 11,215 patients tested for HCV, 164 patients were found to be anti-HCV IgG positive (Table 1), giving a seroprevalence rate of 1.46%. 69% of HCV seropositive patients were male and 31% were female (Odds ratio (OR) 2.54; 95% confidence interval (CI) 1.82–3.54). 52 of the HCV IgG positive patients did not have previous HCV serology results on our system. In total, 23 of the HCV IgG positive patients were HCV RNA positive (RNA seroprevalence 0.2%); and 17 of those were new diagnoses of HCV viraemia. The most common HCV genotype was genotype 1a (39%), followed by genotype 3a (30%) and genotype 1b (13%); genotypes 4a and 4v constituted 4% each. At the time of this study, 14 patients (82%) with new diagnosis of HCV were contacted by the Hepatology team; median time to the first recorded attempted contact was 4 days (range 2 to 43 days) and 5 patients have been started on treatment. For HBV screening, 82 out of 11,192 patients tested were found to be HBsAg positive (prevalence 0.73%; male 55% and female 45%; OR 1.38; 95% CI 0.89–2.13), including one patient who presented acutely with a positive HBV core IgM. 39 of the HBsAg positive patients were previously unknown to us; of these, 9 had an HBV viral load of >2000 IU/ml, including 3 patients with

<table>
<thead>
<tr>
<th>Anti-HCV IgG</th>
<th>HCV RNA</th>
<th>HBsAg</th>
<th>HBeAg</th>
<th>Anti-HBe IgG</th>
<th>HBV DNA</th>
<th>Anti-HDV Antibody</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients</td>
<td>11,215</td>
<td>161</td>
<td>11,192</td>
<td>82</td>
<td>82</td>
<td>40</td>
</tr>
<tr>
<td>Tested</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>164</td>
<td>23</td>
<td></td>
<td>82</td>
<td>4</td>
<td>78</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>113</td>
<td>15</td>
<td></td>
<td>45</td>
<td>3</td>
<td>42</td>
</tr>
<tr>
<td>Female</td>
<td>51</td>
<td>8</td>
<td></td>
<td>37</td>
<td>1</td>
<td>36</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16-35</td>
<td>11</td>
<td>3</td>
<td></td>
<td>10</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>36-55</td>
<td>61</td>
<td>9</td>
<td></td>
<td>34</td>
<td>1</td>
<td>33</td>
</tr>
</tbody>
</table>

Table: (abstract: FRI-120).
positive HBV e antigen (HBeAg) and one patient with hepatitis D virus (HDV) co-infection (Table 1). 38 (97%) of these new patients were contacted by the Hepatology team during the study period.

**Conclusion:** Opt-out screening of HBV and HCV in ED is effective at detecting previously unknown cases of infection and helps to identify patients who needed a link to care. HCV RNA prevalence was lower in our study at 0.21%, compared with RNA prevalence of 0.93% in a similar study conducted at our hospital in 2015 (Cieply et al., 2019), despite a similar HCV IgG seroprevalence (1.46% vs 1.63%).

**Method:** Multi-parameter evidence synthesis (MPES) is an approach that combines simultaneous information to derive an overall estimate. MPES was applied to each country to obtain national estimates. The overall CHCV prevalence (π) in the population was defined as: π = πrec,rec + πrec,ex + πnon,ex + πnon,non. The parameters πrec,rec and πnon,non represent CHCV prevalence among recent PWID (injecting behavior in the last 12 months), ex-PWID, and non-PWID, respectively, while the parameters πrec,ex and πnon,ex represent the proportion of recent, ex-PWID, and non-PWID in the overall population. πrec was provided by the ECDC (European Centre for Disease Prevention and Control) hepatitis national focal points (NFP), the EMCDDA (European Monitoring Centre for Drugs and Drug Addiction) databases or the NFP. πnon was obtained from an ECDC review or by the EMCDDA databases or the NFP. πnon was obtained from the ECDC review or by the NFPs. A multi-state Markov model was used to estimate the number of recent and ex-PWID. Adjustment for treatment with direct-acting antivirals (DAAs) was made when appropriate. The national estimates were combined to obtain regional estimates. NFPs from 26 EU/EEA countries provided feedback.

**Results:** The overall CHCV (HCV RNA positive) prevalence in EU/EEA countries at the end of 2019 was 0.54% (95% credible interval-Crl: 0.50%, 0.59%). The highest and lowest CHCV prevalence were observed in the East (0.89%; 95% Crl: 0.82%, 0.96%) and the West (0.26%; 95% Crl: 0.20%, 0.35%) of EU/EEA. On country level, the Netherlands (0.04%), Slovenia (0.07%), and Iceland (0.1%) had the lowest CHCV prevalence. The highest CHCV prevalence was estimated in Romania (2.26%) and Estonia (1.71%). Still, the majority of the EU/EEA countries have a CHCV prevalence in 2019 of less than 1%. The model estimates that 37.6% (95% Crl: 35.1%, 40.3%) of the 2019 CHCV prevalence in EU/EEA countries is associated with injection drug use.

**Conclusion:** The overall CHCV prevalence among EU/EEA is relatively low but substantial part of the CHCV burden is due to injection drug use. Countries in the east of the EU have the highest CHCV prevalence. Further efforts to monitor, prevent, and control CHCV, especially in this region and among PWID, are needed.

**Background and aims:** In Europe, hepatitis C virus (HCV) infection affects both the general population and specific groups, including people who inject drugs (PWID). Although countries have HCV prevalence estimates in the general population and/or specific population groups, those alone cannot be directly used to obtain a national estimate. Our aim was to estimate the national prevalence of chronic HCV infection (CHCV) and the contribution of injection drug use in the European Union (EU)/European Economic Area (EEA) countries in 2019.

**Method:** Multi-parameter evidence synthesis (MPES) is an approach that combines simultaneous information to derive an overall estimate. MPES was applied to each country to obtain national estimates. The overall CHCV prevalence (π) in the population was defined as: π = πrec,rec + πrec,ex + πnon,ex + πnon,non. The parameters πrec,rec and πnon,non represent CHCV prevalence among recent PWID (injecting behavior in the last 12 months), ex-PWID, and non-PWID, respectively, while the parameters πrec,ex and πnon,ex represent the proportion of recent, ex-PWID, and non-PWID in the overall population. πrec was provided by the ECDC (European Centre for Disease Prevention and Control) hepatitis national focal points (NFP), the EMCDDA (European Monitoring Centre for Drugs and Drug Addiction) databases or the published literature. CHCV prevalence among ever PWID was needed to indirectly calculate πrec and was obtained through the EMCDDA databases or the NFP. πnon was obtained from an ECDC review or by the NFPs. A multi-state Markov model was used to estimate the number of recent and ex-PWID. Adjustment for treatment with direct-acting antivirals (DAAs) was made when appropriate. The national estimates were combined to obtain regional estimates. NFPs from 26 EU/EEA countries provided feedback.

**Results:** The overall CHCV (HCV RNA positive) prevalence in EU/EEA countries at the end of 2019 was 0.54% (95% credible interval-Crl: 0.50%, 0.59%). The highest and lowest CHCV prevalence were observed in the East (0.89%; 95% Crl: 0.82%, 0.96%) and the West (0.26%; 95% Crl: 0.20%, 0.35%) of EU/EEA. On country level, the Netherlands (0.04%), Slovenia (0.07%), and Iceland (0.1%) had the lowest CHCV prevalence. The highest CHCV prevalence was estimated in Romania (2.26%) and Estonia (1.71%). Still, the majority of the EU/EEA countries have a CHCV prevalence in 2019 of less than 1%. The model estimates that 37.6% (95% Crl: 35.1%, 40.3%) of the 2019 CHCV prevalence in EU/EEA countries is associated with injection drug use.

**Conclusion:** The overall CHCV prevalence among EU/EEA is relatively low but substantial part of the CHCV burden is due to injection drug use. Countries in the east of the EU have the highest CHCV prevalence. Further efforts to monitor, prevent, and control CHCV, especially in this region and among PWID, are needed.
Conclusion: The referral of prisoners to treating physicians represents a humble but vital contribution to the WHO’s goal of HCV elimination. NGOs, medical experts and governmental bodies included in multi stakeholder’s approach, through the Force of Four services (detection, protection, prevention, and treatment) within penalty institutions, may add one step closer. This linkage-to-care model brings change to HCV+ prisoners as it ensures that no one is left behind on our road to HCV elimination.

Results: Linkage-to-care services were offered to 368 prisoners (287 male and 81 female). The response rate was 85%, with 313 prisoners (251 male and 62 female). Personal issues were the main reasons for the drop-out. 847 MIHC services included 313 hepatitis counseling, 130 HCV and 69 HIV testing, 299 on-site liver exams by FibroScan®, and 36 referrals to further diagnostic workup. In total, 2.2% of prisoners reported previous/current HCV infection. Of the tested, 19 (14.6%) prisoners were HCV positive, and all were HIV negative. The mean liver stiffness measurement (LMS) and controlled attenuation parameter (CAP) were 6.15 ± 3.97 kPa and 264.99 ± 57.1 dB/m. Most prisoners (55.9%) had no fibrosis, whereas stage F1 to F4 was detected in 24.7%, 12%, 5%, and 2.3% of prisoners, respectively. FibroScan® was performed in 17 out of 19 HCV+ prisoners. Among HCV+ prisoners, fibrosis stage distribution (F1-F4) was 35.3%, 29.4%, 17.6%, and 11.8%, respectively. The LMS was significantly higher in HCV+ than in HCV- prisoners (10.97 ± 11.07 kPa vs. 6.27 ± 3.41 kPa, p = 0.001), whereas CAP did not differ. All HCV+ prisoners and HCV- prisoners (n=17) with advanced fibrosis were referred to liver specialists.

Conclusion: The referral of prisoners to treating physicians represents a humble but vital contribution to the WHO’s goal of HCV elimination. NGOs, medical experts and governmental bodies included in multi stakeholder’s approach, through the Force of Four services (detection, protection, prevention, and treatment) within penalty institutions, may add one step closer. This linkage-to-care model brings change to HCV+ prisoners as it ensures that no one is left behind on our road to HCV elimination.
vs. 24.7%, p < 0.0001). Incarcerated persons had a lower percentage of late presentation (18.0% vs. 27.0%, p < 0.0001). No statistically significant differences were found among those reactive for hepatitis B surface antigen (24.5% vs. 25.7%, p = 0.28).

Conclusion: Despite statistically significant changes in percentages among sub-groups and trend over time, late presentation for hepatitis C care remains a significant problem emphasizing a need for improving testing and linkage to care. Targeted interventions among women, older people, alcohol consumers and those with metabolic disorders can reduce late presentation.

FRI-124
The impact of hepatitis D virus infection on health-related quality of life and fatigue in patients untreated for HDV: descriptive results from a cross-sectional study across Italy, Germany, Spain and the US
Pietro Lampertico1,2, Robert G. Gish3, Nancy S. Reau4, Heiner Wedemeyer5, Maria Buti6, Ankita Kaushik7, Laura Mirams8, Hilary Ellis4, Teresa Taylor-Whiteley8, Alon Yehoshua7, 1Foundation IRCCS Ca’ Granda Ospedale Maggiore Policlinico, Division of Gastroenterology and Hepatology, Milan, Italy; 2CRC “A. M. and A. Migliavacca” Center for Liver Disease, Department of Pathophysiology and Transplantation, Milan, Italy; 3Hepatitis B Foundation, Doylestown,
Background and aims: Hepatitis D virus (HDV) is associated with accelerated progression to advanced liver disease compared to mono-infection with hepatitis B (Fattovich, et al. 2000). Poorer overall prognosis may result in reduced health-related quality of life (HRQoL) relative to the general population and other hepatitis infections (Buti et al., 2021), however there is limited evidence regarding the effect of HDV on HRQoL. This study aimed to understand the impact of HDV infection at various stages of fibrosis by investigating HRQoL among untreated patients living with chronic HDV.

Method: A cross-sectional survey including the Hepatitis Quality of Life Questionnaire (HQLQv2) and the Fatigue Severity Scale (FSS) was completed by adults with a physician confirmed diagnosis of chronic HDV infection in Italy, Germany, Spain, and the US between July-November 2022. Patients who were heavily immunocompromised, received interferon (IFN)/peg-IFN in the past six months, or had received an organ transplant were also excluded for this analysis. Any licensed HDV treatment were also excluded for this analysis.

Results: Descriptive results from a group of 168 patients (74% male, mean age = 52.8) who were not receiving treatment indicated for HDV are presented. This group included patients across all fibrosis stages, F0-F3 (52%), F4 compensated (F4C, 25%), F4 decompensated (F4D, 9%) and 24 (14%) patients with concomitant hepatocellular carcinoma (HCC). The majority of patients (81%) had been diagnosed with HDV between 0 and 5 years. HQLQv2 scores were lowest in patients with F4C and F4D cirrhosis across all domains (Figure 1), suggesting that HRQoL worsens as the disease progresses. All HDV patients regardless of fibrosis stage suffered from fatigue, which was severe in F4C (4.7), F4D (6.2), and HCC (5.8) patients, as defined by a mean FSS score of ≥4 (Rossi et al. 2017) and also seemed to have worsened with higher disease severity.

Conclusion: This study demonstrates that HDV-infected patients with severe disease progression could be considered to lower the impact of HDV on HRQoL and fatigue.
relevance of hepatitis C diagnosis in different hospital services. The selection of services was carried out considering those treating patients with extrahepatic manifestations related to HCV and where a high number of anti-HCV serologies are requested. The services in which the sessions were held included Psychiatry, Emergency, Internal Medicine, Gynaecology/Obstetrician, and Haematology, among others. The training sessions were conducted by hepatologists, infectious diseases specialists, internal medicine specialists and microbiologists. After the sessions, a follow-up was carried out every 6–12 months to collect information about the number of: i) updated protocols to introduce HCV screening in each service; ii) protocols automated; iii) patients’ identification and referral, including those of new diagnosis or lost to follow-up i.e diagnosed but untreated patients (DBU); iv) implementation of an alert between Microbiology lab and HCV specialist to notify RNA-HCV positive cases.

**Results:** 54 hospitals participated until Oct 2022, with 207 training sessions conducted in different services; with an average of 3.8 sessions per hospital and a maximum value of 12 sessions. After the sessions, almost half of the services (101 services, 49%) had an updated, but non-automated protocol, whereas 26 services (12.5%) of 9 hospitals had an updated and automated protocol. After the sessions, 246 HCV patients were identified. HCV-positive viremia alerts to HCV-specialist allowed patient journey simplification.
allowing direct linkage to care for disease management, helping to avoid loss to follow-up of DBU patients through the care cascade.

**Conclusion:** Hospitals without C program has proven to be a key strategy for raising awareness of the infection among professionals in different hospital services managing patients with HCV-associated extrahepatic manifestations. Moreover, the program favours the setup, updating and automation of protocols to find HCV patients of new diagnose and lost to follow-up in the health system.

**FRI-127**

**Policy and implementation needs for hepatitis B birth dose in the WHO African region: a survey of national program managers**

Henry Njuguna1, Lindsey Hiebert1, Neil Gupta1, John Ward1. 1Coalition for Global Hepatitis Elimination, Decatur, United States

**Email:** hnjuguna@taskforce.org

**Background and aims:** Two thirds of the 1.5 M new chronic hepatitis B virus (HBV) infections globally occur in Africa. Most new infections are preventable with HepB vaccination beginning with a timely birth dose (BD) for new-borns. However less than one in five new-borns in Africa receive timely HepB BD vaccination. Due to COVID-19 pandemic, Gavi, the Vaccine Alliance, paused plans to support HepB BD implementation. To understand the status of HepB BD vaccination and operational challenges and resource needs for introduction or scale-up of HepB BD vaccination.

**Method:** CGHE conducted a survey with three objectives: assess NITAGs’ focus on COVID-19 and operational challenges and resource needs for introduction or scale-up of HepB BD vaccination.

**Results:** From October 11, 2022, to January 10, 2023, one respondent from each of 24 countries participated in the survey. Of countries represented, 21 (88%) were eligible for Gavi support, 13 (54%) had no policies for HepB BD vaccination, 9 (38%) and 2 (8%) had policies for universal or targeted HepB BD vaccination, respectively. Of 13 countries without policies for HepB BD vaccination, 7 (54%) National Immunization and Technical Advisory Groups (NITAGs) had recommended routine HepB BD vaccination, 4 (31%) NITAGs were considering a recommendation and 2 (15%) were not. Respondents from only 3 (23%) countries reported their NITAGs focus on COVID-19 vaccination impacted their country’s introduction plans for HepB BD vaccination. In contrast, respondents from 19 (79%) of 24 countries reported that immediate availability of Gavi funds was of high (n = 16) or moderate (n = 3) importance in decisions to introduce or scale-up HepB BD vaccination; 18 (75%) reported that Gavi’s funding would increase their priority for HepB BD introduction or scale-up. The most frequently reported challenges for HepB BD introduction or scale-up were out-of-facility births (n = 17), training health care workers (n = 16), and political and civil society awareness (n = 16). The most frequent recommendations for the priorities for Gavi funding included health care worker training (n = 23), HepB BD demand creation (n = 19) and vaccination of neonates born outside health facilities (n = 19).

**Conclusion:** Many countries in Africa are planning or beginning introduction or scale-up of HepB BD vaccination. Compared to the resource demands for pandemic response, the lack of Gavi support is the major factor influencing national decisions to implement HepB vaccination of newborns. Unpausing GAVI’s support for HepB BD is urgently needed to substantially increase coverage of this critical intervention to eliminate mother to child transmission of HBV in Africa.

**FRI-128**

**Influence of language barrier and cultural differences in hepatitis B disease knowledge in the chinese community of Barcelona**

Anna Pocurull1, Laura Tapia1, Tao Wang1, Maria Jose Moreta1, Anna Miralpeix1, Cristina Collazos1, Sabela Lens1, Zoe Marinho1, Xavier Forns1, 1Liver Unit, Hospital Clinic de Barcelona, University of Barcelona, IDIBAPS and CIBEREHD, Barcelona, Spain

**Email:** apocurull@gmail.com

**Background and aims:** Hepatitis B is prevalent in patients of Asian origin. Due to language barriers and cultural differences, it is not always straightforward to evaluate disease knowledge in the liver clinics. We aimed to assess the current awareness on HBV infection and its mechanisms of transmission in HBV-infected Chinese patients and their household contacts.

**Table 1: Differences in knowledge on the mechanisms of HBV transmission between Chinese and non Chinese patients.**

<table>
<thead>
<tr>
<th>Patients</th>
<th>All patients</th>
<th>Chinese</th>
<th>Non Chinese</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spanish understanding</td>
<td>26 (13%)</td>
<td>25 (29%)</td>
<td>1 (1%)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Good</td>
<td>109 (60%)</td>
<td>43 (51%)</td>
<td>4 (4%)</td>
<td></td>
</tr>
<tr>
<td>Knowledge on horizontal transmission</td>
<td>12 (6%)</td>
<td>9 (10%)</td>
<td>3 (3%)</td>
<td>0.045</td>
</tr>
<tr>
<td>No</td>
<td>170 (94%)</td>
<td>76 (90%)</td>
<td>94 (97%)</td>
<td></td>
</tr>
<tr>
<td>Knowledge on sexual transmission</td>
<td>14 (8%)</td>
<td>10 (11%)</td>
<td>4 (4%)</td>
<td>0.054</td>
</tr>
<tr>
<td>No</td>
<td>168 (92%)</td>
<td>75 (88%)</td>
<td>93 (96%)</td>
<td></td>
</tr>
<tr>
<td>Knowledge on vertical transmission</td>
<td>36 (20%)</td>
<td>5 (6%)</td>
<td>31 (32%)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>No</td>
<td>146 (80%)</td>
<td>80 (94%)</td>
<td>66 (68%)</td>
<td></td>
</tr>
<tr>
<td>Prevention measures (horizontal transmission)</td>
<td>31 (17%)</td>
<td>6 (7%)</td>
<td>25 (26%)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>No</td>
<td>148 (83%)</td>
<td>76 (93%)</td>
<td>72 (74%)</td>
<td></td>
</tr>
<tr>
<td>Prevention measures (sexual transmission)</td>
<td>7 (4%)</td>
<td>4 (4%)</td>
<td>3 (4%)</td>
<td>0</td>
</tr>
<tr>
<td>No</td>
<td>3 (1%)</td>
<td>3 (1%)</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

**Method:** HBV-infected Chinese patients and their household contacts were interviewed by a nurse (Chinese or native) about their knowledge on hepatitis B transmission mechanisms, use of preventive measures and vaccination status. Non-Chinese HBV-infected patients were defined as a control group.

**Results:** A total of 182 patients and 398 relatives/household contacts participated in the study. Eighty-five (48%) patients and 240 (60%) of household contacts were from China. Language barrier was documented in 80% of Chinese patients and 44% of their household contacts. Knowledge on horizontal and sexual HBV transmission was high (90%) in both groups of patients. However, Chinese patients were significantly more aware of vertical transmission (94% vs 68%, p < 0.01) and were more forewarned in the use of horizontal transmission measures (93% vs 74%; p < 0.01). No differences in preventive sexual measures were detected. Chinese household contacts were
Conclusion: Despite relevant language barriers, Chinese HBV-infected patients are well informed on the mechanisms of HBV transmission, particularly on the vertical route. Cultural differences may explain a higher use of preventive measures among the Chinese population. HBV vaccination of household contacts should be reinforced in both groups of individuals.

FRI-129
Health outcomes of hepatitis C direct-acting antivirals: beyond real life sustained viral response data
Carmen Alonso Martin1, Irene Peñas Herrero1, Carolina Almohalla Alvarez1, Félix García Pajares1, Nieves Martín Sobrino2, Laura Issus Lomas2, Albero Rodríguez Palomo2, Gloria Sánchez Antolín1, 1Hospital Universitario Rio Hortega, Valladolid, Spain; 2Dirección Técnica de Farmacia, Gerencia Regional de Salud, Consejería Sanidad, Spain

Background and aims: Hepatitis C (HCV) infection was the leading cause of liver transplantation worldwide, causing significant mortality associated with end-stage liver disease. The appearance in 2015 of HCV direct-acting antivirals (DAAs) for the treatment of Hepatitis C with an efficacy close to 100% has changed the natural history of hepatitis C. Its economic impact conditioned the prioritization of its use, initially in more severe patients. Health results of DAA treatment have been described as reducing the liver transplant waiting list, but there are no studies on the impact of DAAs on the activity of health systems. The aim of our study is to find out if new DAA-based treatments for hepatitis C have had an impact on the outcomes of a healthcare system. We analyzed the evolution of hospital discharges of patients with a primary diagnosis of hepatitis C, hospital discharges for hepatocellular carcinoma, and hospital discharges for other causes with an additional diagnosis of hepatitis C.

Method: The number of hospital discharges from 2012 to 2020 was analyzed, selecting patients with hepatitis C as primary or secondary diagnosis. The information of the admitted patients was obtained from the minimum basic set of hospital discharge data. We also analyzed the average number of discharges due to hepatocellular carcinoma or bile duct neoplasm in the same period and compared the average number of discharges for the period 2012–2015 with the average for 2016–2020.

Results: Hospital discharges associated with HCV infection decreased progressively from 2015 to 2022. The average number of discharges in the period 2012–2015 was significantly higher than that of 2016–2020 for patients admitted for any reason with a diagnosis of hepatitis C associated (232.75 vs. 1505.2, p < 0.005). The mean number of discharges due to hepatocarcinoma and cholangiocarcinoma was also significantly higher in the first period (95.5 vs. 72.8, p < 0.05). The % variation of hospital discharges compared to 2012 was −32.74% in 2015, −40.93% in 2016, −44.84 in 2017, −55.52% in 2018, −53.38 in 2019 and −61.57% in 2020. The average age ranged from 54 years old in the 2012 period, 2,584 (68.9%) individuals started HBV treatment. People with an APRI score ≥1.5. During the study period, 2,584 (68.9%) individuals started HBV treatment. People with HBV mono-infection, HBV/HCV co-infection, and HBV/HIV coinfection were included if they were <2 years old, had information on HBV treatment eligibility criteria according to Rwanda’s national HBV prevention and treatment guidelines: HBV co-infection, HBV DNA ≥20,000 copies/ml, cirrhosis, abnormal ALT on 3 consecutive tests, and aspartate aminotransferase to platelet ratio index (APRI)-score ≥1.5. HBV treatment uptake is the study primary outcome defined as the proportion of individuals who received HBV treatment among those who met the HBV treatment eligibility criteria. We estimated the proportions of treatment uptake, and assessed factors associated with HBV treatment uptake to account for confounders through multivariable logistic regression.

Results: Among 22,570 individuals with HBV infection, 3,750 (1,986 with HBV mono-infection, 1,764 with co-infection HBV/HIV, 14 with co-infected HBV/HCV, and 5 with HBV/HCV/HIV triple infection) were eligible for HBV treatment during the study period. The majority were males (n = 1,972, 52.6%), between 35 and 54 years old (n = 1,545, 48.5%, median age = 41 years). Among all individuals, 246 with HBV mono-infection (12.3%) and 31 (1.8%) with HIV/HBV co-infection, had cirrhosis. Among 1,332 people with data on HBV DNA, 1,076 (80.8%) had >20,000 copies of HBV DNA per ml. Among 1,521 people with data on ALT 562 (36.9%) had >45 IU per ml. Among 1,215 with information on APRI scores, 175 (14.4%) had ≥1.5. During the study period, 2,584 (68.9%) individuals started HBV treatment. People with HBV mono-infection had a greater proportion of treatment uptake compared to those with HBV/HIV co-infection [1,601 (80.6%) vs. 983...
In the multivariable model, HIV coinfection (adjusted odd ratio [aOR]: 0.46; 95%CI: 0.32–0.66), and living in provinces other than Kigali city: East (aOR: 0.11; 95%CI: 0.04–0.28), North (aOR: 0.17; 95%CI: 0.06–0.47), West (aOR: 0.15; 95%CI: 0.06–0.37), and South (aOR: 0.29; 95%CI: 0.11–0.74) were associated with a lower likelihood of HBV treatment uptake. Follow-up at provincial and referral hospitals (aOR: 6.09; 95% CI: 2.50–14.83) compared to follow-up at district hospitals, and having health insurance for public and private employees compared to having community-based health insurance.
(aOR: 2.53; 95%CI: 1.03–6.26) were associated with higher treatment uptake.

**Conclusion:** This study found that during the study period, the treatment initiation was low overall, especially among people with HBV/HIV and HBV/HCV co-infections. These findings highlight the need for scale-up of HBV care and treatment, especially in people with HIV and HCV co-infection.

**FRI-131**

**Prevalence of chronic hepatitis C on the Swiss organ transplantation list from 2009 to 2019**

Philip Bruggmann1,2, Simone Temperli3, Luis Falcato1, Franz Immer3.

1Arud Centre for Addiction Medicine, Internal Medicine, Zurich, Switzerland; 2Institute of Primary Care, University and University Hospital of Zurich, Zurich, Switzerland; 3Swisstransplant, Bern, Switzerland

Email: p.bruggmann@arud.ch

**Background and aims:** The prevalence of chronic hepatitis C (CHC) is high on the organ transplant waiting list compared to the general population. This is mainly due to HCV-induced liver damage and increased risk of infection by hemodialysis in patients with advanced renal failure. Since 2013, HCV can be cured, and sequelae prevented by timely therapy with directly acting antivirals (DAA’s). The aim of this study is to analyze the time trends of the number of HCV-RNA positive patients (RNA+) on the organ transplantation waiting list in Switzerland from 2009 to 2019 and examine the effects of DAA’s.

**Method:** The study is a retrospective secondary analysis of aggregated data on the subsample of RNA+ on the Swiss organ transplantation list. The yearly numbers of listed patients, grouped by requested organ (liver, kidney, any organ), and of delisted patients, grouped by reason (transplanted, deceased) were analyzed. Besides descriptive and visual evaluation of the respective time series, linear regression models (y = constant + b * x) were calculated, using above variables as dependent (y), and the transformed calendar years (2010 = 0; increment = 1) as predictor (x). Parameter estimate, significance, and model fit were assessed.

**Results:** In 2009, there were 36 RNA+ on the total, 33 on the liver and 3 on the kidney waiting list. For the total and the liver list this number peaked in 2013 with 50 resp. 42 patients, while the peak on the kidney list was in 2012 with 6 patients. In 2019 there were 9, 8 resp 1 RNA+ on the total, liver resp kidney list. In 2009 27 RNA+ were transplanted, 4 died. The number of transplants peaked in 2012 with 28 patients, the number of deaths in 2012 with 8 deaths. In 2019 6 RNA+ were transplanted and none died. Linear regression showed significant yearly decreases in cases waiting for any organ (b = −.41, p = 0.002), liver (b = −3.6, p = 0.001) and kidney (b = −0.5, p = 0.041), and decrease for transplantation (b = −2.3, p = 0.001) and death (b = −0.8, p = 0.001) as delisting reasons.

**Conclusion:** Since the introduction of DAAs, few more patients with CHC died on the organ transplant waiting list and the number of individuals with CHC decreased significantly. However, in 2019, 6 years after the first availability of DAAs, CHC patients were still listed for organ transplantation. Every single one of these cases should be considered a failure of the care system, in a country with such a high standard of healthcare as Switzerland.

**FRI-132**

**The impact of removing all hepatitis B virus (HBV) testing and treatment restrictions**

Homie Razavi1, Erkin Musabaev2, Shakhlo Sadirova3,

1Center for Disease Analysis Foundation, Lafayette, United States; 2Research Institute of Virology, Tashkent, Uzbekistan; 3Center For Disease Analysis Foundation, Tashkent, Uzbekistan

Email: hrazavi@cdafound.org

**Background and aims:** Simplifying HBV testing and treatment guidelines has been a topic of debate with proponents arguing for a higher linkage to care and opponents arguing for potential overtreatment.

**Method:** In 2020, 62,975 individuals visiting polyclinics in Tashkent, Uzbekistan were tested for HBV using rapid tests with 30,727 tested before the COVID-19 shut-down, and the remaining tested post-COVID. All positive individuals were tested with HIV and creatinine rapid tests in an adjoining room. Pre-COVID, they were referred to specialists at the Virology Institute and post-COVID to trained General Practitioners (GPs) in the same polyclinic.

**Results:** 1,509 individuals were newly diagnosed. The cascade of care is shown below with 29% of all diagnosed cases initiating treatment in our program and the private sector. A survey of those who did not seek treatment found that 42% did not know HBV infection can lead to cancer. A separate analysis of GPs prescription and treatment initiation found treatment initiation rates between 12%–84% of their patients even though all GPs received the same training.

**Conclusion:** Our study suggests that significant difficulties remain even if all testing and treatment barriers are removed due to a very low level of awareness of HBV and the corresponding disease burden in the general population. It also highlights the importance of
training and retraining GPs as they are typically the first medical experts who explain the implications of the positive HBV test. Finally, the private sector cannot be ignored as it accounted for 38% of all treated patients.

FRI-133

Spontaneous clearance of hepatitis C virus infection in the country of Georgia, 2015–2021

George Kamkamidze1, Maia Butsashvili1, Davit Bialiashvili2, Shaun Shadaker1, Maia Kajaia1, Mamuka Zakalashvili4, Tengiz Tsertsvadze5, Lali Sharvadze6, Maia Tsreteli7, Senad Handanagic3.

1Health Research Union and Clinic NeoLab, Tbilisi, Georgia; 2The Task Force for Global Health, Georgia; 3Centers for Disease Control and Prevention, United States; 4Medical Center Mrcheveli, Georgia; 5Infectious Diseases, AIDS and Clinical Immunology Research Center, Georgia; 6Clinic Hepa, Georgia; 7National Center for Disease Control and Public Health, Georgia

Email: georgekamkamidze@gmail.com

Background and aims: The majority of hepatitis C virus (HCV) infections persist, while approximately 15–30% of infections clear spontaneously and do not progress to chronic hepatitis C. Epidemiological, viral, and host factors have been associated with HCV clearance in previous studies, showing that a strong virus-specific host immune response favors viral clearance. Female sex, younger age at infection, lower HCV RNA levels, co-infection with hepatitis B virus, and specific polymorphisms of IL28 gene were positively associated with spontaneous clearance, while alcohol consumption showed a negative correlation. The aim of our study was to evaluate HCV spontaneous clearance among persons tested for HCV infection within the national HCV elimination program in the country of Georgia and association with sex, age, and the specific population subgroups.

Method: Spontaneous clearance was defined as a reactive HCV-antibody test followed by no detection of HCV RNA or core antigen, with no HCV treatment history. Data were extracted from Georgia’s screening registry and HCV elimination program database, which contain all hepatitis C testing and treatment data nationally. Chi-square tests and logistic regression were used for statistical analysis of the data.

Results: Data for 137,981 persons tested for HCV infection during 2015–2021 were analysed. Overall, 20.7% of persons tested for viremia had spontaneously cleared the virus. Spontaneous clearance of HCV infection increased each year during 2015–2021 (table).

Overall spontaneous clearance was higher among women than men (27.1% vs. 18.5%, respectively; prevalence ratio [PR] = 1.47 and 95% confidence interval [CI] = 1.43–1.49). Clearance was lowest among those aged 40–49 years (17.9%) and highest among children aged <18 years (58.2%). Compared to the general population, lower spontaneous clearance was documented for people living with HIV infection (PR = 0.50; 95% CI: 0.32–0.79) and persons in penitentiary settings (PR = 0.57; 95% CI: 0.38–0.59).

## Year | Anti-HCV positive N | Tested for HCV RNA or Core Antigen N (%) | HCV spontaneous Clearance N (%) | Prevalence Ratio (PR) | PR 95% CI
---|---|---|---|---|---
2021 | 8098 | 5460 (67.4) | 1712 (31.4) | Reference | Reference
2020 | 10755 | 8070 (75.0) | 2445 (30.3) | 0.97 | 0.92–1.02
2019 | 21210 | 17533 (82.7) | 4489 (25.6) | 0.82 | 0.78–0.86
2018 | 23697 | 20103 (84.8) | 4724 (23.5) | 0.75 | 0.72–0.79
2017 | 29619 | 23022 (77.7) | 4143 (18.0) | 0.57 | 0.55–0.60
2016 | 25432 | 22726 (89.4) | 3924 (17.3) | 0.55 | 0.52–0.58
2015 | 19170 | 18125 (94.5) | 2419 (13.3) | 0.43 | 0.40–0.46

Conclusion: Substantial increases in HCV spontaneous clearance over time may be considered as an indirect outcome of a positive impact of the HCV elimination program on the structure of HCV infections in the population of Georgia. Updated estimates of HCV clearance are important for the strategic planning of further activities towards HCV elimination.

FRI-134

Automation of hepatitis C screening through electronic health record algorithm

Vítor Magno Pereira1, Madalena Pestana1, Elisa Xavier2, Luís Jasmins1, Nuno Ladeira1, Ana Reis3, Nancy Faria3, José Bruno Freitas3, Nuno Canhoto3, Alba Carrodeguas4, Diogo Medina4.

1Hospital Dr. Nélio Mendonça, Gastroenterology and Hepatology, Funchal, Portugal; 2Hospital Dr. Nélio Mendonça, Aetaerology and Hepatology, Funchal, Portugal; 3Hospital Dr. Nélio Mendonça, Funchal, Portugal; 4Hospital dos Marmeleiros, Funchal, Portugal; 5Gilead Sciences Inc, Madrid, Spain

Email: magnovitorp@gmail.com

Background and aims: The high proportion of people living with hepatitis B and C who are undiagnosed is a key finding of ECDC recent
report on the elimination of viral hepatitis. World Health’s Organization (WHO) 2030 goals for the elimination of viral hepatitis are still therefore unreachable by many of these countries. In January 2020, we embraced the mission to achieve these goals through the implementation of a universal program for Hepatitis C virus screening (HCV), a systemic policy defended by all players in our region.

**Method:** The initiative consists of an opportunistic HCV screening with HCV antibody in patients aged 18–70, without prior records of HCV antibody or HCV RNA, who required blood work for any purpose across all public health facilities (primary care, emergency department, hospital clinics and wards). Electronic health record (EHR) algorithms were developed in order to determine eligibility and oral opt-out consent was obtained. Whenever a positive antibody test is found, a reflex confirmatory test is automatically generated on the same sample.

**Results:** From January 2020 until December 2022, we screened 32418 patients (average of 900 tests/month) and found 155 positive antibody (0.47%) and 51 viremic patients (0.16%). Linkage to care was achieved at 94% of viremic patients. Usage of intravenous drugs and other patients’ social issues are the major barriers in complying with healthcare. An analysis of fibrosis staging at screening using non-invasive scores was performed for all viremic patients. Fibrosis-4 (FIB-4) Index for Liver Fibrosis was calculated with the following Results: 20 patients low risk (FIB-4 <1.3), 13 patients indeterminate risk (FIB-4 1.3–2.67) and 16 patients high risk (FIB-4 >2.67). For patients with SVR available (15), there were no treatment failures (SVR of 100%).

**Conclusion:** This automated screening strategy permitted the diagnosis of 51 previously undiagnosed HCV viremic patients, including a third with advanced liver fibrosis. The authors report a global HCV antibody prevalence of 0.47% and 0.16% HCV RNA in this general screening population. This kind of strategy is an important measure to ensure a reduction in the significant number of undiagnosed patients with chronic viral hepatitis.

**Figure:** (abstract: FRI-135): Rate of new hepatitis C cases per 100,000 person-years among repeat testers-Georgia, 2017–2021.

**FRI-135**

**Hepatitis C seroconversion rates among individuals with repeated testing-Georgia, 2017–2021**

Davit Baliashvili1, Shaun Shadaker2, Nathan Furukawa2, Maia Tsereteli1, Vladimer Getia3, Paige A. Armstrong2, Senad Handanagic2.

1The Task Force for Global Health, Georgia; 2Centers for Disease Control and Prevention, United States; 3National Center for Disease Control and Public Health, Georgia

Email: dato.baliashvili@gmail.com

**Background and aims:** As Georgia moves closer to achieving hepatitis C virus (HCV) elimination, demonstrating the program’s impact on the ongoing transmission of hepatitis C becomes a priority. One way to monitor reduction in incidence is to observe temporal trends of seroconversion and new viremic cases among repeatedly tested persons. Using nationwide programmatic data, we aimed to estimate annual rates of seroconversion and new viremic infections among persons repeatedly tested in Georgia.

**Method:** We used data from 2017 to 2021 and identified a subset of adults with at least two anti-HCV tests ≥14 days apart and nonreactive results for the first anti-HCV test. Seroconversion was defined as nonreactive anti-HCV test followed by a reactive. The seroconversion rate was calculated by dividing number of seroconversions by total person-time within the given calendar year and expressed per 100,000 person-years (PY). Person-time was calculated as the number of days from the first anti-HCV test to either the last nonreactive test (for consistently nonreactive individuals) or the first reactive test (for individuals who seroconverted). We estimated the seroconversion rate by year and sex. Among those with seroconversion, we identified persons with subsequent HCV RNA or HCV core antigen testing and calculated the rate of new viremic infection with the same methodology as above. Rate ratios and 95% confidence intervals (CI) were calculated to compare rates between different years.

**Results:** We identified 942,030 individuals with more than one anti-HCV test with an initial nonreactive result. After a median follow-up time of 654 days (IQR: 334–1012), 13,022 (1.4%) individuals seroconverted. The seroconversion rate per 100,000 PY decreased
by 66% over five years, from 1,528 in 2017 to 520 in 2021 (rate ratio = 0.34, 95% CI: 0.32, 0.37). Incidence was lowest in 2020 (482 per 100,000 PY), followed by an increase in 2021. Overall, the seroconversion rate was more than twice as high among males than females, but rate of decrease was similar in both sexes. Among those with seroconversion, 10,159 (78%) were tested for viremia, and 5,824 (57%) were detectable. The annual rate of new viremic cases per 100,000 PY decreased by 77%, from 815 in 2017 to 184 in 2021 (rate ratio = 0.23, 95%CI: 0.20, 0.25) (figure).

Conclusion: The seroconversion rate in Georgia decreased approximately three-fold during 2017–2021. A slight reversal of the trend in 2021 could be explained by the potential negative impact of the COVID-19 pandemic on preventive programs and infection prevention and control practices. During a similar period (2015–2021), prevalence of hepatitis C decreased by 67% in Georgia, suggesting use of seroconversion rates may provide a valuable tool for monitoring prevalence of hepatitis C decreased by 77%, from 815 in 2017 to 184 in 2021 (rate ratio = 0.23, 95%CI: 0.20, 0.25) (figure).

FRI-136
Characterization of recent HCV infections and re-infections among the high-risk population from Georgia using global hepatitis outbreak and surveillance technology

Method: GHOST uses next-generation deep sequencing of Hyper Variable Region 1 (HVR1) of the HCV. Genotypes of the HCV strains were determined by HVR1 sequence data analysis. Two HR sites in the cities of Tbilisi and Zugdidi were selected for participation. Samples were collected from HR beneficiaries with documented reinfection or seroconversion. All participants provided written informed consent to participate in the study and completed a questionnaire on the relevant epidemiologic information. All specimen processing and molecular testing laboratory methods were executed according to the respective Standard Operating Procedures developed and approved by the Division of Viral Hepatitis Laboratory (CDC Atlanta, GA)

Results: Overall, 131 PWID were recruited to participate, including 55 (42%) in Tbilisi and 76 (58%) in Zugdidi. Among the 131 participants observed between June 2021–May 2022, 12 (9%) had HCV reinfection and 119 (91%) seroconverted during the observation period. In the 6 months prior to the study, 109 participants (83%) reported injecting drugs and 4 (3%) reported needle sharing. Among participants experiencing reinfection, 1 (8%) received a blood transfusion, and 11 (92%) had an invasive medical procedure; none were incarcerated.

Among participants with new infection, 23 (19%) received a blood transfusion, 58 (49%) had invasive medical procedures more than 1 year prior, and 6 (7%) were incarcerated prior to seroconversion. HCV recombinant genotype 2k/1b was predominant (n = 22, 36%), followed by 1b genotype (n = 18, 29%), 3a (n = 11, 18%), 2c (n = 5, 8%), 1a (n = 3, 5%) and 2a (n = 1, 2%). Using the GHOST transmission detection module, two transmission clusters consisting of 3 and 6 individuals reinfected with HCV genotypes 2c and 1b were identified in Tbilisi. No linkage among the individuals from Zugdidi was found. The Tbilisi participant carried mixed HCV genotype infection (clade with 6 individuals). Additionally, we found two mixed infections, one in Tbilisi and one in Zugdidi, indicating a high rate of exposure.

Conclusion: This is the molecular epidemiologic report among the high-risk PWID population of Georgia using GHOST. The detected transmission clusters and mixed genotype infections indicate a high rate of exposure in these communities. GHOST can be utilized for surveillance for early intervention on networks as well as successfully applied to other infectious diseases including hepatitis B virus, hepatitis A virus and HIV-co-infection.

FRI-137
Zero-HCV before end stage renal disease (ESRD): a collaborative “treat-all” approach to eliminate HCV in chronic kidney disease population in Taiwan
Tsung-Hui Hu1, Shiou-Shiang Chen2, Chen-Yang Hsu3, Wei-Wen Su4, Sam Li-Sheng Chen5, Chih-Chao Yang3, Yen-Po Yeh3, Hsii-Hsi Chen7, Kaohsiung Chang Gung Memorial Hospital, and Chang Gung University College of Medicine, Kaohsiung, Taiwan, Taiwan; Changhua County Public Health Bureau, Changhua, Taiwan, Taiwan; Institute of Epidemiology and Preventive Medicine, College of Public Health, National Taiwan University, Taipei, Taiwan, Taiwan; Changhua Christian Hospital, Changhua, Taiwan, Taiwan; School of Oral Hygiene, College of Oral Medicine, Taipei Medical University, Taipei, Taiwan; Changhua Hospital, Ministry of Health and Welfare, Changhua, Taiwan, Taiwan; Graduate Institute of Epidemiology and Preventive Medicine, College of Public Health, National Taiwan University, Taipei, Taiwan, Taiwan

Background and aims: The Changhua integrated program to stop HCV infection (CHIPS-C) adopted a multidisciplinary care approach since 2019. The elimination of HCV among dialysis population has been successfully completed in Changhua in 20191. To ensure the quality of achievement, we move forward to the HCV elimination in Chronic Kidney Disease (CKD) population to prevent new infection and disease burden in dialysis units from new participants.

Method: Changhua county has conducted Chronic Kidney Disease (CKD) program (including early CKD, stage 1-3a; and pre-ESRD stage 3b, 4, 5 and proteinuria) since 2006. For a better containment of HCV among the well-recognized high-risk population of CKD, a systematic approach by integrating health administrative, health care facilities from primary to medical center guided by CHIPS-C was utilized since 2019. HCV screening and treatment were implemented and evaluated. The achievement rate of HCV care–related indicators, and treatment rate were analyzed. The end of follow-up was Dec 31, 2022.

Results: Following the initiation of CHIPS-C for pre-ESRD cohort in Changhua in 2019, there were total 9,155 subjects included. By excluding those who were unable to enter the program such as deaths, aging, and mobility, the screening targets total 8,933 people. The HCV antibody screening rate reached 94.45% (8,438 people), with HCV antibody positive rate of 7.44% (628 people), HCV RNA virus checking rate of 91.7% (576 people), detectable HCV RNA rate of 63.0% (363 people), eligible treatment rate was 98.6% (358 people), and final treatment rate was 91.1% (326 people). Furthermore, there have been total 71,949 CKD subjects initially included. The HCV antibody screening rate reached 81.4% (58,536 people), with HCV antibody positive rate of 6.6% (3,883 people), HCV RNA virus checking rate of 83.1% (3,226 people), detectable HCV RNA rate of 59.4% (1,916
people), and final treatment rate was 89.2% (1,710 people). We further evaluate the impact of treatment of CKD cohort on the dialysis unit. There have been 1683 new participant of dialysis since 2019 in Changhua County. The positivity rate of HCV RNA was 50% at the end of 2019; 28.6% at the end of 2020; 7.7% at end of 2021, and 0% at June of 2022.

Conclusion: After implementation of the CKD program, the percentage of people who were with active hepatitis C (viremic) upon entry into dialysis units gradually decreased. Zero HCV before ESRD could serve as a surveillance surrogate indicator to monitor the progress of HCV elimination in CKD.

FRI-138
Low coverage of hepatitis D virus testing in individuals with HIV and HBV in the Netherlands: a retrospective, cross-sectional and longitudinal study
Anders Boyd1, Colette Smit1, Annemieck Van der Eijk2, Hans Zaaier3, Bart Rijnders2, Berend van Welzen3, Marc Classen5, Katalin Pogany6, Theodora de Vries-Sluijs2, Eline Op de Coul7, Marc van der Valk1.
1Stichting Hiv Monitoring, Netherlands; 2Erasmus MC University Medical Center, Netherlands; 3Amsterdam University Medical Centers, Netherlands; 4Rijnstate Ziekenhuis, Netherlands; 5University Medical Center Utrecht, Netherlands; 6Maasstad Hospital, Netherlands; 7National Institute for Public Health and the Environment (RIVM), Netherlands

Background and aims: European guidance recommends that all individuals with hepatitis B virus (HBV) be tested for hepatitis D virus (HDV). Little is known on the extent of and reasons for HDV testing in individuals with HIV and HBV during routine practice. We aimed to assess the changes in HDV testing in 2000 to 2021 in individuals with HIV and HBV infection in care in the Netherlands, both overall and according to key population. We also intended to understand the determinants of those who ever received an HDV test.

Method: Data from the ATHENA cohort of people with HIV who were ever hepatitis B surface antigen positive, aged ≥18 years or older, and attended any of the 24 HIV treatment centers in the Netherlands between 2000 and 2021 were assessed. We estimated the percent of included individuals ever tested for HDV (i.e., documented anti-HDV antibody or HDV RNA test) across calendar years. Determinants for ever being tested by the end of follow-up were assessed using relative risk (RR) regression using a Poisson regression model with robust variance estimation.

Results: Of the 1668 included individuals with HIV and HBV, only 212 (12.7%) had a documented HDV test. The percentage of individuals tested for HDV increased from 5.0% (95% confidence interval [CI] = 3.4–7.3) in 2000 to 14.0% (95%CI = 12.1–16.2) in 2021. In 2021, the percentage tested for HDV was 13.0% (95%CI = 10.7–15.7) in men who have sex with men, 23.5% (95% CI = 9.1–48.6) in persons who inject drugs, and 15.6% (95% CI = 12.2–19.8) in heterosexual/others. In multivariable analysis, ever having an HDV test was associated with ever having detectable HBV DNA viral load during follow-up (adjusted RR = 3.61, 2.39–5.46, p < 0.001), ever presenting with elevated alanine aminotransferase (ALT) levels (adjusted RR = 1.48, 95%CI = 1.14–1.93, p = 0.003), advanced fibrosis/cirrhosis (versus no fibrosis/cirrhosis, adjusted RR = 1.78, 95%CI = 1.35–2.34, p < 0.001), and being overweight/obese (versus normal/underweight, adjusted RR = 1.44, 95%CI = 1.11–1.87, p = 0.006). The percentage of individuals with HIV and HBV who tested positive for HDV remained relatively stable over calendar year: 15.4% (n = 4/26; 95%CI = 5.9–34.6) in 2000 and 7.2% (n = 11/152; 95%CI = 4.1–12.6) in 2021.

Conclusion: HDV testing coverage in the Netherlands is low for individuals with HIV and HBV. Although testing was more common in those with advanced liver disease, a considerable proportion at risk of HDV still needs HDV testing in the Netherlands.

FRI-139
Retrospective study of hepatitis C virus antibodies and active viral replication in at-risk population with dual diagnosis in a Spanish university hospital
Cristina del Río-Cubillelo1, Aitana Carla Morano Vázquez2, Denise Monserrat Arroyo Jarrin3, Miriam Soriano Garcia3, Henar las Heras Miralles1, Jose Manuel Olivoares Diez4, Luis Enrique Morano Amado5. 1South Galicia Health Research Institute, South Galicia Biomedical Foundation, Vigo, Spain; 2Preventive Medicine Service, Gregorio Marañón University Hospital, Madrid, Spain; 3Psychiatry Service, Álvaro Cunqueiro University Hospital, Vigo, Spain; 4Psychiatry Service, Vigo Health Area, Álvaro Cunqueiro University Hospital, Vigo, Spain; 5Infectious Disease Unit, Álvaro Cunqueiro University Hospital, Vigo, Spain

Background and aims: In 2019, WHO estimated the prevalence of chronic HCV about 58 million globally, however only 21% were diagnosed and 9.4 million were treated with direct-acting antivirals. In Spain the prevalence of antibodies was 0.85% and the active infection 0.22% in general population between 2017 and 2018. HCV can cause hepatocellular carcinoma and cirrhosis. Among at-risk groups, HCV and other Blood-Borne Viruses (BBV) are very common in people with dual diagnosis (DD), whose infection complicates due to alcohol and substance abuse. People with DD should be screened for BBV as a standard health assessment. Screening in the psychiatric unit of a hospital showed that 9% of patients were HVC positive. Other study showed that testing all psychiatric patients is cost-effective and helps to wipe out HCV. However, people with DD have been under-recognized as a priority group for HCV screening, and studies in patients with DD are few. We aimed to analyse the prevalence of HCV in DD patients at our Psychiatry Unit.

Method: We did a retrospective study of 1631 patients admitted in the Psychiatry Unit at Álvaro Cunqueiro University Hospital between 2019 and 2021 to identify patients with DD to detect the presence of HCV antibodies (anti-HCV) and HCV ribonucleic acid (RNA). We searched for HCV-untreated patients with active viral replication (AVR), HCV-treated patients with sustained virologic response (SVR), spontaneous viral clearance (SVC), HCV-uninfected and HCV-unknown. The selected covariates were age, sex and other BBV.

Results: 291 patients had DD, 186 were male, 105 female and their age average was 41 years. 22.3% of patients had alcohol abuse, 44.7% single drug abuse and 33% several substance abuses. 249 (85.6%) were tested for HCV antibodies. anti-HCV were confirmed in 62...
(24.9%) patients. Among these, 56 (91.8%) showed undetectable RNA, of which only 40 (71.4%) received treatment with SVR and the rest reached SVC. 1.6% were not tested for RNA replication and 5 (8.2%) had AVR and did not follow any treatment. Finally, 69 (23.7%) had also other BBV.

**Conclusion:** The prevalence of anti-HCV in our Psychiatry Unit was 29.3 times higher than in general population in Spain. Our results highlight the need to address the high prevalence of HCV in people with DD. The Health System should provide an effective screening method to identify patients with HCV at at-risk populations and develop a system to test all patients admitted in psychiatry units in hospitals.

**FRI-140**

**Acceptance and feasibility of hepatitis C screening by assisted self-testing in high-risk and general population: a randomized clinical trial**

Federica Benitez Zafra¹, Felicitas Diaz-Flores², Francisco Javier Perez-Hernandez³, Paula Haridian Quintana Diaz², Fabiola Perez Gonzalez⁴, Maria Jesus Medina Alonso⁴, Maria Cristina Reygosa Castro¹, Dalia Morales Arraez¹.
POSTER PRESENTATIONS

Maria del Carmen Plasencia Alvarez1, Victor Perez Perez4,
Manuel Hernández Guerra1. 1Servicio de Aparato Digestivo, Hospital Universitario de Canarias, Tenerife, Spain; 2Laboratorio Central, Hospital Universitario de Canarias, Tenerife, Spain; 3Servicio de Medicina Familiar y Comunitaria de la Zona Norte de Tenerife, La Laguna, Spain; 4Unidad de atención a las drogodependencias, Spain
Email: federicabenitezafra@gmail.com

Background and aims: Strategies for the micro-elimination of hepatitis C virus (HCV) have been implemented, including integrated decentralized diagnostic programs at centers for drug dependence care (CDDC) using the dried blood spot test (DBS). However, many subjects at high-risk of having HCV infection were discharged or lost from follow-up from CDDC before these actions were taken. This study aims to evaluate the effectiveness (acceptance and feasibility) of an HCV screening strategy using home-based self-testing with DBS in patients that missed HCV screening at CDDC and compare it with general population.

Method: Patients who were attended and discharged or lost to follow-up by the CDDC between 2013 and 2017 and subjects from a primary care (PC; general population) cohort were identified and offered to participate by sending the self-testing kit. Deceased subjects, those not belonging to the health area, and those with no postal data were excluded. They were randomized (clinicaltrial.gov NCT05146609) into two groups in each population, according to whether they were offered assistance to perform the test in the hospital, CDDC, or PC center. The sample return rate of the test and the feasibility of processing DBS samples and obtaining ARN results were evaluated. Characteristics associated with sample return were analyzed using logistic regression.

Results: Overall, 1336 subjects (67.7% males, 48.8 ± 0.3 years) were included and the figure shows acceptance rates in each group. The home-based screening was lower in high-risk population compared to general population (7.4% vs 14.8%; p < 0.01). Subjects that returned de sample were older (51.0 ± 14.3 vs 43.7 ± 14 years; p = 0.04), had longer drug use duration (25.8 ± 15.1 vs 19.0 ± 13.5 years; p = 0.001), daily drug consumption (9.3 vs 5.0%, p = 0.04), a previous HCV positive test (19.5 vs 6.8%, p = 0.08), previous digestive system specialist’s appointment (15.6 vs 5.9%, p = 0.001) and absence of psychiatric doctor’s appointment (19 vs 6.3%, p = 0.004). Having a previous HCV positive test was the only predictive factor associated with a high rate of returning the sample (OR 6.6, CI95% 2.1–20.7; p = 0.001). All returned samples, except 2 DBS, were valid and negative for viremia.

Conclusion: This retrieval home-based self-testing screening strategy is feasible, but has a low acceptance rate in the high-risk population, especially among those unaware of the disease. More effective targeted strategies must be sought to achieve 2030 WHO goals.

FRI-141

Cost-effectiveness analysis of a new paradigm to simplify testing, monitoring and treatment of hepatitis C virus in the United States
Douglas T. Dieterich1, Nancy S. Reau2, Aijaz Ahmed3, Rob Blissiter4, Adam Igloi-Nagy5, Alon Yehoshua5. 1Institute for Liver Medicine, Mount Sinai Health System, United States; 2Rush University Medical Center, Department of Hepatology, Chicago, United States; 3Stanford University School of Medicine, Division of Gastroenterology and Hepatology, Stanford, United States; 4Maple Health Group, LLC, New York, United States; 5Gilead Sciences, Inc, United States
Email: douglas.dieterich@mtnsinai.org

Background and aims: The current treatment pathway for hepatitis C virus (HCV) patients in the United States (US) includes a range of tests and appointments that delay treatment and cause substantial loss to follow-up. Our analysis aimed to assess the cost-effectiveness of simplifying the testing and treatment of HCV patients from the US payer perspective.

Method: A series of linked Markov models were developed to estimate the health outcomes and cost differences of simplifying the treatment pathway for HCV patients in the US. The analysis compared three scenarios, one based on the latest treatment guidelines (“status quo” [SQ]), one based on real-world practice as informed by expert opinion (“real-world scenario” [RW]) and a hypothetical scenario with a simplified pathway (“new paradigm” [NP]). The scenarios differed in testing and treatment process steps and time needed to complete each step. Patients in the new paradigm initiated treatment earlier and with fewer tests and appointments required, resulting in a shorter overall process time and less resource use. The model considered the US HCV population, stratified by subpopulations (general population, incarcerated, people who inject drugs, men who have sex with men). Model inputs included direct costs (health state, testing, treatment), treatment effectiveness expressed as sustained virologic response at 12 weeks (SVR12) and health state utilities. Outcomes included the incremental cost per quality-adjusted life year (QALY) and per life year (LY) of introducing the new paradigm compared to the SQ and RW scenarios. Advanced liver disease outcomes (compensated and decompensated cirrhosis, hepatocellular carcinoma, liver transplant, and extrahepatic mortality) were also compared between each scenario. Costs and health effects were discounted at 3.0% over a lifetime horizon.

Results: In the base case analysis with all subpopulations considered, the new paradigm resulted in incremental costs of $-19,751 (vs. SQ) and $-16,448 (vs. RW). The new paradigm was associated with incremental QALYs of 0.42 and 0.70 compared to the SQ and RW scenarios, respectively, and therefore was a dominant strategy compared to both. In addition, the new paradigm was associated with a 60.4% and 58.2% reduction in total advanced liver disease outcomes, compared to the SQ and RW scenarios, respectively. Sensitivity and scenario analyses confirmed the robustness of the model: key drivers included health state utilities and treatment effectiveness inputs.

Table: Summary Model Results

<table>
<thead>
<tr>
<th></th>
<th>Status Quo</th>
<th>Real-World Scenario</th>
<th>New Paradigm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative outcomes, discounted</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LYs per person</td>
<td>13.31</td>
<td>12.97</td>
<td>13.66</td>
</tr>
<tr>
<td>QALYs per person</td>
<td>10.81</td>
<td>10.53</td>
<td>11.23</td>
</tr>
<tr>
<td>Cumulative costs, discounted</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total costs per person ($)</td>
<td>65,461</td>
<td>62,158</td>
<td>45,710</td>
</tr>
<tr>
<td>Cost effectiveness ratios-New Paradigm vs. Status Quo</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incremental cost per QALY ($)</td>
<td>DOMINANT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net mean benefit @ 100,000 WTP ($)</td>
<td>61,660</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost effectiveness ratios-New Paradigm vs. Real-World Scenario</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incremental cost per QALY ($)</td>
<td>DOMINANT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net mean benefit @ 100,000 WTP ($)</td>
<td>85,884</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

HCV: hepatitis C virus; QALY: quality adjusted life year; LY: life year; WTP: willingness to pay.

Conclusion: This analysis demonstrated that simplifying the testing and treatment of HCV patients in the US may be a cost-effective strategy that would allow a quicker path to successful treatment and reduce the number of patients lost to follow-up.

FRI-142

Consider schistosomiasis screening in hepatitis B patients from endemic regions: a hepatic comorbidity that should not be neglected
Oriane Palaprat1, Marie Gladys Robert1, Marie-Pierre Brenier-Pinchart1, Justine Barthemou2, Hélène Fricker Hidalgo2, Cécile Garnaud1, Hervé Pelloix1, Marie-Noëlle Hilleret2. 1Grenoble Alpes University Hospital,
Parasitology-Mycology Laboratory, Grenoble, France; 2Grenoble Alpes University Hospital, Hepatology-Gastroenterology Department, Grenoble, France

Email: mrobert2@chu-grenoble.fr

Background and aims: Highly endemic countries for hepatitis B virus (HBV), particularly sub-Saharan Africa, are also endemic regions for schistosomiasis, a parasitic infection affecting more than 200 million people worldwide and caused by helminths of the genus Schistosoma. HBV-schistosomiasis co-infection is therefore common in these regions and can lead to cumulative chronic liver disease and especially portal hypertension. Thus, it is recommended to screen all migrants from sub-Saharan Africa for both HBs antigen (HBsAg), and anti-Schistosoma antibodies. The aim of this study was to evaluate the effectiveness of this serological screening for schistosomiasis following the diagnosis of hepatitis B in our center.

Method: This single-center retrospective study investigated the records of all patients with a positive HBsAg from January 1, 2012 to November 30, 2022 in the hepato-gastro-enterology department of the Grenoble Alpes University Hospital. The availability of a serological screening for schistosomiasis by ELISA, rapid diagnostic test and/or western blot was examined for patients originating from Africa.

Results: Over the past 10 years, of the 1136 HBsAg-positive patients in our center, 562 (49.5%) were from schistosomiasis-endemic areas. However, serological screening for schistosomiasis was available for only 155 (27.6%) of these patients. In addition, 71 (45.8%) of the schistosomiasis serology performed in patients born in endemic areas were positive by at least one technique. Review of hepatic events related to schistosomiasis is currently ongoing among this population.

Conclusion: Although the prevalence of hepatitis B-schistosomiasis co-infection is significant in the population followed in hepatogastroenterology for hepatitis B in France, screening for schistosomiasis remains insufficiently solicited. It is therefore essential to emphasize the potential impact this parasitic infection may have on the clinical outcomes of these patients and to remind the importance of screening at-risk patients and treating them if necessary.

FRI-143

Micro-elimination of Hepatitis C virus infection in mountainous and remote areas of Taiwan-a multi-center collaborative care model

Ching-Chu Lo1, Wei-Yi Lei2, Ying-Che Huang3, Jow-Jyh Hwang4, Chen-Yu Lo5, Ming-Jong Bai6, Chia-Yen Dai7, Ming-Lung Yu8, Chien-Hung Lin9, Hsu-sheng Cheng9, Yee-Tam Liao9, Mei-Tsu Chen9, Po-Cheng Liang10, 1Division of Gastroenterology and Hepatology.

Department of Internal Medicine, St. Martin De Porres Hospital, Chiayi, Taiwan, Chung-Jen junior College of Nursing, Health Sciences and Management, Chiayi, Taiwan, Internal Medicine, Chiayi, Taiwan; 2Hualien Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation, and Tzu Chi University, Hualien, Taiwan, Taiwan; 3Taipei Veterans General Hospital Yuli Branch, Taipei, Taiwan, Taiwan; 4St. Martin De Porres Hospital, Chiayi, Taiwan, Chung-Jen junior College of Nursing, Health Sciences and Management, Chiayi, Taiwan, Taiwan; 5Eberly College of Science, Department of Biology, Schreyer Honors College, Pennsylvania State University, Taiwan; 6Taichung Mackay Memorial Hospital, Taichung, Taiwan, Department of Medicine, Mackay Medical College, New Taipei, Taiwan, Taiwan; 7Hepatobiliary Division, Department of Internal Medicine, Kaohsiung Medical University Hospital, Kaohsiung Medical University, Kaohsiung, Taiwan, Taiwan; 8School of Medicine, College of Medicine and Center of Excellence for Metabolic Associated Fatty Liver Disease, National Sun Yat-sen University, Kaohsiung, Taiwan, Taiwan; 9St. Martin De Porres Hospital, Chiayi, Taiwan, Taiwan; 10Kaohsiung Medical University Hospital; Hepatitis Research Center, College of Medicine and Center for Liquid Biopsy and Cohort Research, Kaohsiung, Taiwan, Taiwan

Email: fish6069@gmail.com

Background and aims: Taiwan has several hepatitis C virus (HCV) hyper-endemic areas. We aimed to evaluate the effectiveness and safety of a collaborative HCV care system with an outreach decentralized strategy among the resource-constrained Mountainous/remote areas of Taiwan.

Method: The pilot study was conducted in four high HCV-endemic townships in the rural/remote areas of Taoyuan, Alishan, Zhuoxi and Xiulin. Registered residents who worked or lived in the four areas and were aged 30 to 75 years were invited to participate in this program. Multidisciplinary HCV care teams provided outreach decentralized services of anti-HCV screening, link-to-diagnosis, and link-to-treatment with direct-acting antiviral agents (DAA). The primary end point was sustained virological response (SVR).

Results: Of 8,291 registered residents who were invited as the target population, 7,807 (94.2%) subjects received anti-HCV screening, with the average anti-HCV prevalence rate of 14.2% (1108/7807) (range from 92.7%–97.6%). Eventually, the overall effectiveness was 80.7% (range:74.6%–93.1%) (Table 1). The presence of hepatocellular carcinoma at baseline was the only factor associated with DAA failure. The DAA regimens were well-tolerated.
Conclusion: The outreach decentralized community-based care system with DAA therapy was highly effective and safe in the achievement of HCV micro-elimination in the resource-constrained rural and remote regions, which could help us to tackle the disparity.

FRI-144
Impact of the anti-HDV reflex testing on the reduction of hepatitis D burden in Spain

Maria Buti1,2, Raquel Domínguez-Hernández3, Adriana Palom1,2, Ariadna Rando-Segura2,4, Mar Rivero Barciela1,2, Rafael Esteban1,2, Francisco Rodríguez-Frias2,4, Miguel Ángel Casado1,2. 1Liver Unit, Hospital Universitari Vall d’Hebrón, Barcelona, Spain, Spain; 2Centro de investigación biomédica en red de enfermedades hepáticas y digestivas, Instituto de Salud Carlos III, Madrid, Spain, Spain; 3Pharmacoeconomics and Outcomes Research Iberia (PORIB), Madrid, Spain, Spain; 4Microbiology Department, Clinical Laboratories, Hospital Universitari Vall d’Hebrón, Barcelona, Spain, Spain

Email: mariabutiferret@gmail.com

Background and aims: Chronic hepatitis D (CHD) is the most severe form of chronic viral hepatitis due to rapid progression to liver cirrhosis and hepatocellular carcinoma. Early diagnosis and treatment could be able to stop the disease progression if suppression of viral replication is achieved. The aim of this study is to evaluate the impact of performing anti-HDV reflex testing in all HBsAg-positive subjects, on the burden of CHD in Spain in the coming years.

Method: A decision tree was designed to simulate the CHD care cascade from screening to treatment within a temporal horizon of 8 years. Two scenarios were compared: the current screening scenario (7.64% of HBsAg-positive patients tested for anti-HDV), and a reflex test screening scenario (100% of HBsAg-positive patients tested). The study target was the adult Spanish population (18–80 years). The estimated prevalence of HBsAg was 0.22% and of anti-HDV between 7.7%-9.6% of those HBsAg-positive. HDV-RNA was detectable in 60–73% of cases. It was assumed that 66% of viraemic patients would receive pegIFN with a 10% of long-term response. The incidence of complications and hepatic mortality were estimated based on the results of a cohort of patients previously followed for more than 8 years.

Results: The implementation of anti-HDV reflex testing in the HBsAg-positive Spanish population (total 78,965 subjects) would increase the diagnosis of 5,498 positive anti-HDV cases compared to the current scenario, of which 3,225 would be viraemic (Fig 1a). The cost for each anti-HDV+ diagnosed case would be €129. Considering that when using reflex testing, 2,128 more patients would receive treatment and 213 would achieve undetectable HDV-RNA levels, in the median time of the analysis, liver complications would be reduced between 7%-31% (Fig 1b). The prevention of these liver complications would estimatedly save around 40 M euros.

Conclusion: In Spain, the use of anti-HDV reflex testing would increase more than 9 times the diagnoses of CHD, reducing the clinical and economic burden of the disease in the next 8 years.

FRI-145
Final results of a hepatitis C micro-elimination campaign in a highly endemic, well-defined demographic area of peri-urban Karachi, Pakistan

Saeed Sadiq Hamid1, Aliya Hasnain1, Sultan Salahuddin1, Wasiuddin Shah1, Taj Muhammad1. 1Agu Khan University, Medicine, Pakistan

Email: saeed.hamid@aku.edu

Background and aims: Pakistan has one of the highest burden of HCV with a nationwide prevalence of 6% with recognized “hot spots” where prevalence and liver disease related mortality is reported to be much higher. The aim of this study was to achieve highest possible HCV elimination in an endemic district by implementing and scaling
up a highly simplified, community based, low-cost test-and-treat model.

Method: This study targeted 40,000 individuals over 12 years of age, across selected Union Councils (UCs) of Malir district, Karachi, based on known sero-prevalence in previous studies. After a concentrated campaign of public awareness, a two-step test and treat campaign was started through door-to-door visits guided by community mapping. First, a finger-stick rapid-diagnostic test (RDT) was used to screen for HCV. In those screened positive, reflex testing was done for confirmation of infection using GeneXpert, or HCV core antigen, and blood tests to calculate APRI and FIB-4. On the 2nd visit, individuals with confirmed infection were started on Sofosbuvir plus daclatasvir, for 12 or 24 weeks based on APRI and/or FIB-4 scores, after clinical evaluation by a physician. Follow-up visits were done on a monthly basis to deliver medication. RNA testing was done 12 weeks after last dose to assess sustained viral response (SVR). A cohort of individuals previously screened negative was selected for re-screening to identify incidence of HCV infection in this population.

Results: Of the 40,148 individuals screened, 4148 (10%) were positive (mean age 48.37 ± 14.46 years with 69% females). Average seroprevalence in males and females was 10% and 12% respectively. 3694 individuals underwent HCV RNA testing of which 53% (1967/3749) had active viremia. 89% (1748/1967) of these patients started treatment of which 1527 have completed treatment, with a dropout rate of 12% (176/1693). Sustained virologic response (SVR) was achieved in 91%. Incidence of infection in the population re-screened was found to be 0.6% (6/1008), with 2/6 viremic cases.

Conclusion: This study demonstrates feasibility of a highly simplified HCV-micro elimination program, using a low-cost community-based model which can be scaled up and implemented in diverse resource-limited settings.

FRI-146 Evaluation of hepatitis B core-related antigen rapid test (HBcrAg-RDT) to identify HBV-infected women eligible for peripartum antiviral prophylaxis in resource-limited countries

Jeanne Perpétue Vincent1, Olivier Segeral2, Amariane Kone3, Laurence Borand3, Jean-Pierre Adoukara5, Dramane Kania6, Abdoul Tiendrebeogo6, Adeline Pivert7, Saren Sovan4, Jee-Seon Yang8, Gauthier Delvallez2, Françoise Lunel Fabiani7, Yasuhiro Tanaka8, Yusuke Shimakawa1. 1Institut Pasteur, France; 2French Agency for Research on AIDS, Viral Hepatitis and Emerging Infectious Diseases (ANRS-MIE), Cambodia; 2Centre Muraz, Burkina Faso; 3Institut Pasteur du Cambodge, Cambodia; 4Hôpital de Tokombéré, Cameroon; 5Agence de Médecine Préventive (AMP), Burkina Faso; 6University Hospital of Angers, France; 7Kumamoto University, Japan

Email: yusuke.shimakawa@pasteur.fr

Background and aims: Prevention of mother-to-child transmission (PMTCT) of hepatitis B virus (HBV) is a key intervention to globally eliminate HBV as a public health issue. WHO currently recommends universal infant hepatitis B vaccination starting immediately after birth and peripartum antiviral prophylaxis to HBV-infected pregnant women having high HBV DNA levels (≥200,000 IU/ml). However, access to HBV DNA test is severely limited for pregnant women living in resource-limited countries. To enable decentralization of HBV PMTCT to antenatal care services at peripheral health facilities, we recently developed an immunochromatographic rapid test for hepatitis B core-related antigen (HBcrAg). We evaluated its diagnostic performance to identify HBV-infected women with high viral loads (≥200,000 IU/ml) using real-time PCR as reference in three countries with high HBV prevalence: Cambodia, Cameroon, and Burkina Faso.

Method: We evaluated the performance of HBcrAg-RDT: i) retrospectively using stored sera obtained from pregnant women positive for hepatitis B surface antigen (HBsAg) who participated in two large cohorts in Cambodia (ANRS 12345 TA PROHM) and Cameroon (ANRS 12303); and ii) prospectively using capillary blood collected by finger prick from mothers of infants in Burkina Faso (NéoVac study).
Results: In Cambodia, a total of 1194 HBsAg-positive pregnant women were tested and 367 had HBV DNA levels ≥200,000 IU/mL. The sensitivity and specificity (95% CI) were 93.7% (90.7–96.0) and 95.2% (93.5–96.5), respectively. In Cameroon, of 502 HBsAg-positive pregnant women 88 had high viral load ≥200,000 IU/mL. The sensitivity and specificity were 89.8% (81.5–95.2) and 91.7% (88.6–94.2), respectively. In Burkina Faso, a total of 1338 women participated, of whom 115 (8.6%) were positive for HBsAg and 14 had high viral load ≥200,000 IU/mL. The sensitivity was 85.7% (57.2–98.2) and the specificity was 96.7% (90.6–99.3). In 1223 HBsAg-negative women, none were tested positive for HBCrAg-RDT.

Conclusion: HBCrAg-RDT may be a useful alternative to identify negative women, none were tested positive for HBcrAg-RDT.

FRI-147
Implementing hepatitis C self-testing (HCVST) among the general population in Georgia: preliminary results
Ketevan Stvilia1, Maia Tsereteli2, Ketevan Galdavadze2, Senad Handanagić3, Shaun Shadaker1, Niklas Luhmann4, Irinka Tskhomelidze5, Antons Mozalevskis6, Sonjelle Shilton6, Tamar Gabunia7,8, National Center for Disease Control and Public Health, Georgia; 2National Center for Disease Control and Public Health, Georgia; 3Centers for Disease Control, United States; 4WHO Headquarters, Testing, Prevention and Populations Team, Global HIV, Hepatitis and Sexually Transmitted Infections Programmes, Swaziland; 5The Task Force for Global Health, Georgia; 6FIND, Operational and Implementation Research Unit, Swaziland; 7Ministry of Internally Displaced Persons from Occupied Territories, Labour, Health and Social Affairs, Deputy Minister, Georgia; 8National Center for Disease Control and Public Health, Acting Director General, Georgia
Email: stvilia@gmail.com

Background and aims: The 2015 hepatitis C virus (HCV) serosurvey estimated that more than half (57.3%) of all anti-HCV positive persons were males aged 30–59 years in Georgia. Innovative testing strategies to reach this group-such as HCV self-testing (HCVST)-are important to reach elimination. HCVST is recommended by the World Health Organization as a safe, acceptable, and feasible approach. Despite this, some questions remain about uptake and linkage to treatment following HCVST in different settings and populations. Thus, we evaluated both the uptake of HCVST and linkage to care for a secondary distribution model of HCVST among males aged 30–59 in Tbilisi, Georgia.

Method: This is an observational implementation study of a model of secondary distribution of HCVST among men aged 30–59 years recruited through female household members attending cancer screening clinics in Tbilisi, Georgia. Women who were amenable to recruiting their male household members were provided with HCVST kits to take home. After HCVST, male participants were able to register on an online platform to self-report their test results and complete an online survey to provide their demographic data, knowledge of HCV, HCV risk factors, and their experience with self-testing. Participants received a monetary incentive (about 3 USD) for completing the survey. Survey data will be linked with the national Hepatitis C Elimination Program database to assess linkage-to-care and treatment initiation among the anti-HCV positive participants.

Results: During June 9, 2022-January 1, 2023, a total of 1040 female participants were enrolled in the study (refusal rate 29%). A total of 541 male partners self-tested and shared their test results. Seven (1.3%) participants reported a reactive anti-HCV test result; all were more than age 43 years. Of those completing the online survey (n = 533), most said they would self-test again (n = 421, 78.9%); 455 (85.4%) felt they were able to correctly self-test and interpret the test result, and 15 (2.8%) said the self-tests did not work. Most participants reported self-testing independently (n = 288, 60.0%) or receiving assistance from a friend or household member (n = 177, 36.9%). The remaining participants were assisted by the study team (n = 7) or found information online (n = 4).

Conclusion: Preliminary results from this study show that more than half of women who received HCVST kits at the cancer screening sites were able to recruit male partners/household members into the HCV self-testing study. Implementation of this test distribution model was limited because of low internet literacy among the target population, thus additional options should be developed for reporting the HCV self-testing results. Engaging female household members may be instrumental in reaching important, highly burdened segments of the population who are unlikely to access traditional testing strategies.

FRI-148
Retrospective study of hepatitis C virus antibodies and active viral replication in patients with severe mental illness in a Spanish university hospital
Cristina del Rio-Cubilledo1, Aitana Carla Morano Vázquez2, Denise Monserrat Arroyo Jarrin2, Miriam Soriano García3, Henar las Heras Miralles1, Jose Manuel Olaviras Diez4, Luis Enrique Morano Amado5, South Galicia Health Research Institute, South Galicia Biomedical Foundation, Vigo, Spain; 2Preventive Medicine Service, Gregorio Marañón University Hospital, Madrid, Spain; 3Psychiatry Service, Álvaro Cunqueiro University Hospital, Vigo, Spain; 4Psychiatry Service, Vigo Health Area, Álvaro Cunqueiro University Hospital, Vigo, Spain; Infectious Disease Unit, Álvaro Cunqueiro University Hospital, Vigo, Spain
Email: cristina.delrio@issgalicia.es

Background and aims: In 2019, WHO estimated the prevalence of chronic HCV about 58 million globally, however only 21% were diagnosed and 9.4 million were treated with direct-acting antivirals (DAA). In Spain the prevalence of antibodies was 0.85% and the active infection was 0.22% in general population. HCV can cause hepatocellular carcinoma and cirrhosis. Among at-risk groups, HCV and other Blood-Borne Viruses (BBV) are very common in people with severe mental illness (SMI). People with SMI should be screened for BBV as a standard health assessment. Screening in the psychiatric unit of HCVST of patients with personality disorder (15.7%), bipolar disorder (7.8%), depressive disorder (5.9%), adaptive disorders (3.9%) and 21.6% had other disorders.

Method: We did a retrospective study of 1631 patients admitted in the Psychiatry Unit at Álvaro Cunqueiro University Hospital (Vigo, Spain) between 2019 and 2021 to detect patients with HCV antibodies, HCV-uninfected patients with active DNA replication, HCV-infected patients with sustained virologic response (SVR), HCV spontaneous viral clearance, HCV-uninfected and HCV-unknown. The selected covariates were age, sex, psychiatric diagnosis and other BBV.

Results: From 1631 patients with age average of 46 years, 785 were male and 846 female. 1097 (67.3%) were tested for antibodies. Antibodies were confirmed in 102 (9.3%) patients. Among these patients 93 (93.0%) showed undetectable DNA replication, of which only 64 (68.8%) have followed a treatment with SVR and the rest reached spontaneous viral clearance (SVC). 2% were not tested for DNA replication and 7 (7.0%) had active replication and did not follow any treatment. Among patients with positive antibodies, 26.5% had schizophrenia and 18.6% other psychotic disorder, followed by patients with personality disorder (15.7%), bipolar disorder (7.8%), depressive disorder (5.9%), adaptive disorders (3.9%) and 21.6% had other disorders.

Conclusion: The prevalence of HCV in our Psychiatry Unit was 10.9 times higher than in general population. Our results highlight the need to address the issue of higher prevalence of HCV in people with severe mental illness. The Health System should provide an effective screening method to identify patients with HCV at-risk.
POSTER PRESENTATIONS

Figure: (abstract: FRI-148): Percentages of patients with HCV antibodies, RNA detectable or undetectable and patients who took treatment or reached SVC.

populations and develop a system to test all patients admitted in
psychiatric units in hospitals.
FRI-149
Tailored message intervention by nudge theory increases the
number of the viral hepatitis screening for Japanese workers and
consultation behavior of positive patients -Consideration of 1.7
million general check-up participants
Masaaki Korenaga1, Chieko Ooe2, Keiko Kamimura2, Tatsuya Ide3,
Tatsuya Kanto4. 1Hepatitis Information Center, The Research Center for
Hepatitis and Immunology, National Center for Global Health and
Medicine, Ichikawa Chiba, Japan; 2Japan Health Insurance Association,
Japan; 3Kurume University, Japan; 4Hepatitis Information Center, The
Research Center for Hepatitis and Immunology, National Center for
Global Health and Medicine, Japan
Email: dmkorenaga@hospk.ncgm.go.jp
Background and aims: Although the overall number of hepatitis B
virus (HBV) and hepatitis C virus (HCV) carriers in Japan has
decreased, actions against hepatitis at work sites in Japan have not
yet been fully implemented. In Japan Health Insurance Association
(JHIA), which is belonged to more than 40 million Japanese who are
working in Medium and Small Sized Companies, the attendance rates
of hepatitis screening were less than 2% even the cost of only €6.The
aim of this study was to investigate the effectiveness of a tailored
message intervention using nudge theory promoted the numbers of
viral hepatitis screening and how many of those found to be positive
patients have been followed up with examinations and hospital
treatment.
Method: More than 1.7 million Japanese workers at Fukuoka branch
of the JHIA who wish to get annual general checkup from 2017 to
2020 received client reminders by using nudge theory for an optional
hepatitis virus screening. For control subjects, we enrolled general
checkup applicants with typical message condition in 2016. The main
outcome measure was attendance rates in HBV and HCV screening
which were examined HBs antigen (HBsAg) and Anti-HCV antibody
(HCVAb), respectively. In addition, 6 months after the checkup, we
analyzed how many workers who were positive for HCVAb visited to
physicians by medical prescription system.
Results: There was a significant difference in viral hepatitis screening
attendance rates between the client reminders by using nudge theory
(n = 109,003 6.5%) and the control (n = 4,791 1.2%; p < 0.001). One

thousand four workers (0.94%) were positive of HBsAg (n = 631,
0.58%) and HCVAb (n = 373, 0.38%), respectively. The positive rate of
HCV Ab in the 50 s (0.60%) were higher than those in 60 s (0.49%). One
hundred eighty-five with HCVAb positive (50%) were confirmed to
visit specialists within 6 months after the screening. Seventy (38%)
were treated with IFN-free direct-acting antivirals and three males
(1.6%) in 60 s were detected hepatocellular carcinoma.
Conclusion: There were still many positive patients with viral
hepatitis at work sites. A simply modifying the client reminders
using nudge theory could increase the viral hepatitis screening rates.
Promoting hepatitis virus screening for workers at general checkup
can rescue hepatitis virus carriers who are unaware of their infection
and require to therapy for viral elimination and liver cancer.
FRI-150
Metabolic-associated fatty liver disease in socio-economic
vulnerable population with chronic hepatitis B and C
Speranta Iacob1,2, Razvan Iacob1,2, Mihaela Ghioca1,2,
Cristian Gheorghe1,2, Liana Gheorghe1,2. 1Carol Davila University of
Medicine and Pharmacy, Gastroenterology, București, Romania;
2
Fundeni Clinical Institute, București, Romania
Email: msiacob@gmail.com
Background and aims: Viral hepatitis and metabolic-associated fatty
liver disease (MAFLD) are the two leading causes of chronic liver
disease in Romania. We are currently conducting a screening project
in vulnerable population intended to provide preventive medical
services, screening, diagnosis and linkage to care for patients
detected with chronic HBV and HCV infection. The aim of our study
was to investigate the presence of MAFLD in patients detected with
viral hepatitis B and C in the screening project.
Method: 724 patients with B and C viral hepatitis detected at
screening, staged and treated during 1 year period (September 2021–
2022) in Fundeni Clinical Institute, were also screened for MAFLD
using ultrasound, Fibroscan with CAP, FINDRISC (Finnish diabetes
risk) score and AUDIT-C score.
Results: There were 61.5% of patients with HBV infection and 38.5%
with chronic hepatitis C. Associated MAFLD was encountered in 55.8%
of patients. The following statistical significant differences were
encountered in HCV vs HBV infections: older age, higher prevalence
of diabetes mellitus, higher liver stiffness values, higher percentage of
cardiovascular and psychiatric disorders (p values <0.05), but had

Journal of Hepatology 2023 vol. 78(S1) | S100–S1212

S899


similar nonsignificant differences regarding BMI values, liver steatosis evaluated by CAP and chronic alcohol consumption. Liver stiffness values were not influenced by the presence of severe steatosis. Grade III liver steatosis evaluated by CAP was significantly higher in patients with higher BMI values and excessive alcohol drinking evaluated by AUDIT-C score ≥3. FINDRISC score was significantly higher in female patients with HCV infection and correlated well with BMI values. Moderate FINDRISC score to develop diabetes mellitus in the next 10 years was associated with higher AST, ALT, triglycerides and BMI values. A higher FINDRISC and AUDIT scores were not associated with higher liver stiffness measurement.

**Conclusion:** MAFLD is highly prevalent in patients with chronic hepatitis B and C in Romania, being associated with high BMI and AUDIT-C scores. Liver stiffness measurement was not influenced by the presence of MAFLD, but was significantly higher in HCV chronic hepatitis patients.

**FRI-151**

**Strategies to eliminate hepatitis C virus infection in the Americas**


1Departamento de Gastroenterología, Escuela de Medicina, Pontificia Universidad Católica de Chile, Chile; 2Observatorio Multicéntrico de Enfermedades Gastrointestinales (OMEGA), Chile; 3Escuela de Medicina, Pontificia Universidad Católica de Chile, Chile; 4Division of Gastroenterology, Department of Medicine, Schulich School of Medicine, Western University and London Health Sciences Centre, London, Canada; 5Departamento de Gastroenterología, Escuela de Medicina, Pontificia Universidad Católica de Chile, Chile; 6Department of Ciencias de la Salud, Facultad de Medicina, Pontificia Universidad Católica de Chile, Chile; 7Department of Medicina Familiar, Escuela de Medicina, Pontificia Universidad Católica de Chile, Chile; 8Department of Anesthesiology, London Health Sciences Centre, Western University, Canada; 9Department of Community Health and Prevention and Urban Health Collaborative, Dorrisyle School of Public Health, Drexel University, Philadelphia, United States; 10Division of General Internal Medicine, Johns Hopkins University School of Medicine, Baltimore, United States; 11Public Health Department, School of Medicine, Pontificia Universidad Católica de Chile, Chile; 12Advanced Center for Chronic Diseases, ACCDis, Chile; 13Hepatology and Liver Transplant Unit, Hospital Universitario Austral, Buenos Aires, Argentina; 14Unidad de Hígado, Hospital Privado de Rosario, Rosario, Argentina; 15Instituto de Gastroenterología Boliviano-Japonés, Cochabamba, Bolivia; 16Division of Gastroenterology and Hepatology, University of Sao Paulo School of Medicine, Sao Paulo, Brazil; 17Hospital de Clinicas de Porto Alegre, Porto Alegre, Brazil; 18Department of Medicine, McGill University Health Centre, Montreal, Quebec, Canada; 19University of Calgary, Cumming School of Medicine, Calgary, Alberta, Canada; 20University of British Columbia, Vancouver, British Columbia, Canada; 21Department of Gastroenterology and Hepatology, University of Saskatchewan, Saskatoon, Saskatchewan, Canada; 22Division of Gastroenterology, St Paul's Hospital, University of British Columbia, Vancouver, British Columbia, Canada; 23Toronto Center for Liver Disease, Toronto General Hospital, Toronto, Canada; 24Unidad de Hepatología del Hospital Pablo Tobón Uribe, Grupo de Gastrohepatología de la Universidad de Antioquia, Medellín, Colombia; 25Clínica Equilibrio, San José, Costa Rica; 26Hospital San Carlos, Ciudad Quesada, Costa Rica; 27Department of Research and Teaching, Instituto de Gastroenterología, University of Medical Sciences of Havana, Havana City, Cuba; 28Hospital Eugenio Espejo, Quito, Ecuador; 29Instituto Salvador-relo del Seguro Social, San Salvador, El Salvador; 30Gastroenterología Endoscopia Digestiva, Hospital Roosevelt, Ciudad de Guatemala, Guatemala; 31Gastroenterología Endoscopia Digestiva, Hospital Roosevelt, Ciudad de Guatemala, Guatemala; 32Hospital Escuela Universitaria, Fegucigalpa, Honduras; 33Instituto Hondu-reño de Seguridad Social, Tegucigalpa, Honduras; 34Department of Gastroenterology, Instituto Nacional de Ciencias Médicas y Nutrición “Salvador Zubrín,” Mexico City, Mexico; 35Asociación Latinoamericana para el Estudio del Hígado (ALEH), Mexico; 36Medica Sur Clinic and Foundation, Mexico City, Mexico; 37Hospital Santo Tomas, Ciudad de Panamá, Panama; 38Hospital Punta Pacífica, Ciudad de Panamá, Panama; 39Departamento de Gastroenterología, Hospital de Clínicas, Universidad Nacional de Asunción, Asunción, Paraguay; 40Unidad de Trasplante Hepático, Hospital Nacional Guillermo Almenara, Lima, Peru; 41Hospital Nacional Edgardo Rebagliati Martins—Es es Up Salud, Lima, Peru; 42Clinica Anglo Americana, Lima, Peru; 43Hepatology and Liver Transplant Unit, Hospital Central de las Fuerzas Armadas, Montevideo, Uruguay; 44Clinica de Gastroenterología, Hospital de Clínicas, Facultad de Medicina, Universidad de la República Uruguay, Montevideo, Uruguay; 45Servicio de Gastroenterología, Hospital Dr. Sótero del Río, Santiago, Chile; 46Hospital de la Santa Cruz y Sant Pau, Barcelona, Spain; 47Instituto Médico La Floresta, Caracas, Venezuela; 48Division of Gastroenterology and Hepatology, Mayo Clinic, Rochester, MN, United States; 49Division of Gastroenterology and Hepatology, University of Arkansas for Medical Sciences, United States; 50Gastroenterology Unit, Massachusetts General Hospital, Boston, MA, United States; 51Virginia Commonwealth University and Central Virginia Veterans Health Care System, Richmond, Virginia, United States; 52Division of Gastroenterology and Hepatology, University of Michigan, Ann Arbor, Michigan, United States; 53Gastroenterology Section, Veterans Affairs Ann Arbor Healthcare System, Ann Arbor, Michigan, United States; 54Division of Gastroenterology, Hepatology, and Nutrition, Department of Medicine, Vanderbilt University Medical Center, Nashville, Tennessee, United States; 55Hepatitis B Foundation, Doylestown, United States; 56Division of Gastroenterology and Hepatology, Cook County Health and Hospital Systems, Chicago, Illinois, United States; 57Division of Digestive and Liver Diseases, UT Southwestern Medical Center, Dallas, Texas, USA; 58Liver Unit, Hospital Clinic, Barcelona, Spain; 59Gastroenterología—Hepatología, Hospital del Salvador. Universidad de Chile, Santiago, Chile; 60Division of Gastroenterología, Escuela de Medicina, Pontificia Universidad Católica de Chile, Santiago, Chile; 61Gastroenterología-Hepatología, Hospital Nacional Edgardo Rebagliati Martins-Es up Salud, Lima, Peru; 62Department of Medicine, University of South Dakota Sanford School of Medicine, Division of Transplant Hepatology, Avra Transplant Institute, Sioux Falls, SD, United States; 63Lever Unit, Hospital Clinic, Barcelona, Spain; 64Gastroenterología-Hepatología, Hospital del Salvador. Universidad de Chile, Santiago, Chile; 65Division of Gastroenterología, Escuela de Medicina, Pontificia Universidad Católica de Chile, Santiago, Chile; 66Observatorio Multicéntrico de Enfermedades Gastrointestinales (OMEGA), Santiago, Chile; 67CUNY Graduate School of Public Health and Health Policy (CUNY SPH), New York, NY, United States; 68Barcelona Institute for Global Health (ISGlobal), Hospital Clinic, University of Barcelona, Barcelona, Spain; 69Division of Gastroenterology, Department of Medicine, Schulich School of Medicine, Western University and London Health Sciences Centre, London, Ontario, Canada

Email: jparab@gmail.com

**Background and aims:** Although the WHO strategy has the goal to eliminate the hepatitis C virus (HCV) as a public health threat by 2030, the existence of national strategies is variable worldwide. We
aimed to assess the establishment of different policies and strategies to eliminate HCV in the Americas.

Method: We conducted a 23-item survey about HCV infection among gastroenterologists and hepatologists in the Americas. Questions were classified into four categories: policies and civil society (1 question), diagnosis (6 questions), care management (14 questions), and monitoring systems (2 questions). The survey was administered using an electronic form between November 7, 2022- January 8, 2023. Data were collected in a spreadsheet, revised by two independent reviewers, and compared with governmental institutions, regulatory agencies, scientific societies, and scientific publications.

Results: We obtained 47 responses from 19 out of 21 countries targeted (Argentina, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Panama, Paraguay, Peru, United States, Uruguay, and Venezuela). Fifteen (78.9%) countries have adopted a national strategic plan to eliminate HCV. Three (15.8%) countries have universal screening for HCV infection (Figure 1A). HCV was more commonly diagnosed in older cirrhotic patients (57.8%), followed by young patients who inject drugs (21.1%), and men who have sex with men (21.1%). After a positive HCV serological test, 10 (52.6%) countries perform reflex testing to confirm HCV diagnosis using the same sample. However, only 7 (36.8%) countries have an alert system for the requesting physician. Twelve (63.2%) countries have a direct referral system for specialized care of HCV positive cases. There is universal access to direct-acting antivirals (DAAs) in 15 (78.9%) countries (Figure 1B). Seven (36.8%) countries have generic DAAs available. Only 3 (15.8%) countries perform a retrospective search for HCV positive cases that could have been lost to follow-up.

Conclusion: Although most countries have adopted a national strategic plan to eliminate HCV, there are several issues and barriers to elimination in the Americas.

FRI-152
Qualitative interviews to assess the impact of chronic hepatitis delta virus infection on health-related quality of life in untreated patients from the US, Italy, Spain, and Germany

Pietro Lampertico1,2, Robert G. Gish3, Nancy S. Reau4, Heiner Wedemeyer5, Maria Buti6, Hannah Elwick7, Nicola Williamson7, Ashwarya Chohan7, Margaret Guy7, Rowena Jones7, Ankita Kaushik8, Alon Yehoshua8, 1Foundation IRCCS Ca’ Granda Ospedale Maggiore Policlinico, Division of Gastroenterology and Hepatology, Milan, Italy; 2CRC “A. M. and A. Migliavacca” Center for Liver Disease, Department of Pathophysiology and Transplantation, University of Milan, Milan, Italy; 3Hepatitis B Foundation, Doylestown, PA, United States; 4Department of Internal Medicine, Division of Digestive Diseases and Nutrition, Rush Medical College, Chicago, United States; 5Department of Gastroenterology, Hepatology, and Endocrinology, Hannover Medical School, Hannover, Germany; 6Liver Unit, Hospital Universitario Valle Hebrón and Ciber-ehd del Instituto Carlos III, Barcelona, Spain; 7Patient-Centred Outcomes, Adelphi Values, Bollington, United Kingdom; 8Gilead Sciences, California, United States

Email: pietro.lampertico@unimi.it

Figure: (abstract: FRI-151): Screening strategies (A) and availability of direct-acting antiviral treatments (B) among 19 countries in the Americas. The potential groups for screen were solid organ transplantation, haematological transplantation, chronic kidney disease, haemodialysis, human immunodeficiency virus infection, cirrhosis (any aetiology), hepatocellular carcinoma, bleeding disorders who have received a transfusion of blood products, sexually transmitted infections, injectable drug users, serious mental health disorders, migrants from countries with a high prevalence of HCV, pregnant women, and people of a certain age (eg., baby boomers).
**Background and aims:** Hepatitis delta virus (HDV) is the most severe form of viral hepatitis, which often results in accelerated progression to cirrhosis and poor prognosis, impacting patients’ health-related quality of life (HRQoL). Patient-Reported Outcome (PRO) instruments can capture the patient perspective and provide additional insights beyond surrogate markers such as viral load and alanine aminotransferase changes. The US Food and Drug Administration’s guidance states that PRO instruments should have sufficient evidence of content validity in the target population prior to use. This study aimed to explore the experience of patients living with chronic HDV and evaluate the content validity of the Hepatitis Quality of Life Questionnaire (HQLQ) and the Fatigue Severity Scale (FSS) for use in HDV.

**Method:** Semi-structured concept elicitation and cognitive debriefing qualitative interviews were conducted with patients in the US, Germany, Italy, and Spain with a clinician-confirmed diagnosis of chronic HDV. Patients were eligible to participate if they were not treated with interferon at the time of the study or in the previous six months. Patients diagnosed with Hepatitis C or had experienced an acute episode of liver disease in the previous six months were excluded. Participants described their experience living with HDV and then completed two instruments using a think-aloud technique to assess understanding, comprehension, and relevance of items, instructions, response scales, and recall period. Interviews were conducted in the native language of each country, and official translations of instruments were used. Thematic and framework analyses of verbatim interview transcripts were performed.

**Results:** The study sample (n = 32) included participants with a range of liver fibrosis stages from F0–F3 or F4 compensated, and two participants diagnosed with hepatocellular carcinoma. The majority of participants were aged over 55, and 63% of the sample were female. Fatigue, loss of appetite, pain over liver, nausea, and fever were the most frequently reported symptoms. Participants reported that HDV impacted their emotional wellbeing (low mood, anxiety), physical functioning (inability to exercise, difficulty walking), social functioning (including stigma), and work (difficulty meeting job responsibilities). By this approach, participants demonstrated good understanding of HQLQ and FSS items, instructions, response scales and recall periods, and concepts assessed in the instruments were considered relevant to HDV by most participants.

**Conclusion:** Findings contribute to the understanding of the patient experience of HDV and support the content validity of the HQLQ and FSS as outcome assessments for use in HDV. Further research to examine the psychometric validity of the PRO instruments and support their use as clinical trial end points is recommended.

**FRI-153**

**Microbiological analysis of acute hepatitis of unknown aetiology in children in Spain**

Ana Avellon Calvo1,2, Milagros Munoz-Chimeno1, Carmen Varela3, Maria Guerrero1,2, Marina Peñuelas1, Lucia Morago1, Nazaret Sanchez1, Monica Gonzalez4, David Tarrago5, Juan Emilio Echevarria6, Maria Dolores Fernandez2, Raquel Escudero6, Francisco Pozo7, Sarai Varona8, Victoria Hernando6, Asuncion Diaz1, 1National Centre for Microbiology, Hepatitis Unit, Spain; 2Instituto de Salud Carlos III, Hepatitis Unit, Spain; 3National Centre for Epidemiology, Spain; 4National Centre for Microbiology, Central Laboratory, Spain; 5National Centre for Microbiology, Viral Detection Unit, Spain; 6National Centre for Microbiology, Bacteriology, Spain; 7National Centre for Microbiology, Respiratory Viruses, Spain; 8Instituto de Salud Carlos III, Bioinformatics Unit, Spain

**Email:** avellon@isciii.es

**Background and aims:** On 2022 5th April, United Kingdom notified to WHO an alert of severe acute hepatitis in children. Since then to the end of 2022, Spain has detected 61 cases with 3 deaths. Microbiological analysis, complementary to that performed at the hospitals, has been performed at the National Centre for Microbiology in 42 cases. The aim of this report is to describe the microbiological analysis performed at the National Centre for Microbiology in 42 cases, including the metagenomic analysis.

**Method:** Samples (serum, total blood, faeces, urine and nasopharyngeal swab) were studied through PCRs of: herpes simplex viruses, virus varicella-zoster, cytomegalovirus, Epstein-Barr virus, herpes 6, 7 and 8, enterovirus, parvovirus B19, adenoavirus, hepatitis A and E, norovirus and lep Has performed in most of the cases with a metagenomic approach.

**Results:** Among serum and total blood samples, 11/42 (26.2%) cases were positive to herpes and 3/42 (7.1%) positive to enterovirus. Adenoaviruses were detected in 18/42 (42.8%) of the cases, obtaining 2 complete genomes. Adeno-associated viruses were detected by metagenomics in 8/42 (19.0%) cases. Some other viruses were detected as: CoVNL63, Coronavirus HKU1, Sapporovirus, Respirovirus and Parechovirus.

**Conclusion:** Obtained results parallels those reported in other European countries in where adenoaviruses and adeno-associated viruses were the most common viruses detected. However, the aetiology of the hepatitis cases remains unclear, as more case and control studies are needed to define the exact role of each microorganism.

**FRI-154**

**Emergency department contribution to hepatitis C elimination through opportunistic screening in Cascais, Portugal**

Inês Vaz Pinto1, Catarina Esteves Santos1, Mafalda Guimarães1, Ríia Vale Rodrigues1, Vanda Castro1, Alba Carrodeguas2, Diogo Medina2. 1Hospital de Cascais Dr. José de Almeida, Alcabideche, Portugal; 2Gilead Sciences, Lda, FOCUS Program, Lisboa, Portugal

**Email:** diogomedia@gmail.com

**Background and aims:** Advancing screening and linkage to care practices is necessary to eliminate hepatitis C in Portugal toward WHO goals for 2030. We aimed to ascertain whether screening of patients seeking urgent care could effectively complement existing targeted screening policies.

**Method:** We implemented opportunistic screening in the emergency department from September 2018 to September 2021 (36 months), using existing infrastructure and staff, aided by electronic health
record system automations to identify screening eligibility and request serologies. Patients aged 18–64 were eligible upon verbal consent IF they had no recorded tests in the previous year AND required blood work. Follow-up or discharge were provided regardless of test results. Case managers contacted positive patients to ensure linkage to care.

**Results:** We screened 88.9% (n = 38,357) of eligible patients, finding 1.49% (n = 571) HCV antibody seroprevalence, 0.56% (n = 215) HCV viremia were assessed at the DAC office by a hepatologist, a pharmacist, and DAC professionals. During the same visit, baseline clinical, laboratory and elastographic characteristics were determined, as well as potential drug interactions, before starting direct-acting antivirals (DAA). Therapy began on the same day of the visit and was fully facilitated by the DAC, where adherence control was carried out. Sustained viral response (SVR) was evaluated at week 12 post-treatment (SVR12). We present descriptive data of 48 patients visited and treated at the DAC in the periods of January–March 2020 and November 2020–December 2022.

**Results:** 91.2% of the patients were men with a mean age of 48 years. 96% were Caucasian; 83% were Spanish. 90% were treatment-naïve, and genotype 1a was the most frequent (50%). Most were F0-1 (73%) and only 3% (6%) were F4. 35 received treatment for 8 weeks with Glecaprevir/Pibrentasvir and 13 for 12 weeks with Sofosbuvir/Velpatasvir. In the pre-interaction study, only 3 patients required modifications. The adherence of patients who have already completed treatment (48) has been excellent in 90%. The response of 45 patients is evaluated (2 are completing treatment and 1 died before being evaluated): At the end of treatment: 43 (96%) had responded and in 2 (4%) the response is unknown due to loss of follow-up. At week 12 post-treatment: 40 patients (89%) had achieved SVR12, 1 patient presented criteria for treatment failure and in 4 (9%) this was due to loss of follow-up. The maintenance of the response one year post-treatment has been evaluated in 43 patients: 25 (58%) maintain SVR, 4 (9%) present criteria for reinfection (3 of them have already been retreated), while in 14 (33%) the response is unknown due to loss of follow-up.

**Conclusion:** A high adherence to treatment was observed applying the test and treat in point of care strategy. The efficacy of the novel
strategy was significantly higher than those described for this group of patients with the usual strategies (standard of care). Only one case of virological failure has been observed, however, the loss of follow-up after completing the treatment makes it difficult to obtain efficacy comparable to the general population. The study also found a significant rate of reinfection at one year of follow-up. Most reinfected patients have already been retreated. The center-based action strategy was found to be superior to usual strategies for treating this difficult-to-treat population.

FRI-157
Comparison of HCVRNA results using plasma separation card with gold standard veni-puncture
Huma Qureshi1, Hassan Mahmood2, Syeda Zahida Sarwar3, Khalid Mahmood4. 1Ministry of National Health Services, Regulations and Coordination, Pakistan, Pakistan; 2Integral Global, Pakistan; 3Independent Consultant, Lahore, Pakistan; 4Punjab Health Department, Lahore, Pakistan Email: drhumamrc@gmail.com

Background and aims: Drawing a venous sample for HCVRNA testing requires an expert. The transportation of this sample and its storage also requires special care and refrigeration especially in the low middle income countries. The plasma separation card is a solution for all these issues where whole blood collected from a finger stick is placed onto the card and is transported without separating or refrigerating it. HCV RNA is extracted from it at the laboratory. To compare the ease of extraction and results HCVRNA using Plasma Separation Card with Gold standard venous blood collected in a gel tube.

Method: A total of 352 anti HCV reactive persons underwent reflex blood collection for HCVRNA. From each individual 5 ml of venous blood was collected in a gel tube and stored for HCVRNA testing. From the other hand, using a finger stick, 140 microliters of whole blood were collected in the capillary tube and poured over the marked point of the plasma separation card (PSC). The gel tube and the PSC were transported to the main laboratory for RT PCR, where plasma was separated from the gel tubes and was run for HCVRNA testing (both qualitative and quantitative assays). From the plasma separation card, one punch of spot was removed and placed in the virus extracting solution and tested for HCVRNA using standard steps (both qualitative and quantitative assays). The two tests were run simultaneously for comparison. A correlation factor of 50 was applied to the PSC viral quantification and then compared with the quantitative HCVRNA levels obtained from the venous samples.

Results: A total of 3407 patients were screened between January 2019 and June 2022. Among them, 1540 (45%) were HBsAg+, 53 (2%) anti-HDV+, and 1.814 (53%) HCVRNA+. 498 (31%) HCV-RNA+ patients were not linked to care, 14 (26%) from the anti-HDV patients and 1018 (56%) from the HCVRNA+. The proportion of reinfected patients significantly more linked to care than hepatitis C patients (p < 0.0001). After the telephone calls, 226 (46%) from the HCVRNA+ patients not linked to care, 12 (8%) from the anti-HDV+ (2 of which HDV-RNA+) and 54 (5.3%) from the HBsAg+ patients were finally linked; being hepatitis D patients significantly less linked to care (p < 0.0001). Patients with hepatitis C had significantly more advanced age or comorbidities (703 (23%), compared to patients with hepatitis B or D (17 (1%) and 1 (2%)) (p < 0.0001). Of the total number of patients, 670 (20%) could not be contacted due to missing personal data.

Conclusion: Plasma separation card for blood collection, transportation, storage and extraction of HCV RNA was found to be user friendly when compared with the venous blood collection. The HCVRNA extracted from the PSC correlated well with the venous sample suggesting its wider use especially in difficult to reach populations and areas.

FRI-158
Patients with hepatitis B and D are more often linked to medical care than patients with hepatitis C
Elena Vargas Accarino1, Anna Feliu-Prius1, Adriana Palom1, Ariadna Rando-Segura2, Ana Barreira1, Joan Martinez-Camprecios1, Judit Vico-Romero1, Juan Carlos Ruiz-Cobo1, Jordi Llaneras1, Mar Rivero Barciela1, Francisco Rodriguez-Frias2, Rafael Esteban1, Maria Buti1. 1Vall d’Hebron University Hospital, Liver Unit, Spain; 2Vall d’Hebron University Hospital, Microbiology Department, Spain Email: mbuti@vhebron.net

Background and aims: The WHO established the goal to decrease hepatitis B and C associated mortality to less than 6 cases/100,000 people for 2030. To achieve this goal, it is important to identify and link to care patients with viral hepatitis. The objective of this study was to retrieve hepatitis B, C and D lost to follow-up patients and to deepen the reasons why they were not linked to care. This study was performed in the Spanish public health system.

Method: Retrospective and prospective search in the microbiology database of the northern area of Barcelona (450,000 inhabitants) of patients with hepatitis C (HCVRNA+), hepatitis B (HBsAg+) and hepatitis D (anti-HDV+). Patient medical records were reviewed to identify lost to follow-up patients. Candidates to contact were telephoned a maximum of 5 times to offer them a medical visit.

Results: A total of 3407 patients were screened between January 2019 and June 2022. Among them, 1540 (45%) were HBsAg+, 53 (2%) anti-HDV+, and 1.814 (53%) HCVRNA+. 498 (31%) from the HBsAg+ patients were not linked to care, 14 (26%) from the anti-HDV patients and 1018 (56%) form the HCVRNA+; being hepatitis D patients significantly more linked to care than hepatitis C patients (p < 0.0001). After the telephone calls, 226 (46%) from the HBsAg+ patients not linked to care, 12 (8%) from the anti-HDV+ (2 of which HDV-RNA+) and 54 (5.3%) from the 1018 HCVRNA+ were finally linked; being HCVRNA+ patients significantly less linked to care (p < 0.0001). Patients with hepatitis C had significantly more advanced age or comorbidities (703 (23%), compared to patients with hepatitis B or D (17 (1%) and 1 (2%)) (p < 0.0001). Of the total number of patients, 670 (20%) could not be contacted due to missing personal data.

Conclusion: From the patients not linked to care, 46% (226) from the HBsAg+, 85% (12) from the anti-HDV+ and 5.3% (54) from the HCVRNA+ were finally linked. In total, 292 (19%) patients have been linked to care, suggesting this is an effective strategy. Patients with hepatitis D are more linked and predisposed to be linked to care than patients with hepatitis C. The biggest challenge of this strategy has been the lack of contact details.
The impact of hepatitis B and C serologies on the outcomes of non-liver solid organ transplantation

Maria Stepanov1,2,3, Reem Al Shabeeb4, Katherine Eberly5, Janus Ong6, Saleh Alqahtani7, Zobair Younossi1,5, 1Inova Health System, Inova Medicine Services, Falls Church, United States; 2Beatty Liver and Obesity Research Program, Inova Health System, United States; 3Center for Outcomes Research in Liver Disease, United States; 4Inova Fairfax Hospital, Center for Liver Disease, Inova Medicine, United States; 5Inova Fairfax Hospital, Department of Medicine, Center for Liver Diseases, United States; 6College of Medicine, University of the Philippines, Manila, Philippines; 7Johns Hopkins University, Division of Gastroenterology and Hepatology, Baltimore, United States

Email: zobair.younossi@inova.org

Background and aims: Viral hepatitis B (HBV) and C (HCV) could negatively affect the outcomes of non-liver solid organ transplantation. Our aim was to assess post-transplant survival in patients with HBV and HCV serologies who received a non-liver solid organ transplant.

Method: We used Scientific Registry of Transplant Recipients (SRTR) 2006–2021 to collect data for all patients ≥18 years of age who received a lung, heart, or kidney single organ transplant in the U.S. History of hepatitis C virus (HCV) infection was determined as positive HCV Ab, and history of hepatitis B (HBV) infection was determined as positive HBsAg.

Results: We included a total 348,024 non-liver solid organ transplant recipients (N = 30,872 lung: mean age 57 ± 13 years, 60% male, 4% re-transplants, 15% type 2 diabetes (T2D); N = 36,990 heart: age 54 ± 13 years, 74% male, 3% re-transplants, 26% T2D; N = 280,162 kidney: age 52 ± 14 years, 61% male, 12% re-transplants, 30% T2D). The prevalence of pre-transplant HBsAg was 1.3% in lung, 1.5% in heart, and 1.7% in kidney transplant recipients. The HCV Ab was positive in 2.2%, 2.2%, and 5.0% in lung, heart, and kidney recipients; respectively. The post-transplant 1- and 5-year survival of patients with vs. without HBsAg was not different in all solid organ transplants (all p > 0.05). Similarly, there was no difference in post-transplant survival between lung transplant recipients with vs. without anti-HCV: 42% vs. 43% at 5 years, 69% vs. 69% at 10 years (all p > 0.05). In contrast, heart transplant recipients with HCV Ab (+) had higher crude post-transplant mortality: 27% vs. 21% at 5 years, 50% vs. 38% at 10 years (all p < 0.01). Similarly, there was higher post-transplant mortality in kidney transplant recipients with HCV Ab (+): 6% vs. 3% at 1 year, 21% vs. 13% at 5 years, 47% vs. 31% at 10 years (all p < 0.0001). In multivariate analysis controlling for confounders, the association of HCV Ab (+) with higher post-kidney transplant mortality remained significant: adjusted hazard ratio (aHR) (95% CI) = 1.13 (1.09–1.17), p < 0.0001. There was no association of viral hepatitis with the risk of graft failure in solid organ transplants (p > 0.05) except for the association of HBsAg with the risk of kidney graft loss (cumulative 4.3% vs. 3.1%, p < 0.01).

Conclusion: In most cases, presence of HBV and HCV serologies are not associated with adverse post-transplant outcomes in non-liver solid organ transplantation. However, kidney transplant recipients with HCV Ab (+) seem to have an increased risk for post-transplant mortality.

Development of a rapid workflow for detecting HCV RNA from whole blood

Matthew Pauly1, Sabrina Torres1, Tonya Hayden1, Lilya Ganova-Raeva1, Saleem Kamili1, 1Centers for Disease Control and Prevention, United States

Email: omx40@cdc.gov

Background and aims: Chronic hepatitis C virus (HCV) infection is a leading cause of cirrhosis, hepatocellular carcinoma, and other liver complications. Effective treatments are available, yet only 20% of the estimated 58 million global HCV infections have been diagnosed. Accurate and timely diagnosis of HCV infection is important for linking people with HCV infections to care and stopping virus spread. Most diagnostic tests for HCV are expensive and performed in a laboratory, which limits their effectiveness in some at-risk populations. Diagnostic tests for HCV infection that are compatible with point-of-care use could greatly improve access to testing.

Method: We developed a workflow for the extraction, amplification, and detection of HCV RNA from whole blood samples that uses simple and inexpensive equipment. First, a brief spin in a mini-centrifuge removes blood cells from a small volume of whole blood. Cell-free blood is mixed with a lysis solution containing paramagnetic solid phase reversible immobilization (SPRI) beads capable of binding nucleic acids. The beads are washed once, and then the bound nucleic acids are eluted. The eluted nucleic acids are added to an HCV-specific reverse-transcription loop-mediated isothermal amplification (RT-LAMP) reaction. Positive amplification is detected using either measured fluorescence or lateral-flow test strips.

Results: The workflow for HCV RNA detection from whole blood takes 45 minutes from sample preparation to result and the reagents can cost less than 5.00 USD per sample. The 95% limit of detection by probit analysis is 2.8 log_{10} (IU/ml) (95% CI 2.5–3.4) for HCV RNA in whole blood, which would permit detection of approximately 98% of global HCV infections. This workflow can detect HCV genotypes 1–6. This workflow detected 75/80 (94%) samples from a panel of whole blood spiked with diverse HCV RNA-positive plasma samples. Each of the samples from this panel that were not detected contained HCV RNA levels below 3.0 log_{10} (IU/ml). Simplifying the procedure to include a magnetic wand in place of precision pipettes for processing the paramagnetic SPRI beads during the nucleic acid extraction steps allowed for similar HCV RNA detection results.

Conclusion: We have developed a rapid, sensitive, and inexpensive workflow for the detection of HCV RNA from small volumes of whole blood. With additional procedural simplifications, this workflow may form the basis for a point-of-care test for the detection of HCV RNA from clinical samples.
Background and aims: A lack of awareness compromises appropriate consideration of hepatitis C virus (HCV) infections in patients undergoing surgery. We evaluated the status of HCV screening, confirmation, and treatment in patients undergoing surgery.

Method: Patients who underwent surgery in a tertiary academic center between 2019 and 2021 were eligible for this retrospective study. The testing and positivity rates for anti-HCV antibodies and HCV RNA were analyzed.

Results: Among 96,894 patients (40,121 males, 41.4%) who underwent surgery, 576 (0.7%) were positive for anti-HCV antibodies and had significantly higher rates of diabetes mellitus (32.6% vs. 18.5%), hypertension (50.5% vs. 28.6%), liver cirrhosis (13.2% vs. 1.7%), and unfavourable laboratory test results compared with those who were negative (all p < 0.05). The HCV RNA status was assessed in 215 (37.3%) of the anti-HCV antibody-positive patients, and the rate of HCV RNA positivity was 20.5% (n = 44 of 215). Of these 44 patients, 42 (95.5%) were referred for treatment, and all 29 treatable patients were successfully treated with direct-acting antiviral therapy. The HCV RNA positivity rate was significantly higher in the hepatobiliary and transplant surgery department (76.6%) than in other surgical departments (25.0–33.5%).

Conclusion: A significant number of preoperative anti-HCV antibody-positive patients did not receive appropriate HCV management. An automated alert system may be required.
The efficacy of HBSCE program was 47.7% (221/463). HBsAg was found positive in one fourth (24.2%) of contacts and Anti- HBc was positive in about two third (31.2%) of contacts. The overall infection rate (either HBsAg+ or any antibody positive with no history of immunization) was 42.1%. Past Exposure Rate (HBsAg -ve with Anti-HBc (Total) +ve, or Anti-HBs +ve, with no history of vaccination) was seen in 15.7%. Out of 128 uninfected individuals, 32 were already vaccinated, and 61 (47.6%) were vaccinated after the counselling. Prevalence of HBV infection was significantly higher among mothers (51.1%) as compared to other family members (28.1%) (OR 3.2, 95%CI 2.3–4.6) supporting vertical transmission.

Conclusion: Familial clustering of HBV infection was seen. Opportunistic screening and multilevel counselling of family members was an effective strategy for active case finding. Younger index cases, with two out of every four mothers being infected strongly suggest vertical transmission as the most common mode of infection. This data suggests family screening as important additional strategy to eliminate hepatitis B by 2030 via test and treat approach.

FRI-164
HCV elimination in persons living with HIV (PLWH): the NoCo (No-Coinfection) study of the ICONA network
Antonella d’Arminio Monforte1, Alessandro Tavelli1, Roberto Rossotti2, Roberta Gagliardini3, Annalisa Saracino4, Sergio Lo Caputo5, Matteo Sala6, Eugenia Quiros-Roldán7, Cristina Mussini8, Enrico Girardi9, Andrea Antinori3, Massimo Puoti2,10. 1Icona Foundation, Milan, Italy; 2ASST Grande
Background and aims: PLWH are often HCV coinfected and undergo more frequently to progressive disease. Early diagnosis and treatment are essential to eliminate HCV in this population. No-Co is a prospective cohort study on PLWH aimed to estimate: prevalence of past and active HCV infection in PLWH in care in 2017–2022, the incidence of HCV re-infections and HCV seroconversions and DAA-uptake and response.

Method: No-Co study included PLWH screened for HCV from Sept-2017 to Oct-2022, independently of their HCV status, belonging to centers of the Italian ICONA network. Prevalence of HCV infection (HCVAb+) and active HCV infection (HCV-RNA+) were evaluated at baseline. Incidence of HCV seroconversions, in those HCVAb-at baseline, and of HCV re-infections (in those HCVAb+/HCV-RNA- who turned to HCV-RNA+) were evaluated and predictors identified by Poisson regression models. Standard survival methods (Kaplan-Meier curves and Cox models) used to estimate the probability and predictors of DAA-start from first HCV screening in the study, for those HCV-RNA+. Logistic regression models have been used to investigate predictors of SVR12.

Results: 4,569/16,743 (27.3%) were HCVAb+ at baseline. HCVAb+ were older (median 54 vs 46 yrs), more frequently Italian (94% vs 78%), and with higher CD4/mmc (median 644 vs 598). In a median follow-up of 1.6 years, 42/4,890 seroconverted, with KM probability of 0.5% (95%CI 0.3–0.7) at 1 year. No factors were associated with seroconversion. 1,732/4,569 (37.9%) were HCV-RNA−; in a median follow-up of 1.3 years, 38 turned to HCV-RNA+; 10 relapsed, 28 were re-infections), KM probability of HCV reinfection at 1 year was 1.3% (95%CI 0.7–2.3). Younger age was the only factor independently associated to higher incidence of re-infection (aIRR 1.67, 95%CI 1.05–2.64). 1,374/1,732 HCV-RNA− PLWH had a follow-up, 1,184 (86.2%) started DAA, the KM probability of DAA uptake at 1-year was 79.5% (95%CI 77.3–81.7). Independent predictor of reduced access to DAA was CD4<200/mmc (aHR 0.59, 95%CI 0.43–0.80), HIV-RNA >50 copies/ml (aHR 0.72, 95%CI 0.57–0.91) and being IDU (aHR 0.72, 95%CI 0.60–0.87). SVR12 was obtained in 95.5%; CD4<200/mmc were associated with lower probability of SVR12 (aHR 0.18, 95%CI 0.06–0.52). Globally, the cascade of care of HCV indicates that 86.2% of HCV-RNA+ were treated, of these 77.2% reached 12 weeks follow-up after DAA, and 95.5% of these obtained SVR12, resulting in 63.6% of SVR among HCV-RNA+ (Figure 1A-B). Finally, the yearly prevalence of active HCV infection decrease from 41.7% in 2017 to 11.7% in 2022 (p < 0.001, Figure 1C).

Conclusion: Only 12% of PLWH in this cohort are still viremic. Prevalence of active HCV infection decreased over time in PLWH, both because of DAA treatment and relatively low rate of new infection or reinfections. Access to DAA was lower in IDU and in those with uncontrolled HIV infection. Low CD4 counts were independent predictors of non-response.

Figure: (abstract: FRI-164): HCV Cascade of Care in NoCo study (A-B) and proportion of HCV-RNA viremic subjects according to calendar year of test (C).
FRI-165
A modelling study of the impact of scaling up of HCV case finding and treatment for people who inject drugs in English region of Bristol and Severn

Zoe Ward1, Hannah Fraser1, Adam Trickey1, Jo Kesten1, Andy Gibson2, Leila Reid1, Fiona Gordon4, Alec Miners2, Jack Williams4, Matthew Hickman3, Graham Foster2, Monica Desai4, Sema Mandal4, Yvonne Lynch-Hill1, Christina Leblanc1, Barbara Goodall1, Lisa Barrett2, Zoe Ward1, Hannah Fraser1, Jo Kesten1, Andy Gibson2, Leila Reid1, Fiona Gordon4, Alec Miners2, Jack Williams4, Matthew Hickman3, Graham Foster2, Monica Desai4, Sema Mandal4.

1University of Bristol, United Kingdom; 2Dalhousie University, Infectious Diseases, Halifax, Canada; 3Nova Scotia Health Authority, Infectious Diseases, Halifax, Canada; 4University of West of England, United Kingdom; 5Hepc Trust, United Kingdom; 6University Hospitals Bristol and Weston Trust, United Kingdom; 7Source Health Economics, United Kingdom; 8London School of Hygiene and Tropical Medicine, United Kingdom; 9Queen Mary University of London, United Kingdom; 10United Kingdom Health Security Agency, United Kingdom

Email: zoe.ward@bristol.ac.uk

Background and aims: People who inject drugs (PWID) are the main risk group affected by Hepatitis C (HCV) in the UK. The National Health Service in England (NHSE) aims to eliminate HCV as a public health threat by 2025, ahead of the WHO target of 2030. Scaling up HCV testing and treatment among PWID will be critical for reaching this elimination goal. This entails decreasing the incidence of HCV among PWID by 80% compared to 2015 levels or <2 per 100 person years (py) by 2025. We assess whether existing strategies are sufficient for reaching these elimination goals.

Method: A dynamic HCV transmission model among PWID, including incarceration and drug treatment centres (DTC), was used to project the impact of existing prevention, testing and treatment services in the Bristol and Severn region (defined by NHSE Operational Delivery Networks responsible for delivering HCV treatment). The model includes the pathway from testing to treatment in prison, DTC and other settings. Detailed data from NHSE HCV treatment database and HCV testing sentinel surveillance database and a yearly bio-behavioural survey among PWID were used to parameterise and calibrate the model using Approximate Bayesian Computation. Model outputs were used to project HCV chronic prevalence, incidence and number of treatments over time and determine whether existing testing and treatment strategies will reach the elimination goals by 2025 or 2030.

Results: Data suggests that 178, 72 and 270 treatments were undertaken in DTC, prison and other settings over 2015–2019 in Bristol and Severn, with the time from diagnosis to treatment decreasing from >1 year to <3 months in all settings. Our model projects that this treatment scale-up resulted in prevalence decreasing by median of 51% (47.9–58.6%) and incidence decreasing by 48.4% (44.6–56.2%) by start of 2020. If testing and treatment continued at the same rates from 2020, then chronic prevalence will decrease by 84.1% (79.8–91.1%) from 31.9% in 2015 to 5.0% by 2030 and incidence will decrease by 83.1% (78.1–90.6%) from 9.4 (8.0–11.4) to 1.5 per 100 py (0.8–2.3). In total, 2083 (1882–2217) treatments would be used over 2015–2030 (PWID population=5300). By 2025, incidence will decrease by 70.9% (65.9–79.9%) to 2.7 per 100 py (1.3–3.6) following 1722 (1536–1861) treatments.

Conclusion: Our modelling suggests the scale-up of HCV testing and treatment among PWID in Bristol and Severn will reach the WHO targets for HCV elimination between 2025 and 2030.

FRI-166
Treatment start resilience but testing decrement in a coordinated statewide HCV treatment program during COVID: lessons learned and future steps

Yvonne Lynch-Hill1, Christina Leblanc1, Barbara Goodall1, Lisa Barrett2, Yvonne Lynch-Hill1, Christina Leblanc1, Barbara Goodall1, Lisa Barrett2

1Nova Scotia Health Authority, Infectious Diseases, Halifax, Canada; 2Dalhousie University, Infectious Diseases, Halifax, Canada

Email: lisabarrett@me.com

Background and aims: The SARS-CoV-2 pandemic was associated with marked decreases in access to lab based blood borne pathogen testing, including HCV molecular diagnostics. While new diagnoses may have decreased, it was unclear if all other parts of the HCV care cascade engagement would also decrease during each year of the pandemic. Our goal was to describe engagement in care across the care cascade before and during the SARS-CoV-2 pandemic in a statewide coordinated virtual HCV care program.

Method: Nova Scotia is a Canadian province with approximately 1,000,000 population. From 2017 to 2022, the majority of HCV care was initiated through in a province wide program which converted to a fully virtual, nurse delegated program in July 2020 with the advent of the pandemic. We measured the number of referrals, care engagements, treatment starts, documented SVRs (sustained virologic responses), and treatment failures annually from 2019 (considered pre-pandemic) until December 2022.

Results: HCV program referrals decreased approximately 30% in 2020/21 (187, 183) compared to 2019 (264) and 2022 (220). However, initial virtual visits to establish care were stable across 2019 (69), 2020 (85), and 2021 (67), and increase to 114 in 2022. 158 people initiated treatment in 2019, compared with 135 in 2020, 115 in 2021 and 93 in 2022. SVR was status was known in 111 people in 2019, compared to 104 people in 2020, 75 in 2021, and 21 in 2022. Treatment failure or reinfecion was stable over all years.

Conclusion: New HCV infection estimation was limited during the pandemic, given the lack of point of care and lab-based HCV testing in the province. However, conversion to a virtual platform, centralized referral and treatment, as well as expert delegated nurse role was associated with equivalent engagement in care but slightly decreased treatment initiation. Building HCV care resilience through virtual and delegated collaborative prescriber programs should be considered in future pandemic preparedness planning and blood borne pathogen management.

FRI-167
Who is missing? Analysis of the 2021 Georgian seroprevalence survey to identify the population left to be screened for hepatitis C

Sophia Surguladze1, Davit Bialiashvili2, Shaun Shaqder2, Tamar Gabunia3, Maia Tsereteli4, Paige A. Armstrong2, Senad Handanagic2, Tamar Gabunia3, Maia Tsereteli4, Paige A. Armstrong2, Senad Handanagic2.

1The Task Force for Global Health, Georgia; 2Center for Disease Control and Prevention, United States; 3Ministry of Labour, Health and Social Affairs of Georgia, Tbilisi, Georgia, Georgia; 4National Center for Disease Control and Public Health, Georgia

Email: sophiessurguladze@gmail.com

Background and aims: Georgia has made great progress towards hepatitis C virus (HCV) elimination since starting their elimination program in 2015; a 2021 serosurvey showed a 67% decrease in prevalence of current HCV infection. As a part of the program, people are screened at multiple different sites, the most common being mandatory inpatient screening at hospitals. However, low awareness of infection status and loss to follow-up after reactive HCV antibody or detected HCV RNA or HCV core antigen remains a challenge. This study used data from the 2021 survey to identify sub-groups of adults with low HCV screening and status awareness, highlighting gaps in the HCV elimination program and groups least served by the HCV elimination program.

Method: The 2021 serosurvey used a stratified, multi-stage cluster design with systematic sampling. Participants were interviewed and tested for anti-HCV. The weighted proportions with 95% confidence intervals (CI) for ever been screened for hepatitis C were calculated and stratified by demographic and behavioral variables to assess screening coverage in different groups. To assess awareness of anti-HCV status, weighted proportions of anti-HCV reactive persons who reported ever being screened positive were also calculated.

Results: Overall, 42.1% (95% CI: 39.6–44.7%) of participants reported ever being screened for anti-HCV. This proportion was similar in men and women at 35.5% (95% CI: 32.7%–38.4%) and 39.8% (95% CI: 37.2%–42.5%) respectively. Reported screening was lowest in those aged >60 years (27.8% [95% CI: 25.5%–30.6%]) and the highest in the 30–39 year age group (49.9% [45.3%–54.5%]).
Among anti-HCV-reactive persons overall, 75.6% (95% CI: 68.2–81.7%) knew their screening status. This proportion was 56.4% (95% CI: 47.9–64.5%) for anti-HCV-reactive men and 38.8% (95% CI: 29.2–49.3%) for anti-HCV-reactive women. Among those who were reactive, the proportion aware of their status was lowest in the 18–29 year age group (34.7% [95% CI: 8.5–75.4%]) and highest in those aged 40–49 years (63.3% [95% CI: 50.1–74.7%]). In terms of risk groups, awareness of anti-HCV reactivity was 61.4% (95% CI: 42.0–77.7%) in previously incarcerated individuals, 62.2% (95% CI: 46.8–75.5%) in reported injection drug users, and 63.7% (95% CI: 47.1–77.6%) in those reporting having ever received a blood transfusion.

**Conclusion:** Our analysis identified sub-groups in Georgia with low HCV screening and status awareness. The youngest and oldest participants had the lowest reported screening. Targeted interventions to improve HCV screening are needed in these sub-groups. Awareness of anti-HCV reactivity was lowest in the 18–29 year age group, and was higher in risk groups compared to the general population; improved follow-up for people with positive screening results is needed to ensure they are notified of their status.

**FRI-168**

**Are primary healthcare facilities ready to provide hepatitis delta services in Mongolia: service availability and readiness assessment findings**

Azzaya Oktaybiri, Badmaa Ogonbayar, Enkhjargal Altangerel

1Mongolian National University of Medical Sciences, Mongolia;
2Anagdakh Ukhanyng Mergejiltuudin Academy, Mongolia

**Email:** mndzul@gmail.com

**Background and aims:** Primary health care (PHC) facilities are the frontline service providers responsible for provision of the essential services to the population. Some portions of the clinical management for hepatitis patients are provided at PHC facilities within the National Liver Programme, especially for HBV and HCV related services. However, information on HDV service provision at PHC is uncertain. Therefore, we aimed to explore what services are available and how are they ready for HDV patients at the PHC level.

**Method:** WHO developed a tool for service availability and readiness assessment (SARA) was used, which comprised a set of indicators to define whether a health facility meets the required conditions for providing basic and specific services. The cross-sectional study examined randomly selected 79 PHC facilities from urban (82.3%) and rural (17.7%) areas. The assessment questionnaire was modified to the country context with focus on hepatitis and immunization services. Immunization service assessment was included to explore the possibility of applying temperature-controlled daily injections of Bulevirtide for HDV patients. Collected data was analyzed using SPSS 21.0 to define the indicators of availability and readiness.

**Results:** Overall PHC basic service readiness score was 62.1%. Almost all (96.2%) of the facilities conduct rapid testing for HBV, with 70.8% have ready stock of the test strips. They do not provide HDV rapid testing. 45.8% of the facilities managed to train the staff for hepatits management within the last two years. There is no unified registry system for HDV patients, and 44.3% of the facilities maintain the monitoring of the diagnosed patients, through referral to secondary hospitals and counseling on disease management. The immunization service readiness was assessed by exploring the presence of the routine vaccines, cold chain equipment, and trained staff and guidelines. All PHC facilities provide immunization services in both urban and rural areas. Overall readiness for immunization services was 86.8%, which included trained staff (80.38%), required equipment (99.79%); and supplies (69.11%).

**Conclusion:** The study revealed that the availability and readiness of basic PHC services is considerably good within the facilities. The service provision at PHC for HBV and HCV, obliged by the National Liver Programme, is well maintained at both urban and rural places. The screening and testing for HDV are not delivered at all PHC facilities. The availability of HDV specific treatment is none. The required condition and readiness for immunization is built up well, therefore, it could be used for daily injectable treatment (Bulevirtide) for hepatitis D patients at PHC facilities. The good level of availability and readiness for basic and hepatitis (B and C) services could serve as a good foundation for future introduction of HDV related services at PHC facilities in both urban and rural places.

**FRI-169**

**Cascade of care among people with an HBV notification in New South Wales, Australia, including diagnosis, specialist assessment, and treatment uptake**

Syed Hassan Bin Usman Shah, Heather Valerio, Behzad Hajarizadeh, Maryam Alavi, Gail Matthews, Gregory Dore

1The Kirby Institute, UNSW, Viral Hepatitis Clinical Research Program, Sydney, Australia; 2The Kirby Institute, UNSW, Viral Hepatitis Clinical Research Program, Sydney, Australia

**Email:** hbinsman@kirby.unsw.edu.au

**Background and aims:** Hepatitis B virus (HBV) care cascade characterisation is important for monitoring progress towards HBV elimination. This study evaluated the care cascade and factors associated with HBV DNA testing and treatment uptake during 2010–2018 in New South Wales, Australia.

**Method:** HBV testing, specialist consultation, and treatment care cascade were determined through linkage of HBV diagnoses/notebook, (generally epidemiological, 1993–2017) to Medicare and pharmaceutical benefits schemes (2010–2018), hospital admissions (2001–2018), and mortality (1993–2018) databases. Timely HBV testing was defined as DNA testing at or within four weeks of HBV notification. Multivariate cox proportional-hazards regression analyses were performed to evaluate factors associated with HBV DNA testing and antiviral treatment.

**Results:** Among 15,202 people with an HBV notification, 10,368 (68%) were tested for HBV DNA, of whom 5366 (52%) received timely testing. A total of 10,794 (71%) consulted a specialist post-HBV notification, and 3,166 (21%) initiated HBV treatment. HBV DNA testing was more likely among those ≥45 years old at HBV notification (adjusted Hazard Ratio [aHR] 1.13, 95%CI: 1.07, 1.18), those with a history of hepatocellular carcinoma (HCC) (aHR 1.25, 95% CI: 1.02, 1.53) and notified in the later period (2014–17) (aHR 1.46, 95%CI: 1.40, 1.52), and less likely among females (aHR 0.96, 95%CI: 0.92, 0.99), those with a history of alcohol use disorder (AUD) (aHR 0.77, 95%CI: 0.66, 0.89), and those coinfected (HBV/HCV: aHR 0.62, 95%CI: 0.54, 0.69) (HBV/HIV: aHR 0.75, 95%CI: 0.58, 0.98). Higher likelihood of HBV treatment was associated with age ≥45 years (aHR 1.40, 95%CI: 1.27, 1.53), a history of compensated cirrhosis (aHR 2.08, 95%CI: 1.62, 2.66), a history of HCC (aHR 2.89, 95%CI: 2.28, 3.64), HBV/HIV coinfected (aHR 3.71, 95%CI: 2.93, 4.68) and HBV notification in the later period (2014–17) (aHR 1.61, 95%CI: 1.49, 1.73). HBV treatment was less likely among females (aHR 0.68, 95%CI: 0.63, 0.73), people of Indigenous ethnicity (aHR 0.58, 95%CI: 0.42, 0.80), and those with a history of AUD (aHR 0.77, 95%CI: 0.60, 0.98).

**Conclusion:** Most people with an HBV notification got HBV DNA testing and consulted a specialist. Of those tested, about half received timely HBV DNA testing, higher in the later period. Treatment coverage has increased, but may be sub-optimal among some sub-populations, including Indigenous Australians and those with AUD.

**FRI-170**

**Reimplementation of a revamped cost-effective national elimination strategy is the only way Brazil moves towards eliminating HCV**

Alexis Voeller, Devin Razavi-Shearer, Ivane Gamkrelidze, Homie Razavi

1Center for Disease Analysis Foundation, United States Email: avoeller@cdafound.org

**Background and aims:** In 2018, Brazil developed the Hepatitis C Elimination Plan, a national strategy to achieve HCV elimination, but in 2019 the intervention was discontinued by the national
government. The goal of this analysis was to evaluate the impact of this policy change.

**Method:** A Markov mathematical model was used to quantify the HCV disease and economic burden under three scenarios: National Elimination (developed in 2018); 2021 base (reflecting empirical data through 2021) and National Elimination Reimplementation (empirical data through 2021; elimination assumptions after 2021). This work built on a previously published model for Brazil that was updated using publicly available data for treatment and diagnosis. The base case was compared to the 2018 elimination plan to evaluate which WHO elimination targets would be met and whether this type of strategy still proved cost-effective given the current HCV burden.

**Results:** Under the original National Elimination Strategy, Brazil would have seen a 53% decrease in HCV-related mortality and a 51% decrease in HCV-related liver cancer. Considering empirical data through 2021, the 2021 base could result in an additional 207,000 HCV infections by 2030 along with an excess 12,600 liver-related deaths, 1,700 incident HCC cases and 1,340 incident decompensated cirrhosis cases, relative to the original national strategy. Reimplementing the national strategy from 2022 forward would only achieve the absolute, treatment and incidence targets. To reimplement the national strategy beginning in 2022, Brazil would need to undertake up-front direct costs peaking at 724 million BRL for the scaling up of screening, diagnosis, and treatment to meet all elimination targets. These costs would drop to 146 million BRL annually within 10 years to combat HCV. Annual indirect economic losses would decrease dramatically within a similar timeframe from 1,184 million BRL to nearly 3 million BRL as a result of a reimplemented strategy. The cost per DALY averted from 2017 to 2035 with an elimination strategy is estimated to be 5,263 BRL, which is significantly lower than the GNI per capita of 28,757 BRL demonstrating the high cost-effectiveness of disease intervention.

**Conclusion:** If Brazil wants to move forward to HCV elimination by 2030, a form of the national strategy program needs to be reinstated. If the previous Hepatitis C Elimination Plan is reused, WHO elimination targets will not be met by 2030 due to significant loss of time. For the country to continue combating HCV, it needs to increase screening, diagnosis, and treatment of patients soon. Model outputs demonstrate that Brazil is not currently on track to eliminate viral hepatitis C by 2030 without utilizing a revamped intervention.

FRI-171

The evaluation of people suspected of sexually transmitted diseases requires tools for the comprehensive diagnosis of viral hepatitis and HIV

Joaquin Cabezas1,2, Eva Torres-Sangiao3,4, Susana Llerena1,2, Carmen Ribes1,2, Carlos Gutierrez1,2, Sara Alonso1,2, Victor Echavarria1,2, Ángela Antón1,2, Andrea González1,2, María Eliece Cano3, Jorge Calvo3, Javier Crespo1,2, Ángela Antón4, Joaquín Cabezas1,2, Eva Torres-Sangiao3,4, Susana Llerena1,2, Carmen Ribes1,2, Sara Alonso1,2, Marqués de Valdecilla University Hospital, Gastroenterology and Hepatology Department, Santander, Spain; 4Research Institute Valdecilla-IVI/AL, Santander, Spain; 5Marqués de Valdecilla University Hospital, Microbiology Department, Santander, Spain; 6Clinic University Hospital of Santiago de Compostela, Microbiology Department, Santiago de Compostela, Spain

Email: joweycabezas@gmail.com

**Background and aims:** The prevalence of viral hepatitis is higher in patients with a sexually transmitted disease (STD). The World Health
Organization recommends ruling out the existence of a secondary STD and/or concomitant viral hepatitis in all people with a suspected STD. Objective: To evaluate the simultaneous diagnosis of viral hepatitis in subjects suspected of having an STD.

**Method**: Review of STD studies (syphilis, Trichomonas vaginalis, Chlamydia trachomatis, Mycoplasma genitalium, and Neisseria gonorrhoeae) to assess the performance of diagnostic tests for hepatitis B, hepatitis C, and HIV in the three months before or after the index sample for STD diagnosis. The results available between April 2019 and September 2022 from the Microbiology Department of our center were evaluated.

**Results**: We found 157,185 serology determinations against syphilis and/or exudates against STD. Of the 49,664 serologies for the study of syphilis, anti-HCV serology was determined in 62.2% of the cases; in 1092 subjects with syphilis, an anti-HCV prevalence of 2.3% was detected; 3 viremic, 12 with sustained viral response and 8 spontaneous clearance. HBsAg was requested in 82.4%, detecting 20 positive cases (0.8% prevalence in patients with anti-treponemal antibodies). Finally, the presence of anti-HIV was evaluated in 89.3% of the requests for syphilis, being positive in 150 cases (prevalence = 5.8%: 72 new cases and 78 already known). The determination of HBsAg and anti-HCV and anti-HIV antibodies in subjects with other STD were respectively: 1) Trichomonas vaginalis (27,924 samples): 1.6% of the cases had a study for HBsAg, detecting 2 positives; 1% study for HCV (1 positive) and 1.6% study for HIV (2 positive). 2) Chlamydia trachomatis (6,018 samples): 2.2%, 2.3% and 2.7% had an HBV, HCV and HIV study, respectively; detecting 2 anti-HCV positive subjects and 4 anti-HIV positive subjects. 3) Mycoplasma genitalium (4,879 samples): 1.9%, 2.1% and 2.5% had an HBV, HCV and HIV study respectively, detecting 2 positive anti-HCV and 4 positive anti-HIV. 4) Neisseria gonorrhoeae (5,978): 2.2%, 2.3% and 2.7% had an HBV, HCV and HIV study respectively, detecting 3 anti-HCV positive subjects and 4 anti-HIV positive subjects.

**Conclusion**: In subjects with suspected syphilis there is an under-diagnosis of viral hepatitis, higher for hepatitis C than for HIV (60% vs 80%). The reflex diagnosis of HIV, although not optimal, is clearly better (90%). The absence of a diagnostic study aimed at ruling out a concomitant infection by viral hepatitis is the rule in the rest of the STD. These results highlight the need to implement tools for the complete and comprehensive diagnosis of viral hepatitis in subjects with suspected sexually transmitted diseases.

**FRI-172**

**The impact of hepatitis C and socio-demographic variables on Health-related quality of life among patients in Pakistan**

Siwaporn Niyomsri1, Josephine Walker1, Ejae Alam2, Abhineet Arif3, Muhammad Asim4, Bazil Ather5, Mishal Azam5, Auj Chaudhry4, Asad Chaudhry4, Naheed Choudhry5, Graham Foster6, Saeed Sadiq Hamid1, Aliya Hasanin8, Polychronis Kemos5, Pir Zarak Khan3, Aaron G. Lim1, Saad Niaz3, Noor Saba6, Muhammad Asim3, Bazil Ather3, Mishal Azam5, Auj Chaudhry4, Asad Chaudhry4, Naheed Choudhry5, Graham Foster6, Saeed Sadiq Hamid1, Aliya Hasanin8, Polychronis Kemos5, Pir Zarak Khan3, Aaron G. Lim1, Saad Niaz3, Noor Saba6, Sultan Sallahuddin4, Muhammad Nabeel Shafqat4, Huma Qureshi2, Wasiuiddin Shah2, Peter Vickers1, 1Bristol Medical School, Population Health Sciences, United Kingdom; 2Doctors Plaza, Karachi, Pakistan; 3Dow University of Health Sciences (DUHS), Karachi, Pakistan; 4The Liver Clinic, Gujranwala, Pakistan; 5Queen Mary University of London, United Kingdom; 6Aga Khan University, Karachi, Pakistan; Email: josephine.walker@bristol.ac.uk

**Background and aims**: Pakistan has a high burden of hepatitis C virus. We assessed health-related quality of life (HRQoL) among the general population screened for hepatitis C virus in Pakistan, and identified key socio-demographic factors associated with HRQoL.

**Method**: We conducted a case-control study to measure HRQoL among patients screened for HCV in four community and clinic-based settings in Karachi and Gujranwala, Pakistan. Cases were those diagnosed with chronic hepatitis C (CHC) and controls were negative for HCV antibodies (HCV Ab-negative). Patients diagnosed with CHC were initiated on treatment for 12 weeks, or 24 weeks if APIR and Fib-4 scores suggested liver cirrhosis. At the point of screening, prior to HCV antibody status being reported to the patient, HRQoL was assessed using the EuroQol EQ-5D-3L survey tool and Visual Analogue Scale from 0 to 100 (VAS). EQ-5D-3L scores were converted to HRQoL weights between 0 and 1 based on a value set from the United Kingdom general population as no value set is available for Pakistan. Beta regression analyses were performed to identify associations between HCV status or cirrhosis status (defined by treatment duration for those who started treatment) and HRQoL, controlling for patient socio-demographic characteristics (age, gender, employment status, rural/urban location, ethnicity, education level, and city). Model selection was performed using a stepwise algorithm to define the best linear predictor according to Akaike Information Criterion (AIC).

**Results**: The study included a total of 4,402 participants, with a median age of 36.2 (inter-quartile range: 27.1, 47.6) years and 59.6% males. Of these, 836 individuals were identified as having HCV (HCV RNA positive). The average HRQoL and VAS of CHC patients were 0.855 (95%CI: 0.842–0.867) and 68.5 (95%CI: 67.5–69.4), lower than for HCV Ab-negative controls (0.937, 95%CI: 0.932–0.939 and 80.7, 95%CI: 80.3–81.2, p < 0.001, respectively). Among all patients, the best fit model included city, employment, age, gender, and HCV status. Having HCV was significantly associated with lower HRQoL (B = –0.236, p < 0.001), as was being unemployed (B = –0.296, p < 0.001), living in Gujranwala (B = –0.552, p < 0.001), older age (B = –0.011, p < 0.001), or being female (B = –0.327, p < 0.001). Among CHC patients, older age (B = –0.017, p < 0.001), living in Gujranwala (B = –0.386, p < 0.001), and being female (B = –0.230, p = 0.05) were significantly associated with lower HRQoL. Having cirrhosis (defined by being on longer treatment regimen) was not significantly associated with HRQoL.

**Conclusion**: HRQoL was worse among individuals with chronic Hepatitis C infection or if they had older age, female gender, were unemployed or came from study sites based in Gujranwala. The study findings suggests that the high burden of HCV in Pakistan is associated with reduced HRQoL and emphasizes the need for health promotion, diagnosis and treatment for Hepatitis C patients.

**FRI-173**

**Hepatitis C screening program in Lithuania: first results and scenarios for virus elimination**

Limas Kupcinskas1, Giedriu Ciupkevičienė2, Alexis Voeller2, Gedimino Urbano1,1, Līgita Jancoriene6,7,7, 6Centre for Disease Prevention and Control, Lithuania; 7Lithuanian University of Health Sciences, Lithuanian University of Health Sciences, Department of Gastroenterology and Institute for Digestive Research, Kaunas, Lithuania; 2Lithuanian University of Health Sciences, Health Research Institute, Kaunas, Lithuania; 3Centre for Disease Analysis Foundation, Lafayette, United States; 4Lithuanian University of Health Sciences, Department of Family Medicine, Kaunas, Lithuania; 5Vilnius University, Clinical of Infectious Diseases and Dermatovenerology, Vilnius, Lithuania; 6Vilnius University, Clinic of Gastroenterology, Nephrology and Surgery, Vilnius, Lithuania; 7Vilnius Gediminas Technical University, Department of Chemistry and Bioengineering, Vilnius, Lithuania; 8National Health Insurance Fund under the Ministry of Health, Vilnius, Lithuania

Email: l.kupcinskas@gmail.com

**Background and aims**: In 2016, WHO announced a plan to eliminate viral hepatitis C as a public health threat by 2030. To achieve this goal, it is important to detect hidden infections by launching national screening programs. In 2022, Lithuanian health authorities decided to pay general practitioners (GPs) a special fee for a service of promoting and performing serological tests for hepatitis C virus (HCV) antibodies: 1) for the population born in 1945–1994 (once per life) and 2) for people who inject drugs (PWID) or are HIV-infected (annual HCV testing). Such an initiative is the first in Central and Eastern Europe. This study aimed to evaluate the first results of the
Background and aims: Approximately 15 million women of reproductive age are estimated to have chronic hepatitis C virus (HCV) infection worldwide, and an increasing number are diagnosed during pregnancy. Treatment is not currently recommended during pregnancy or breastfeeding due to a lack of safety data. Routine clinical practice is to refer pregnant individuals for treatment after pregnancy and breastfeeding; however, successful linkage to care is extremely limited. The Coalition for Global Hepatitis Elimination established a Community of Practice (CoP) to share existing programmatic experiences and identify best practices for linkage and treatment for pregnant individuals.

Method: A virtual CoP was advertised to interested clinicians, public health professionals, researchers, and advocates, via website posting, social media, professional societies, and targeted outreach. From November 2022 to January 2023, two 90-minute online sessions were conducted, consisting of expert presentations, panel discussions, and first-hand accounts from affected persons. CoP members were polled at the conclusion of each session.

Results: In total, 378 participants from 43 countries attended the CoP sessions, representing all six WHO regions. Most participants self-identified in the fields of public health (33%), primary care (family medicine, obstetrics, pediatrics, or other healthcare provider) (24%), or specialties (hepatology or infectious diseases) (23%). The most frequent challenges for linkage and treatment in pregnancy reported by participants were lack of safety data for HCV treatment in pregnancy (55%), lack of guidelines or recommendations (48%), lack of provider understanding of treatment options (40%), inadequate insurance coverage or payment restrictions (35%), high cost or unavailability of HCV medications (32%), and other patient-side socioeconomic barriers (28%) (n = 96 respondents). The most frequent recommendations to improve linkage to care and treatment were co-location of perinatal and HCV treatment services (76%), training of antenatal care providers in HCV treatment (68%), integration of harm reduction or opiate use disorder services (67%), outreach programs (59%), patient navigators (58%), patient communication materials (54%), and guidance from professional societies (48%) (n = 85). More participants believed that referral during pregnancy (75%) or HCV treatment during pregnancy (71%) were optimal strategies compared to immediate post-partum treatment (42%), treatment after delivery and breastfeeding (38%), or referral immediately after delivery (35%).

Conclusion: Through a CoP, specific challenges for HCV linkage and treatment for pregnant individuals identified, and actionable strategies were defined to improve linkage and treatment. Adequate safety data for antenatal administration of direct-acting antivirals, evidence-based operational guidance, and innovative clinical models to increase linkage and treatment for pregnant individuals are urgently needed in order to achieve HCV elimination goals.

FRI-175 New and easy strategy for mass screening for hepatitis C in leisure spaces

Sonia Albertos Rubio1,2,3, Rafael Esteban4, Joan Colom2, María Buti4

1Hospital Residencia Sant Camil, Division of Gastroenterology and Hepatology, Barcelona, Spain; 2Hospital Residencia Sant Camil, Barcelona, Spain; 3Hospital Residencia Sant Camil, Spain; 4Vall d’Hebron University Hospital, Barcelona, Spain; 5Agència de Salut Pública de Catalunya ASPCAT, Barcelona, Spain

Email: sonia.albertos@gmail.com

Background and aims: Spain in one of the high income countries on the track for hepatitis C elimination. The prevalence of active hepatitis C in the general population is 0.22% but is higher in vulnerable group. Data from Men who have Sex with Men (MSM) in Catalonia has been established at 0.75%. The aim of the study is the HCV screening of the population at street level in leisure events of the LGTBI+ collective, using a new screening strategy in leisure spaces. Saludes, V. et al. Community-based screening of hepatitis C with a one-step RNA

Method: We designed a new method of mass screening for hepatitis C in adults, in 3 festive events of the LGTBI+ community in Sitges (Catalonia), in 2022. The participants were cared for in tents located in leisure spaces where an antibody saliva test was performed -ORAQUICK®- and, if positive, a second HCV RNA test was offered -Xpert HCV Fingerstick®. The baseline demographic value, prior knowledge of having or having had hepatitis C, self-perception of sexual transmission disease risk (visual scale from 0 to 10), risk practices identification test (RPIT) and informed consent were collected (8 items). The project was supported by a scholarship Gilead and Spanish Society of Hepatology, local authorities and the Colors Sitges LGTBI+ association.

Results: We tested 1249 adults, 1197 (96%) identified as MSM. Median age of 44 years (35–54), and 49 different nationalities (24.3% Spanish). The tests were performed in 33 hours (an average of 39 tests/hour). There were only 4 positive tests (3 from the MSM collective), all of them with undetectable RNA. Of the MSM group, 13% did not know their previous hepatitis C status, expressed self-perception of sexual transmission disease risk of 3 out of 10 and an average TISPR of 1.4 out of 8.

Conclusion: We present an efficient and well-accepted hepatitis C screening strategy at the community level, allowing rapid screening of large groups. Although the majority was MSM population exposed to STDs, the project was supported by a scholarship, local authorities, and the Colors Sitges LGTBI+ association. The project was supported by a scholarship Gilead and Spanish Society of Hepatology.

FRI-176

Burden of hepatitis C in pregnant women and children in the United States

Paul Wasuwanich1, Joshua So1, Tony Wen2, Robert Egerman2, Wikrom Karnsakul2. 1University of Florida College of Medicine, Gainesville, United States; 2University of Florida College of Medicine, Division of Maternal-Fetal Medicine, Department of Obstetrics and Gynecology, Gainesville, United States; 3The Johns Hopkins University School of Medicine, Division of Pediatric Gastroenterology, Hepatology, and Nutrition, Department of Pediatrics, Baltimore, United States

Email: p.wasuwanich@ufl.edu

Background and aims: Cases of hepatitis C virus (HCV) infection are increasing every year in the United States, and while injection drug use remains the largest contributor to HCV transmission, another major route is vertical transmission. We aim to elucidate and extrapolate the financial and health burden of vertically transmitted hepatitis C in pregnant women and children with hepatitis C.

Method: We utilized the 2010–2019 National Inpatient Sample, a nationwide database of hospitalizations in the United States. We identified hepatitis C-related hospitalizations in pregnant women and children using ICD-9 and ICD-10 diagnosis codes. We extracted demographic, financial, and clinical data including all-cause mortality, length of stay, co-infections, and pregnancy outcomes. Financial calculations are inflation adjusted to 2020 and reported in USD. Trends were analyzed by Poisson regression and frequencies by chi-squared test, with significance defined as p < 0.05.

Results: We identified a total of 174,430 pregnancies and 134,574 deliveries between 2010 and 2019 that involved hepatitis C. Between 2010–2019, there is an increasing trend of hospitalizations of pregnant women with hepatitis C (incidence rate ratio = 1.14; 95% CI = 1.13–1.16; p < 0.001). Maternal deaths were rare (<0.1%) and similar to the non-hepatitis C pregnancy cohort (p = 0.147). However, the length of hospitalization was longer in the hepatitis C pregnancy cohort, 3 days versus 2 days (p < 0.001). Additionally, preterm delivery was more common in pregnant women with hepatitis C, 19.1% versus 10.2% (p < 0.001). Post-term deliveries were less common in pregnant women with hepatitis C, 8.7% versus 13.2%, (p < 0.001). Rates of stillbirths were similar in hepatitis C and non-hepatitis C pregnancy cohorts (p = 0.253). HIV co-infection was also more common in the pregnant women with hepatitis C, 0.9% versus 0.1% (p < 0.001). Additionally, Caesarian deliveries were more frequent in the hepatitis C pregnancy cohort, 19.5% versus
16.8% (p < 0.001). Among the children ≤18 years with hepatitis C, 4.1% developed non-alcoholic cirrhosis. In 2019, there was a financial burden of $30,414 in excess cost in infants who have hepatitis C per hospitalization. However, for the pregnant women, hospitalization costs were similar between the hepatitis C and non-hepatitis C populations.

**Conclusion:** Hepatitis C-related hospitalizations in the pregnancy population are increasing yearly and so are the health burdens of the disease, on both the pregnant women and the infants/children. While the financial burden was not obvious the pregnant women, there is a clear cost burden is on the infants with hepatitis C.

**FRI-177**

**Micro-elimination of chronic hepatitis C virus in patients with psychiatric disorders: a multidisciplinary strategy in the outpatient mental health center**

Inés Sáenz de Miera1,2, Joel López1,2, Maite Royo2,3, Isabel Plo2,4, Adriá Rodríguez1,2, Silvia Montoliu1,2, Albert Pardo1,2, Joaquín Ruiz2,3, Juan Carles Quer Boniquet1,2, Joan XXIII University Hospital of Tarragona, Gastroenterology, Spain; Pere Virgili Health Research Institute, Tarragona, Spain; Pere Mata Institute, Mental Health Center for Adults, Tarragona, Spain; Joan XXIII University Hospital of Tarragona, Pharmacy, Spain

Email: senisamier@yahoo.com

**Background and aims:** The psychiatric population is considered a vulnerable group with difficulties in accessing diagnostic services and treatment for chronic hepatitis C virus (HCV) (CHC). The seroprevalence of the disease in the psychiatric population is not well known and ranges from 4 to 17%. Data on seroprevalence in Spain are scarce. A multidisciplinary care strategy has been implemented for screening, diagnosis, and treatment of CHC in patients with psychiatric pathology treated in the outpatient mental health center for adults (MHCA) in Tarragona, where the studied and treated population does not move from their usual care environment. The aims of the study are to evaluate the prevalence of CHC in this population and to assess the efficiency of the established circuit for its diagnosis and treatment.

**Method:** Prospective observational study. Preliminary data are presented with a analysed period of 9 months (January-September 2022). Rapid screening is offered with determination of antibodies for HCV (Ab-HCV) in saliva (OraQuick HCV). In positive cases, viral load of HCV (RNA-HCV) is performed. In cases with proven infection, a study of interactions (Pharmacy-Psychiatry) and prescription of treatment is carried out. The clinical visit, elastography, and initiation of treatment are performed on the same day. The medication is provided to patients at the MHCA, where adherence to treatment is monitored.

**Results:** Screening was offered to 610 individuals, 349 accepted inclusion (57.2%). 50% are men, median age 47 years; 39% with psychotic disorder, 13% bipolar disorder; 32% with a history of risk factor. Ab-HCV was detected in 9 cases (seroprevalence 2.6%): 7 men, median age 54 years; 8 of them with a history of drug use. Of the 9 cases, 3 had positive RNA-HCV (prevalence 0.85%); 2 of them with criteria for non-response to a previous treatment with Interferon-Ribavirin. 2 have received 12 weeks of treatment with Sofosbuvir-Velpatasvir, with good adherence. They did not require significant modifications of their usual psychiatric therapy and achieved SVR. The third is pending initiation. Of the remaining 6 seropositive cases, 5 had previously been treated and it is confirmed that they maintain SVR; the remaining one, does not have a risk factor and meets criteria for spontaneous resolution. 4 of the seropositive cases in blood had a negative saliva test result.

**Conclusion:** The inclusion rate of patients in the screening program has been acceptable, nevertheless, measures have been taken to improve recruitment. The seroprevalence of HCV detected in the sample analysed is higher than that described for the general population. Most of the seropositives had already been diagnosed and treated previously. The saliva test is reliable, so the false negative results obtained imply a need to improve the collection technique to avoid underdiagnosis. The treated cases have maintained excellent adherence and have required few modifications to their psychiatric therapy. These results suggest that a management strategy in the patient’s environment can be effective.
**FRI-178**

**Simple treatment eligibility score for chronic HBV infection at peripheral health facilities in sub-Saharan Africa**

Nicolas Minier1, Asgeir Johannessen2,3, Alice Guingand4, Gilles Wandel5, Michael Vinikouf6, 7, Jantje Taljaard8, Alexander Stockdale9,10, Wendy Spearman11, Mark Sonderup11, Roger Sombie12, Edford Sinkala13, Moussa Seydi13, Nicholas Riches14, Edith Okete15, Gibril Ndow16,17, Adri Ramirez Mena18, Philippa Matthews18,19,20, Tongai Gibson Maponga21, Hailiemichael Desalegne22,23, Fatou Fall24,25, Monique Andersson18,26, Maud Lemoine16, Yusuke Shimakawa1. 1Institut Pasteur Paris, Emerging Disease Epidemiology, Paris, France; 2Westfold Hospital, Department of Infectious Diseases, Tønsberg, Norway; 3University of Oslo, Institute of Clinical Medicine, Oslo, Norway; 4Bogodogo University Hospital Center, Hepato-Gastroenterology Department, Ouagadougou, Burkina Faso; 5University of Bern, Institute of Social and Preventive Medicine, Bern, Switzerland; 6University of Zambia, Department of Internal Medicine, Lusaka, Zambia; 7University of Alabama at Birmingham, Birmingham, United States; 8Sygeborg Hospital and Stellenbosch University, Division of Infectious Diseases, Department of Medicine, Stellenbosch, South Africa; 9Institute of Infection, Veterinary and Ecological Sciences, University of Liverpool, Department of Clinical Infection, Microbiology and Immunology, Liverpool, United Kingdom; 10Malawi-Liverpool-Wellcome Trust Clinical Research Programme, Blantyre, Malawi; 11Faculty of Health Sciences, University of Cape Town, Division of Hepatology, Department of Medicine, Cape Town, South Africa; 12Yalgado Ouédraogo University Hospital Center, Hepato-Gastroenterology Department, Ouagadougou, Burkina Faso; 13Centre National de Recherche et de Formation, Centre Hospitalier National Universitaire de Fann, Service de Maladies Infectieuses et Tropicales, Dakar, Senegal; 14Liverpool School of Tropical Medicine, Department of Clinical Sciences, Liverpool, United Kingdom; 15Faculty of Medical Sciences, University of Jos, Jos, Nigeria; 16Imperial College London, Department of Metabolism, Digestion and Reproduction, United Kingdom; 17London School of Hygiene and Tropical Medicine, MRC Unit The Gambia, Banjul, Gambia; 18University of Oxford, Nuffield Department of Medicine, Oxford, United Kingdom; 19The Francis Crick Institute, HBV Genomics for Elimination Laboratory, London, United Kingdom; 20University College, London Hospitals, London, United Kingdom; 21Stellenbosch University Faculty of Medicine and Health Sciences, Division of Medical Virology, Cape Town, South Africa; 22St. Paul’s Hospital Millennium Medical College, Medical Department, Addis Ababa, Ethiopia; 23Hospital Principal de Dakar, Department of Hepatology and Gastroenterology, Dakar, Senegal. Email: yusuke.shimakawa@pasteur.fr

**Background and aims:** To eliminate hepatitis B virus (HBV) infection in resource-limited settings, it is essential to decentralize HBV care services to peripheral health facilities. However, at these facilities, access to recommended diagnostic tools to assess eligibility for antiviral therapy (ART), particularly quantitative HBV DNA tests and transient elastography, is severely limited. Through a multi-regional collaboration in sub-Saharan Africa (SSA), we developed and evaluated a simple scoring system, using tests available at peripheral health facilities, to identify eligibility for ART in people with HBV.

**Method:** Through HEPSANET (Hepatitis B in Africa Collaborative Network), we conducted a site survey to define the availability of biomarkers potentially useful for HBV management at different levels of health facilities. Then, using the HEPSANET dataset, the largest cross-sectional dataset of people with chronic HBV in SSA, we divided the sample into derivation and validation sets. We used data from those with a known HBV DNA levels, elastography score, and treatment eligibility status according to the EASL 2017 criteria, which was used as a reference. Using the derivation set, we identified a combination of variables available at peripheral health facilities that can best identify people eligible for ART through a stepwise logistic regression. With the validation set, we estimated the sensitivity and specificity of the simplified score to identify people eligible for ART.

**Results:** The survey of 11 sites found that on average, transaminases (AST, ALT) and platelet counts were available at the district hospital level, hepatitis B e antigen (HBeAg) and near point-of-care HBV DNA test (Xpert) at regional/provincial hospital level, and transient elastography and conventional quantitative HBV DNA tests were only available at national reference centers. Liver decompensation (jaundice, ascites, encephalopathy, etc.) was diagnosed clinically at all levels. We proceeded to create a scoring tool for use at district level. The analysis included 2928 treatment naïve individuals with HBV-monon from seven SSA countries, of which 398 (13.6%) were eligible for ART according to EASL guidelines. ART, ALT, and platelet count remained in the multivariable stepwise regression model and the following scoring system was developed: platelet counts (109/L), <100 (±2); 100–149 (+1); ≥150 (±0); AST (IU/L), <40 (±0), 40–79 (+1), ≥80 (+2); and ALT (IU/L), <40 (±0), 40–79 (+1), ≥80 (+2). Using a cut-off of ≥2, the score had a sensitivity of 75% and specificity of 87% to identify treatment-eligible individuals in the validation dataset.

**Conclusion:** We found that a low cost combination of platelet counts, AST and ALT levels-tests available even at low level health facilities-can identify the majority of people with HBV in need of ART in SSA. This suggests that even in the absence of upgrades in laboratory/radiology, decentralization of clinical staging for people with HBV may be realized in resource-limited settings.

**FRI-179**

**A nationwide study on the core indicators related to elimination of viral hepatitis B and C in Korea**

Chang Hun Lee1, Gwang Hyeon Choi2, Hwa Young Choi3, Sojung Han4, Young Eun Chon5, Young Chang6, Eun Sun Jang7, Kyung-ah Kim6, Do Young Kim8, Hyung Joon Yim8, Hye-Lin Kim9, Sook-Hyang Jeong10, In Hee Kim11, Research Institute of Clinical Medicine of Jeonbuk National University-Biomedical Research Institute of Jeonbuk National University Hospital, Jeonju, Korea, Rep. of South; 2Seoul National University Bundang Hospital, Seoul National University College of Medicine, Internal Medicine, Seongnam-si, Korea, Rep. of South; 3Seoul National University Bundang Hospital, Seoul National University College of Medicine, Internal Medicine, Seongnam-si, Korea, Rep. of South; 4Changwon National University Medical Center, College of Medicine, South Korea; 5Seoul National University Biomedical Research Institute of Jeonbuk National University Hospital, Jeonju, Korea, Rep. of South; 6Seoul National University Bundang Hospital, Seoul National University College of Medicine, Internal Medicine, Seongnam-si, Korea, Rep. of South; 7Seoul National University Bundang Hospital, Seoul National University College of Medicine, Internal Medicine, Seongnam-si, Korea, Rep. of South; 8Inje University Ilsan Paik Hospital, Internal Medicine, Goyang-si, Korea, Rep. of South; 9Yonsei University College of Medicine, Severance Hospital, Seoul, Korea, Rep. of South; 10Korea University Ansan Hospital, Korea University College of Medicine, Ansan-si, Korea, Rep. of South; 11College of Pharmacy, Sahmyook University, Seoul, Korea, Rep. of South. Email: ihkimmd@jbnu.ac.kr

**Background and aims:** The World Health Organization (WHO) recognizes viral hepatitis as a global public health problem and proposed the elimination of viral hepatitis as a goal to be achieved by 2030. In June 2021, WHO published an interim guideline that sets impact and programmatic targets for country validation of viral hepatitis elimination. We aimed to calculate core indicators for country validation of viral hepatitis elimination in Korea.

**Method:** The incidence, linkage-to-care rate, treatment rate, and mortality rate related to hepatitis B and C in Korea were analyzed using the health insurance claims data provided by the Korean National Health Insurance Service (NHIS), infectious disease surveillance data from Korea Centers for Disease Control and Prevention Agency, and cause-of-death data from Statistics Korea.

**Results:** The incidence of acute hepatitis B in Korea was 0.71 per 100,000 patients, and the linkage-to-care rate of hepatitis B was only about 39.1%. Among those who need hepatitis B treatment, the treatment rate was 67.3%, which did not reach the WHO program index of 80%. Regarding liver-specific mortality, the annual liver-related mortality rate is as high as 18.1 per 100,000 people, and liver
cancer accounted for the leading cause of death at about 54%. In Korea, the annual incidence of hepatitis C remains high at 11.0 per 100,000 people, whereas the hepatitis C linkage-to-care rate and the treatment rate are low (61.3% and 57.1%, respectively). Regarding the liver-specific mortality rate, the annual liver-related mortality rate for hepatitis C is 1.92 per 100,000 people.

**Conclusion:** A considerable number of core indicators of country validation for viral hepatitis elimination in Korea have not yet met the certification criteria. It is required to continuously monitor the certification criteria for viral hepatitis elimination in Korea and develop a comprehensive national viral hepatitis elimination strategy.

**FRI-180**

**Hepatitis C seroprevalence screening and linkage to care of unknown infected patients admitted to a tertiary care emergency department: on the road to achieve the WHO 2030 virus elimination target**

Roberta Lasco1, Marco Tizzani1, Rosa Claudia Stasio1, Elisabetta Bretto1, Yulia Troshina1,2, Anna Castiglione3, Fabrizia Pittaluga4, Rossana Cavallo4, Fulvio Morello5, Giorgio Maria Saracco1,2, Enrico Lupia2,5, Alessia Gancio1,2, S.C. Gastroenterology U, AOU Città della Salute e della Scienza, Turin, Italy; 2Department of Medical Sciences, University of Turin, Italy; 3Clinical Epidemiology, Città della Salute e della Scienza, Turin, Italy; 4S.C. Microbiology and Virology, AOU Città della Salute e della Scienza, Turin, Italy; 5Department of Emergency Medicine, AOU Città della Salute e della Scienza, Turin, Italy

Email: marco.tizzani91@gmail.com

**Background and aims:** direct-acting antivirals (DAAs), with their proven effectiveness, allowed WHO to define the elimination of the Hepatitis C virus (HCV) as a health-related global goal by 2030. Hence, worldwide screening campaigns were developed to detect unknown infections. The current study aims to determine the prevalence and characteristics associated with positive HCV serology in patients admitted to an academic tertiary care emergency department to increase diagnosis, define predictors of linkage to care (LTC) and properly achieve anti-viral treatment.

**Method:** a prospective screening was conducted between November 2021 and October 2022, in patients attending the Emergency Room (E.R.) of the Molinette Hospital of Turin. Individuals with reactive HCV-Ab test were informed and, if the infection was unknown, HCV RNA testing was proposed. HCV-Ab production was investigated with ELISA method and HCV RNA was performed by RT-PCR testing. Patients were then interviewed to assess LTC and administer DAAs therapy.

**Results:** among 57715 patients attending the E.R. in study period, 5418 participated to the HCV screening. On a total of 5418 screened patients (51.1% Male/48.9% Female), we identified 188 (3.47%) HCV-Ab reactive patients. The positivity rate was higher in males than in females (4.6 vs 2.3%, p < 0.001), in over 50 years old than under 50 years old patients (4.4 vs 1.5%, p < 0.001), in patients with severe triage tags than in those with moderate tags (3.0% vs 4.2%, p value = 0.014) and in patients admitted to hospital than home discharged patients (14.9% vs 8.5%, p = 0.008). Of the 188 HCV-Ab reactive patients, 53 (28.19%) were not aware of the Ab-positivity and 33 (17.6%) resulted HCV-RNA positive. Between the HCV-RNA positive patients, 17 (51.5%) had a new diagnosis of ongoing infection and 16 (41%) agreed to be treated with DAAs. Of these, 100% reached a viral sustained virological response (SVR).

**Conclusion:** the prevalence of HCV infection in the population recruited in the E.R. is greater than in general population (3.5% vs. 1%). HCV screening in the E.R. could be an effective way of identifying ongoing unknown infections and achieve the WHO 2030 elimination targets. Currently, the screening is still ongoing. A case control study has been designed to explore HCV risk factor and determinants to LTC.

**FRI-181**

**D-Mongolia: new strategy for hepatitis B, D and C screening and linkage to care in Mongolians living in Spain**

Adriana Palom1,2, Edurne Almandoz3, Antonio Madejón2,4, Ariadna Rando-Segura2,3, Ylenia Pérez Castaño6, Judit Vico-Romero1, Nambataar Battulga1,2, Mar Rivero Barciela1,2, Jordi Gómez-Prat7, Juan Ignacio Arena2,3, Francisco Javier Garcia-Samaniego Rey2,4, Maria Buti1,2, 1Liver Unit, Hospital Universitari Vall d’Hebron, Barcelona, Spain; 2Centro de Investigación Biomédica en Red en Enfermedades Hepáticas y Digestivas, Instituto de Salud Carlos III, Madrid, Spain; 3Gastrointestinal Unit, Hospital Universitario Donostia, Instituto de Investigación Bimodal, San Sebastian, Spain, Spain; 4Liver Unit, Hospital Universitari La Paz, IdiPAZ, Madrid, Spain,
Background and aims: Mongolia is one of the countries with the highest prevalence of viral hepatitis (B, C and D) in the world. One third of Mongolia’s population lives outside the country. In Spain, there are 853 Mongolians registered on the census, mostly distributed between Barcelona, San Sebastián and Madrid. The reported prevalence of viral hepatitis in Spain is 0.22% for HBsAg, 0.85% for anti-HCV and 0.22% for HCV-RNA. The aims of this study were to screen Mongolians living in Spain for viral hepatitis B, D and C, describe their characteristics and in positive cases, offer them the possibility to be linked to care.

Method: Mongolian adults residing in Spain were contacted by a community worker to attend a community program consisting of an educational activity (audiovisual information on viral hepatitis), an epidemiological questionnaire (knowledge of the disease, risk factors...) and a point-of-care rapid test for hepatitis B and C. In positive cases, a dried blood spot test was performed to determine HBV-DNA, HCV-RNA and anti-HDV, and a blood test that included serological and virological parameters. The positive cases were linked to care during the same screening.

Results: From a total of 709 Mongolians residing in Barcelona, San Sebastián and Madrid, 290 were invited to the community program and 216 (75%) subjects carried out the educational activity and were tested. One-hundred-thirty-five were women (62.5%), mean age 41.1 ± 11.6 years, 73 (34%) subjects had one or more viral hepatitis risk factor, and 46 (21%) reported being already vaccinated against HBV. The rest were unaware of their vaccination status.

Among them, 14 (6.5%) were anti-HCV+, 2 had detectable HCV-RNA (0.9%); 9 were HBsAg+ (4.2%) and 8 with detectable HBV-DNA (3.7%). From those HBsAg+, 2 had hepatitis B/D co-infection (0.9%), both with undetectable HDV-RNA. Peripheral blood serology confirmed the results of the rapid test in all cases. However, the virological dried blood tests showed lower virological values than the peripheral blood ones. Among the 23 diagnosed patients, 15 (65%) were unaware of their diagnosis. All of them are currently linked to care.

Conclusion: The community program was feasible, widely accepted, and allowed linkage to care of 23 subjects, 65% of whom were unaware of the infection. The prevalence of viral hepatitis was higher than that described in the Spanish population. Among the screened participants, the prevalence of hepatitis B was higher than active hepatitis C, and an important number of adults were not aware of being vaccinated against HBV. In the future, hepatitis B vaccination needs to be included in these community programs.

This project has been funded by Gilead Sciences (GLD21/00139).
settings. A pilot project was developed at two London based IRCs where healthcare is provided by PPG. PPG regional BBV Lead Nurses and a Gilead Medical Scientist worked with the IRC and BBV stakeholders to optimise test and treat pathways for new IRC admissions. An important step was to gain agreement that every effort would be made to delay the transfer of residents if diagnosed, an issue that has previously been a barrier to screening. All IRC staff were trained in offering and administering point of care (PoC) BBV testing and regular review meetings were implemented to discuss progress and targets.

**Results:** The number of residents offered and tested increased rapidly from the start of the pilot in August 2022 with the majority of those tested being screened for all three BBVs (see Figure). Across both IRCs between April 2022 and December 2022, 18 HCV antibody positive cases, 14 hepatitis B surface antigen (HBsAg) positive cases and 9 HIV RNA positive cases were identified. The prevalence of HBV antibody, HBsAg and HIV RNA positivity was 2.9%, 2.2% and 1.4% respectively. Updated data on referral to treatment and treatment initiation for these cases will be available at the conference.

**Conclusion:** This pilot highlights the importance of ensuring that HBV, HCV, and HIV are all included in screening in IRC populations. Data from this project demonstrates that the BBV prevalence is significantly different to that of other UK secure settings and indicates the need for a multi-agency approach.

**FRI-184**

**Tenofovir prophylaxis during pregnancy for the elimination of mother-to-child transmission of hepatitis B virus: a cost-effectiveness analysis**

Chawisar Janekrongtham¹, Wirichada Pan-ngum², Kittiyod Poovorawan³, Pisit Tangkijvanich⁴.

¹Department of Disease Control, Thailand Ministry of Public Health, Thailand; ²Department of Tropical Hygiene, Faculty of Tropical Medicine, Mahidol University, Thailand; ³Department of Clinical Tropical Medicine, Faculty of Tropical Medicine, Mahidol University, Thailand; ⁴Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand

**Background and Aims:** Despite implementing hepatitis B immunoglobulin (HBIG) and vaccination, Tenofovir Disoproxil Fumarate (TDF) has been added for HBeAg-positive mothers during pregnancy to reduce HBV-DNA at birth. To optimize national strategies in Thailand, we assessed the effectiveness of TDF in preventing maternal to child transmission and conducted cost-effectiveness of different TDF-based strategies.

**Method:** We retrospectively reviewed medical records of mother and infant pairs whose mothers have HBeAg-positive and received TDF in preventing maternal to child transmission of viral hepatitis B according to Thai national guidelines during 2018–2020. Based on the available data of transmission rate, we also applied a decision tree to estimate the cost-effectiveness of different TDF-based strategies to eligible mothers. These included [1] HBIG for all HBV-exposed infants (“HBIG for all”) [2] HBIG for only infants of HBeAg-positive mothers (“HBIG for e-positive”) and [3] without HBIG to infants (“HBIG-free”).

The incremental cost-effectiveness ratio (ICER) between the different strategies and baseline intervention without TDF was calculated. The one-way sensitivity analysis was used to adjust prevalence of HBeAg-positive mothers, cost of HBIG, cost of TDF, and transmission rate.

**Results:** Of 223 infants enrolled, 212 (95.0%) received HBIG while 11 (5.0%) did not. None (0%, 95%CI = [0, 1.69]) of the infants had chronic HBV infection (figure). The most cost-saving intervention was “HBIG-free” followed by “HBIG for e-positive.” The one-way sensitivity demonstrated that the results were reasonably robust to changes. The cost-effectiveness was greater with a higher HBeAg prevalence. The HBIG-free strategy remained best at transmission rates of 0–1.4%, meeting the additional target for eliminations.

**Conclusion:** The study is the first cost-effectiveness analysis to provide evidence supporting HBIG-free strategy in the era of antivirals. This approach should be considered for preventing maternal to child transmission in resource-constrained settings, particularly in countries with high HBeAg prevalence.
Background and aims: The World Health Organization (WHO) goal of Hepatitis C Virus (HCV) elimination by 2030 rose awareness about the need of screening plans, worldwide. In Italy, it has been estimated that graduated screening starting from people born between 1969 and 1989 might be the most-effective strategy. Aim of this study was to perform a territory-wide opportunistic HCV screening study in the general population born between 1969 and 1989 and attending hospitals and outpatient blood collection centers in Lombardy region, Northern Italy.

Method: This is a prospective multicenter territory-wide opportunistic HCV screening study supported by the Regional Government of Lombardy, Italy. Between June 2022 and December 2022, all subjects born between 1969 and 1989 and hospitalized or accessing outpatient blood collection centers in Lombardy were offered for-free anti-HCV and HCV-RNA tests. Patients with known anti-HCV positivity and/or previous anti-HCV treatment were excluded. Demographic features were uploaded into a regional web-based platform.

Results: 120,193 individuals underwent HCV screening in 76 screening centers in Lombardy. Their mean age was 44 ± 6 years, 65.2% were females, 83.7% were tested at outpatient blood collection centers. Anti-HCV tested positive in 604 (0.50%) subjects: mean age 47 (±5), 51.1% females. HCV seroprevalence was higher in males than in females (0.71% vs. 0.39%; p < 0.0001), in elderly (p < 0.00001) and in-in vs. out-patients (p = 0.0007). HCV-RNA was detectable in 125 out of 441 (28.3%) anti-HCV positive subjects with available HCV-RNA. Patients with active HCV infection were 46 ± 6 years-old, mostly males (56.8%) and screened in wards or DH/DS services (p < 0.00001). Overall, the prevalence of active HCV infection in the overall population was 0.10%, and differed according to age-groups (p = 0.001), being higher in elderly.

Conclusion: The prevalence of active HCV infection in the general population born between 1969 and 1989 hospitalized or referred for blood testing in Northern Italy was low. However, since this prevalence was higher in older individuals, the extension of such opportunistic screening programs to lower birth-cohorts could be considered.
have been proposed to identify HCV-infected inner-city residents, engage them in care, provide them with antiviral therapy, establish conditions to maximize the likelihood of completion of treatment and cure of HCV infection. We have evaluated a novel approach of Community Pop-Up Clinics (CPCs) to achieve this goal within the inner city of Vancouver, Canada.

**Method:** CPC events are held weekly at various locations (mainly single room occupancy housing projects) interacting with up to 30 residents/half-day event. Point of care antibody testing for HCV is provided in the context of an offer of engagement of multidisciplinary care to address medical, social, psychologic and addiction-related concerns in a co-located manner. For those found to carry HCV antibodies, viremia is assessed by accessing the provincial database for prior results or on-site phlebotomy if required. All viremic individuals are offered HCV treatment in the context of other interventions, with medications administered at the place of residence or pharmacy as most appropriate. Daily/weekly dispensing is available as required. The end points of this analysis are the number of viremic individuals identified per event, the time from engagement to treatment initiation, and the outcome of HCV therapy.

**Results:** From 01/21–12/22 (24 months), we conducted 80 CPCs and evaluated 1420 individuals. 477 individuals (33.6%) were found to carry HCV antibodies. Of these, 331 individuals (69.4%) were found to be viremic, a mean of 41.1 event. Engagement in HCV therapy has been secured in 289 cases (87%). 247 (85%) individuals have started treatment and 41 remain in the pre-treatment phase, and 1 died of an overdose in the pre-treatment phase. The median time from CPC attendance to HCV treatment initiation was 6 weeks. Of 247, 233 have completed treatment, 9 are currently on treatment, 3 patients did not complete treatment, 2 died of an overdose while on treatment and 1 has been lost to follow-up. Of 233 subjects who have completed treatment, 205 are confirmed cured (SVR 4/12), 25 are awaiting SVR 4, 2 have documented virologic relapse and 1 has been reinfected, a rate of 0.31/100 person-years. Of participants in whom an outcome of treatment has been ascertained, the cure rate is 97.2% (205/211).

**Conclusion:** Our program is very cost-effective, identifying over 4 individuals requiring HCV therapy per half-day event. The vast majority initiate treatment within weeks and complete it successfully, with a LTFU rate below 5%. Cure rates match or exceed those reported in clinical trials. Taken together, the data we present has been proposed to identify HCV-infected inner-city residents, engage them in care, provide them with antiviral therapy, establish conditions to maximize the likelihood of completion of treatment and cure of HCV infection. We have evaluated a novel approach of Community Pop-Up Clinics (CPCs) to achieve this goal within the inner city of Vancouver, Canada.

**FRI-187**

**Incidence of hepatitis C virus antibody seroconversion among people who inject drugs in Tbilisi, Georgia**

Tengiz Tsotsrasvadze1,2, Nikoloz Chkhartishvili1, Akaki Abutidze1,2, Marine Gogia3, Ketevan Shermadini1, Francisco Averhoff4.

1Infectious Diseases, AIDS and Clinical Immunology Research Center, Georgia; 2Tengiz Tsertsvadze1,2, Nikoloz Chkhartishvili1, Akaki Abutidze1,2, Marine Gogia3, Ketevan Shermadini1, Francisco Averhoff4.

**Background and aims:** One of the priority directions of Georgian hepatitis C virus (HCV) elimination program is the prevention of HCV transmission among people who inject drugs (PWID). Furthermore, hepatitis C incidence among PWID is one of the key indicators set by the World Health Organization (WHO) for validating the elimination of hepatitis C. With a target of ≤2 cases per 100 person-years (PY), we established Georgian PWID cohort study to estimate incidence of HCV antibody (anti-HCV) seroconversion.

**Method:** This prospective observational cohort study enrolled PWIDs in the capital city of Tbilisi in 2017–2019. Participants were recruited using incentivized chain-referral sampling, with maximum of 5 peers recruited by each participant. The outcome of interest was anti-HCV seroconversion. Incidence was calculated as number of new anti-HCV seroadaptations divided by the number of total person-years of follow-up (PYFU).

**Results:** Study enrolled 1,744 PWID; among them, 563 (32.3%) were positive for anti-HCV at baseline and were excluded from follow-up. Among remaining 1,181 anti-HCV–PWID, 929 (78.7%) returned for at least one visit. Overall, 929 participants were followed for the mean of 11.7 months, contributing to the total of 906 PYFU. During the follow-up, 7 (0.8%) persons seroconverted, corresponding to an incidence rate of 0.77 (95% CI: 0.31–1.59) new infections per 100 PYFU. After adjusting for post-stratification weights, the incidence increased to 0.87 (95% CI: 0.43–1.74) new infections per 100 PYFU. In regression analysis, the only factor significantly associated with seroconversion was a history of sharing injection equipment (Hazard ratio: 50.51, 95% CI: 2.46–611.58, p = 0.01).

**Conclusion:** Our study suggests that the incidence of hepatitis C seroconversion among PWID is below the target set by the WHO. However, PWID remain at risk of contracting the virus, primarily through unsafe injection practices. Further scaling-up harm reduction services is needed to reach the elimination of hepatitis C.

**FRI-188**

**Survey to evaluate the implementation of the recommendations on the comprehensive diagnosis of viral hepatitis in a single extraction: where are we?**

Joaquin Cabezas1,2, Antonio Aguilera3, Marina Berenguer4, Maria Buti5,6, Maria Eliece Cano7, Xavier Forns8, Federico García García9, Francisco Javier Garcia-Samaniego Rey10, Manuel Hernandez-Guerra11, Francisco Jorquera Plaza12, Jeffrey Lazarus13,14, Sabela Lens15, Elsa Marrtò16,17, Juan Pineda18, Martin Prieto19, Francisco Rodríguez-Frias20, Manuel Rodríguez21, Miguel Serra22, Juan Turner23, Arceli Casado Gómez24, Raquel Domínguez-Hernández24, Nerea Tejado Alsua24, Miguel Ángel Casado24, José Luis Calleja Panero25, Javier Crespo1,2.

1University Hospital Marqués de Valdecilla, Gastroenterology and Hepatology Department, Santander, Spain; 2Research Institute Valdecilla-IDIVAL, Santander, Spain; 3Hospital Clínico Universitario de Santiago de Compostela, Servicio de Microbiología, Santiago de Compostela, Spain; 4Hospital Universitario y Politécnico La Fe, Unidad de Hepatología y Trasplante Hepático y Ciberehd, Valencia, Spain; 5Hospital Universitario Valle Hebrón, Servicio de Hepatología, Barcelona, Spain; 6CIBEREHD del Instituto Carlos III, Madrid, Spain; 7University Hospital Marqués de Valdecilla, Microbiology Department, Santander, Spain; 8Hospital Clínico, Servicio de Hepatología, Barcelona, Spain; 9Servicio de Microbiología, Hospital Universitario Clínico San Cecilio, Instituto de Investigación IBS, Granada, Spain; 10Unidad de Hepatología, Hospital Universitario La Paz, CIBERehd, IDiPAZ, Madrid, Spain; 11Servicio de Aparato Digestivo, Hospital Universitario de Canarias, Tenerife, Spain; 12Servicio de Aparato Digestivo, Complejo Asistencial Universitario de León, León, Spain; 13Barcelona Institute of Global Health (ISGlobal), Hospital Clinic, Barcelona, Spain; 14Facultad de Medicina, Universidad de Barcelona, Barcelona, Spain; 15Servicio de Hepatología, Hospital Clinico Universitario de Barcelona, IDIBAPS, CIBEREHD, Barcelona, Spain; 16Servicio de Microbiología, Laboratorio Clínico Metropolitano Nord (LCMN), Hospital Universitari Germans Trias i Pujol, Institut d'Investigación Germans Trias i Pujol (IGTP), Badalona, Spain; 17Consorcio de Investigación Biomédica en Red de Epidemiología y Salud Pública (CIBERESP), Instituto de Salud Carlos III, Madrid, Spain; 18Grupo Virología Clínica e ITS, Hospital Universitario de Valme, Ciber de Enfermedades Infecciosas CIBERINTEC, Sevilla, Spain; 19Unidad de Hepatología y Trasplante Hepático, Hospital Universitario y Politécnico La Fe, Valencia, Spain; 20Servicios de Microbiología y Biología Molecular, Laboratorios Clínicos, Hospital Universitario Vall d'Hebron, CiberEHĐ, Instituto de Investigación Vall d’Hebron (VHIR), Barcelona, Spain; 21Ección de Hepatología, Servicio de Digestivo, Hospital Universitario Central de Asturias, Instituto de Investigación Sanitaria del Principado de Asturias (ISPA), Oviedo, Spain; 22Universidad de Valencia, Valencia.
**Background and aims:** The SEPD (Spanish Association for Digestive Diseases), AEEH (Spanish Association for the Study of the Liver), SEIMC (Spanish Society of Infectious Diseases and Clinical Microbiology), SEIMC-GEHEP (Work-group for Viral Hepatitis) and AEHVE (Spanish Viral Hepatitis Elimination Alliance) agreed on a document at the beginning of 2022 to carry out a comprehensive diagnosis of viral hepatitis (B, C and D): a positive result in serology to detect viral hepatitis (HBV, HCV and HDV), as well as HIV, would trigger the analysis of the rest of the virus, including the viral load when necessary, from the same blood sample. This process would increase the diagnosis rate and it would reduce the time to be evaluated. Aim: To evaluate the situation in Spain regarding the comprehensive diagnosis of viral hepatitis in a single blood draw.

**Method:** A panel of experts prepared a structured survey disseminated through the Google Forms platform to all Spanish hospitals, public or private with teaching accreditation, with 200 beds or more. The survey was sent on 20th Oct 2022 and the reception of the results closed on 1st Dec. 2022.

**Results:** Of the 130 hospitals with inclusion criteria, 48 responded (37% response rate, 34 centers >500 beds). All centers have tools for the determination of HBV surface antigen, anti-HCV and HIV serology. 92% have a PCR technique for HBV/HCV. Only 67% of the centers have capacity for the determination of anti-HDV, and this drops to 31% for the detection of HDV-RNA; 88%, who do not have this technique, outsource it. The availability of Point-of-Care (POC) tests is low (21% of centers), GenXpert HCV (38%) and dry blood spot (38%) being the most frequent. Most of the POCs (90%) are supervised by Microbiologists and are always included in the clinical records. Reflex-test diagnosis is performed simultaneously in 88% of centers for HCV, 62% for HBV, 50% for HDV, and only 41% for HBV-HDV. Although 90% of centers believe that HBV and HCV serology should be performed on HIV-positive patients in the same sample, it is only done on 18% of HBsAg-positive and/or anti-HCV-positive subjects. When there is an active infection, any communication strategy is used in 38/48 (79%) of the hospitals (38 hospitals for HCV, 18 for HBV and 10 for HDV). The automated appointment arrangement is only available in 19% of the centers. Only 44.2% of the respondents believe that the determinations to reach a definitive diagnosis must be made with a single blood sample.

**Conclusion:** Although most hospitals have the procedures to carry out a comprehensive diagnosis of viral hepatitis in a single analytical sample, this is used in less than 50% of cases for HBV/HDV. Alerts to maintain continuity of care are widely available for hepatitis C, but they need to be increased for HBV and HDV. Likewise, it is necessary to implement the devices for decentralized diagnosis.

**FRI-189**

*Occult hepatitis B virus infection among blood donors in northwestern Greece*

Maria Leontari¹, Fotios Fousekis¹, Gerasimos Baltayannis¹, Dimitrios Christodoulou¹, Peter Karayiannis². ¹Department of Gastroenterology and Hepatology, University Hospital of Ioannina, Ioannina, Greece, Greece; ²Medical School, University of Nicosia, Cyprus, Greece

**Background and aims:** Occult hepatitis B virus (HBV) infection (OBI) is characterized by the presence of HBV-DNA in blood or tissues in individuals with undetectable serum HBsAg. This study aimed to assess the prevalence and characteristics of (OBI) in Northwestern Greece.

**Method:** Serum samples from 702 blood donors were prospectively collected at University Hospital of Ioannina between February 2018 to September 2022 and were investigated for presence of HBV markers. The Abbott Architect HBsAg and HBcAb HB Qualitative II kit were used for detection of HBsAg and anti-HBc respectively. Serum from patients who were HBsAg (−)/anti-HBc (+) was further tested by polymerase chain reaction (PCR) for the detection of HBV-DNA. In cases of OBI, sequencing and mutation analysis of the HBV pre-S/S gene were performed.

---

**Figure:** (abstract: FRI-189): Prevalence of HBV infection, occult HBV infection (OBI) and OBI with high HBV-DNA levels in blood donors.
Results: Screening revealed 56 cases (7.9%) with HBV infection (HBsAg positive) and 144 cases (20.5%) of past HBV infection ([HBsAg (−)] /anti-HBc (+)), while 38 cases of OBI were identified. In 36 out of 38 cases, the HBV DNA load was <225 IU/ml. One patient with OBI had HIV co-infection. Furthermore, there were two cases with OBI and high HBV-DNA levels (>200,000 IU/ml). Sequencing demonstrated S- and pre-S mutations in 4 cases of OBI, including both OBI and high HBV-DNA levels.

Conclusion: High prevalence of HBV infection and OBI was detected in a region with a high proportion of immigrants from endemic countries. In addition, 5 gene mutations were associated with cases of OBI with high HBV-DNA levels.

FRI-190
Hepatitis E virus seroprevalence in immunosuppressed patients in Belgium: a prospective study
Marie Philippart1, Michael Peeters2, Hubert Pessevaux3, Maria Badí3, Sarah Bailly4, Xavier Poiré4, Nada Kanaan5, Arnaud Devresse6, Benoit Kabamba4, Géraldine Dahlqvist1. 1Cliniques Universitaire Saint Luc, Service d’Hépato-Gastroentérologie, Bruxelles, Belgium; 2Sciensano, Viral Disease Department, Bruxelles, Belgium; 3Cliniques Universitaire Saint Luc, Service de cardiologie, Bruxelles, Belgium; 4Cliniques Universitaire Saint Luc, Service de hématologie, Bruxelles, Belgium; 5Cliniques Universitaire Saint Luc, Service de néphrologie, Bruxelles, Belgium; 6Cliniques Universitaire Saint Luc, Laboratoire de microbiologie médicale, Bruxelles, Belgium
Email: marie.philippart01@gmail.com

Background and aims: Hepatitis E virus (HEV) is the commonest cause of acute viral hepatitis in Western countries. In immunocompromised patients, chronic HEV have been described, leading in certain cases to cirrhosis, decompensation and death or liver transplantation.

The aim of the study is to determine the prevalence of HEV infections in the immunosuppressed population followed in a single tertiary center in Belgium.

Method: From May 2022 to April 2023, we are prospectively screening for HEV (IgG, IgM and PCR) all patients transplanted from a solid organ (SOT) as well as patients suffering from a lymphoma or followed in the hematology department for a bone marrow transplantation under immunosuppression from at least three months.

We compared the data from our immunosuppressed patients to the data collected from national serum banks in Belgium in 2014 by Ho et al., representing the general seroprevalence in Belgian population. Chi² test or Fisher exact test were performed to compare the groups.

Results: We present here an intermediate analysis after 8 months of screening. Among 570 patients, 240 were followed for a kidney transplantation (KT), 139 for a heart transplantation (HT), 163 for a liver transplantation (LT), and 55 for haematological disease (HD). The median age was 61. The sex ratio F/M was 1/2. The mean IgG HEV seroprevalence was 9.2% in our population, 8.1% in KT, 13% in HT, 14.8% in LT and 0% in HD. A positive HEV PCR was found in 6 patients, 5 in the KT group and one followed for HD and genotype 3c was identified in all of them. There is a significant difference between the HEV IgG seroprevalence in Belgian population in 2014 (5.8%) and our population (p = 0.001). In subgroup analysis, there is a significant difference between the Belgian population and the patients followed for LT (p = 0.0006) and HT (p = 0.0114). There is also a significant difference between the different SOT groups and the patients followed for haematological diseases (LT vs HD: p = 0.0026; HT vs HD: p = 0.0068; KT vs HD: p = 0.03).

Conclusion: The seroprevalence between our group of immunosuppressed patients and the Belgian population is significantly higher. Subgroup analysis showed a significantly higher seroprevalence in HT and LT patients but does not translate into an actual chronic infection rate. KT is a risk factor for the occurrence of chronic HEV compared to other SOT groups. The seroprevalence is however not significantly different in this group compared to the general population. More data are awaiting to draw conclusions on the importance of systematic screening in these immunosuppressed populations.

This study is supported by a Gilead fellowship grant.

FRI-191
What is the most effective strategy to identify HBV-infected women eligible for antiviral prophylaxis in Burkina Faso? A modelling study on different testing strategies
Andréa Gosset1, Yusuke Shimakawa2, Alice N. Guingané3, Abdoul Tiendrebeogo2, Maria Patrizia Carrieri1, Tim Hallett4, Shevanthi Nayagam1, Sylvie Boyer1. 1Aix Marseille University, INSERM, IRD, SESSTIM, Sciences Economiques et Sociales de la Santé et Traitement de l’Information Médicale, ISSPAM, 13005 Marseille, France; 2Unité d’Épidémiologie des Maladies Emergentes, Institut Pasteur, 75015 Paris, France, France; 3Hepatogastroenterology Department, Bogodogo University Hospital Center, Ouagadougou, Burkina Faso, Burkina Faso; 4Department of Surgery and Cancer, Imperial College London, London, United Kingdom, United Kingdom; 5Department of Surgery and Cancer, Imperial College London, London, United Kingdom, United Kingdom
Email: andrea.gosset@inserm.fr

Background and aims: To prevent mother-to-child transmission of hepatitis B (HBV), WHO recommends tenofovir (TDF) prophylaxis in high-risk pregnant women from the 28th week of pregnancy until at least birth, in addition to 3–4 doses of hepatitis B vaccination (HepB3) in all infants, including a timely birth dose (HepB-BD). TDF
prophylaxis is recommended for HBV-infected pregnant women with an HBV DNA $\geq 5.3 \log_{10}$ IU/ml or those positive for hepatitis B e antigen (HBeAg) in settings without access to HBV DNA quantification. However, HBV DNA testing is not widely available at antenatal care in Burkina Faso (BF) and rapid diagnostic tests (RDTs) to detect HBeAg lack sensitivity. Therefore, alternative strategies could be to use hepatitis B core-related antigen (HBcrAg) RDT (data from The Gambia: 100% sensitivity and 87% specificity to detect HBV DNA $\geq 5.3 \log_{10}$ IU/ml) or to treat all pregnant women positive for hepatitis B surface antigen (HBsAg) without any additional tests. This study assessed the impact of different testing strategies to identify HBV-infected pregnant women who should receive TDF prophylaxis in BF.

**Method:** We analysed five intervention strategies and used a deterministic model specified by age, sex, and type of transmission to estimate the effectiveness of each strategy over the period 2021–2030 in BF. The baseline strategy was the current policy-HepB-BD in addition of HepB3. The four other strategies additionally considered screening pregnant women for HBsAg using a RDT, and providing TDF prophylaxis to HBsAg-positive women if they had: i) HBV DNA $\geq 5.3 \log_{10}$ IU/ml, ii) positive HBeAg using RDT, iii) positive HBcrAg using RDT, or iv) without additional test. HepB-BD was introduced in 2022 in BF. We introduced TDF prophylaxis in 2023 in the model. We considered a linear scale up of HepB-BD, HBsAg screening and TDF prophylaxis to achieve 90% over 5 years. We estimated the costs of each strategy using a health system perspective.

**Results:** In 2021–2030, the total number of pregnancies requiring TDF treatment would be 10,567 in the HBV-DNA strategy, 17,729 in the HBeAg strategy, 40,573 in the HBcrAg strategy (including a higher number of women with low HBV-DNA treated unlike the first strategy), and 263,779 in the treat all strategy. In the baseline scenario, we estimated 84,091 new chronic infections including 29,976 infections due to MTCT in 2021–2030. Compared to the baseline scenario, the addition of TDF prophylaxis would allow to avert 3,552 new chronic infections ($-4.2\%$) in the first strategy, 2,555 ($-3.0\%$) in the second strategy, 3,741 ($-4.4\%$) in the third strategy, 5,348 ($-6.4\%$) in the fourth strategy.

**Conclusion:** The treat all strategy might be most effective, however the effects of treating all HBsAg-positive women are unknown and will drastically increase treatment needs in pregnant women and costs. The cost-effective analysis is ongoing and results will be presented at the conference.
Background and aims: Africans in Europe migrating from high-endemic hepatitis B and C virus (HBV and HCV) areas may not know their disease status due to unreliable testing and vaccination in their home countries and underutilization of the host country health services. In Catalonia, Spain, universal health coverage grants migrants access to health services, which offers an entry point into the health system. We aimed to use point-of-care testing in community settings to identify and link to care or vaccinate West African migrants in the greater Barcelona area, Spain.

Method: Between November 2020 and December 2022, viral hepatitis testing was offered to 636 people. Testing in community settings used an HBV surface antigen (HBsAg) rapid lateral flow test (DETERMINE® HBsAg 2) followed by whole blood sample collection using a plasma separation card (Roche Diagnostics), which analyzed HBV-DNA and anti-hepatitis D virus (HDV) among those HBsAg+ and anti-HBV core antigen (anti-HBc) among those HBsAg-. Anti-HCV testing with the OraQuick® was incorporated in June 2022. HBsAg+ participants were immediately referred to a collaborating tertiary hospital for full assessment.

Results: 622 participants were included for analysis (mean age 42 [SD 10]). They were primarily from Ghana (81%) and Senegal (16%), were male (63%), and 17% (n = 104) arrived to Spain ≤5 years ago. Most participants had never been tested for HBV nor HCV (70%), while 15% were unsure if they had been. HBsAg+ prevalence was 10% (n = 62) and no one was anti-HCV+. Of those HBsAg+, 50% (n = 31) had detectable HBV-DNA and one person was anti-HDV+. Of those who were HBsAg- (n = 560), 38% (n = 216) were anti-HBc+. The remaining, if not previously vaccinated (n = 292), were offered the first dose of the HBV vaccine in situ during the second visit (191 returned for results), of which, 85% (n = 164) accepted. Overall, 76% (n = 49) of those who were HBsAg+ had a first documented visit with a collaborating tertiary hospital; three preferred to visit their own physicians. The mean number of days between testing and linkage to care was 26 (SD 10.5). Successful linkage to care was documented in 65% of all participants.

Conclusion: This community-based viral hepatitis screening program provides an effective model for identifying and providing care to migrant populations at high risk of HBV infection who may otherwise not engage in care. Nearly half of all participants had evidence of past or current HBV virus, highlighting the importance of targeted interventions for this population.

FRI-194 Hepatocellular carcinoma associated with chronic hepatitis C: a case for an annual mortality and morbidity review

Neil Mclnnes1, Peter Davies1, Lynn Laverty2, Stephen Barclay3, Erica Peters1, Queen Elizabeth University Hospital, Infectious Diseases, Glasgow, United Kingdom; 2Hunter Street Health Centre, Community Blood Borne Viruses, United Kingdom; 3Glasgow Royal Infirmary, Gastroenterology Department, Glasgow, United Kingdom Email: neil.mclnnes4@nhs.scot

Background and aims: The concept of a late diagnosis and mortality meeting is well established in HIV services for clinical governance, and to disseminate wider learning to the clinical community. In Scotland, there is no equivalent for Hepatitis C (HCV) despite a significant associated morbidity and mortality, and similar “missed diagnosis opportunities.” This cohort study aims to reflect on those with HCV and Hepatocellular carcinoma (HCC), to identify missed opportunities for earlier diagnosis with a view to wider clinical learning.

Method: From the Scottish HCV registry, 40 patients with both an HCV and subsequent HCC diagnosis between 2011 and 2021 were extracted. Demographics, risk factors for chronic liver disease (CLD), dates of HCC and HCV diagnosis, and circumstances of HCV diagnosis were extracted from the registry and electronic patient records. Date of peak-alanine aminotransferase (ALT) and first abnormal ALT (>50 U/L) prior to Hep-C diagnosis were recorded. Prior healthcare exposure to addiction liaison (via EMIS®) or hospitalisation was recorded.

Results: Of forty patients identified, 85% were male with a median age of 59 years. 23 (58%) patients had a raised ALT on at least one occasion, >1 year prior to a Hep-C diagnosis, with a median time from first deranged ALT to HCV diagnosis of 2.5 years (IQR 6 years) and a median peak ALT of 112 U/L. The most common indication for HCV testing was deranged liver function and, at diagnosis, 7 (18%) patients...
had developed HCC, with a further 7 presenting with decompensated liver disease. 24 (60%) had co-existing risk factors for CLD e.g. alcohol excess or Hepatitis-B. Ten (25%) had a pre-diagnostic inpatient stay and 3 (8%) pre-diagnostic Addictions input.

**Conclusion:** Abnormal biochemistry prior to a HCV diagnosis, often for many years, is a common finding. Where other CLD risk factors are present, HCV testing may be overlooked. Highlighting episodes of missed opportunities for HCV diagnosis in a timely manner to clinical teams involved in previous care episodes, using established clinical governance models, may reduce the risk of future similar missed diagnoses. Review of local data may lead to a consideration of reflex HCV testing in all patients with abnormal LFTs, or similar responses, to support early HCV diagnosis; not only to reduce liver related mortality but to support HCV elimination.

**FRI-195**

**Prevalence of hepatitis B and C viral infections among transgenders and men who have sex with men in Pakistan**

Hassan Mahmood1, Quaid Saeed2, Francisco Averhoff3, Huma Qureshi4. **Integral Global (IG), Pakistan; 2Islamabad Healthcare Regulatory Authority, Islamabad, Pakistan; 3Abbott Diagnostics, United States; 4Ministry of National Health Services, Regulations and Coordination, Pakistan, Pakistan**

**Email:** hassanmahmood1@hotmail.com

**Background and aims:** In Pakistan, Transgenders (TGs) and Men who Have Sex with Men (MSM) are marginalized communities at high risk of sexually and parenterally transmitted infectious diseases. The prevalence of hepatitis B virus (HBV) and hepatitis C virus (HCV) infection in these populations has not been well described, and access to care and treatment is lacking.

To estimate the prevalence of HBV and HCV infection among TGs and MSM in two cities in Pakistan, Lahore and Larkana. To assess the effectiveness of screening and referral for treatment among those who screen positive for HBV and HCV, and response to treatment.

**Method:** During 2020–2022 community health workers identified and recruited a total of 2241 TGs and MSM for testing by who prequalified rapid test for hepatitis B surface antigen (HBsAg) and antibody to HCV (anti-HCV) in the community. All participants who tested positive for HBsAg were referred to their respective public sector provincial hepatitis control program for further testing and care. For those who tested positive for anti-HCV, a “One Stop Shop” model was established where the local Community Based Organizations (CBOs) who were already providing free HIV care services to these communities were equipped and trained to provide HCV care and treatment services.

Those who tested positive for anti-HCV and were referred to the CBO, were tested for HCV viremia (RNA) using GeneXpert machines. All the HCV RNA positive patients had additional testing including a complete blood count (CBC) and testing for aspartate aminotransferase (AST) to calculate their AST to platelet ratio index (APRI) score, to estimate degree of liver fibrosis. HCV cases were provided at the same visit free of cost oral medications (Sofosbuvir and Daclatasvir) to treat their HCV infection. All testing was done on the same day as the visit, and the results were available on the same day of treatment initiation.

**Results:** A total of 201/2241 (9%) tested positive for anti-HCV, and 69/2241 (3.1%) tested positive for HBsAg. All participants who tested HBsAg+ were referred to the provincial hepatitis control program for additional care. The 201 who tested anti-HCV+ were referred to CBOs for additional testing and care under One Stop Shop model. Of those, 161 (80%) were tested for HCV RNA, of which 99 (62%) tested positive for HCV RNA. Of these 87 (88%) initiated treatment and 77/87 (89%) completed treatment; all were tested for cure (sustained virologic response; SVR), of which 72 (94%) were HCV RNA negative (cured).

**FRI-196**

**Multidisciplinary approaches to increase hepatitis C screening rates in a New York City primary care clinic**

Carolina Villarroel1, Silpa Yarra1, Gres Karim1, Jake Debroff1, Einat Kadar1, Anna Mageras2, Rebecca Roediger2, Ilan Weisberg3.

1Mount Sinai Beth Israel, Internal Medicine, United States; 2Icahn School of Medicine at Mount Sinai, New York, United States; 3NewYork-Presbyterian Brooklyn Methodist Hospital, United States

**Email:** carolina.villarroel@mountsinai.org

**Background and aims:** Hepatitis C virus (HCV) infection is a common cause of cirrhosis, hepatocellular carcinoma, and liver-related mortality, but also remains to be one of the leading indications for liver transplantation. In New York City (NYC), two out of five residents with HCV remain undiagnosed. In 2020, the Centers for Disease Control and Prevention (CDC) and the United States Preventive Services Task Force (USPSTF) expanded previous guidelines to recommend universal HCV screening among adults 18 and over.

Baseline data of screening rates in 2021 at an NYC primary care clinic were 14%, well below the NYC Department of Health screening goal of 42%. Our study aimed to investigate the causes of low screening rates and promote physician knowledge and behaviors to increase overall screening rates to 20% in 6 months.

**Method:** Using the Plan-Do-Study-Act (PDSA) quality improvement methodology, an interdisciplinary team including hepatologists, internists, and a viral hepatitis program manager was created to investigate baseline HCV screening rates in an NYC primary care clinic. In January 2022, a campaign was initiated for HCV screening with four initiatives including: patient-facing signage in the clinic, a best practice alert (BPA) for HCV screening via electronic medical record system (EMR), weekly printed lists of eligible patients for screening for each primary care physician (PCP), and an oral educational presentation to providers. Baseline physician knowledge regarding HCV screening guidelines was assessed using a survey composed of six knowledge-based and PCP-level barrier questions as shown in Figure 1 immediately before and six weeks after the educational session to assess for retention of knowledge.

**Results:** A total of 45 internal medicine physicians were initially provided a survey to assess baseline knowledge regarding HCV screening criteria. Six weeks after an educational session to promote
HCV screening rates, 21 physicians responded (46%) to a follow-up survey to assess retention of knowledge. Respondent knowledge slightly increased after the educational session (80% of correct answers before the lecture vs. 81% after). However, our multi-initiative approach successfully resulted in an increase in HCV screening rates from 14% to 35% in the first quarter of 2022 and 32% by the third quarter of 2022, exceeding the study goal of 20%.

**Conclusion:** Given that there was a minimal difference in retained knowledge based on pre and post-surveys, we attribute the overall increased HCV screening rates from 14% to 35% to our other initiatives which include utilization of the automated BPA within the EMR and weekly reminders as printed lists for each PCP to increase awareness of HCV screening for timely detection and prompt referral for treatment of newly diagnosed HCV.

**FRI-197**

Effectiveness of birth-dose vaccine in preventing mother-to-child transmission of hepatitis B virus in Ethiopia

Mebrihit Arefaine¹, Asgeir Johannessen², Tilahun Teklehaymanot¹, Andargachew Mulu³, Dawit Hailu³, Adane Mihret³, Mahlet Osman³, Dareskedar Teshay³, Nega Berhe⁴,⁵. ¹Addis Ababa University, Ethiopia; ²Vestfold Hospital Trust, Norway; ³Armauer Hansen Research Institute, Ethiopia; ⁴Aklilu Lemma Institute of Pathobiology, Addis Ababa University, Infectious Disease, Addis Ababa, Ethiopia; ⁵Oslo University Hospital-Ullevål, Regional Centre for Imported and Tropical Diseases, Oslo, Norway

**Email:** johannessen.asgeir@gmail.com

**Background and aims:** Studies from Asia have shown that maternal-to-child transmission (MTCT) is a major transmission route of the hepatitis B virus (HBV). Administration of a monovalent HBV vaccine within 24 hours of birth (viz birth-dose vaccine), followed by completion of the vaccine series, is 85–95% effective in the prevention of MTCT. In Africa, studies from the 1980s suggested that vertical transmission of HBV was less common than in Asia, which led to a reluctant attitude towards birth-dose vaccination in many African countries. This study aimed to determine the effectiveness of the birth-dose vaccine in preventing MTCT of HBV in Ethiopia.

**Method:** Hepatitis B surface antigen (HBsAg) positive pregnant women who attended the delivery wards at five public hospitals in Ethiopia were included in the study. Birth-dose HBV vaccine was given at the time of birth within 24 hours of birth. Maternal HBsAg positive status was determined using ELISA. Maternal HBeAg status, maternal viral load (IU/ml) were evaluated. HBsAg serostatus of the infant was determined at 9 months of age.

**Table (abstract: FRI-197):** Factors associated with mother-to-child transmission of hepatitis B virus, Ethiopia.

<table>
<thead>
<tr>
<th>Infant HBsAg at 9 months</th>
<th>OR 95% CI</th>
<th>P</th>
<th>OR 95% CI</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBsAg + N (%)</td>
<td>HBsAg − N (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birth-dose vaccine</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>5 (35.7)</td>
<td>134 (83.8)</td>
<td>1</td>
<td>2.9–29.9</td>
</tr>
<tr>
<td>No</td>
<td>9 (64.3)</td>
<td>26 (16.2)</td>
<td>9.3</td>
<td></td>
</tr>
<tr>
<td>Maternal HBsAg status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neg</td>
<td>6 (42.9)</td>
<td>141 (88.1)</td>
<td>1</td>
<td>3.1–31.7</td>
</tr>
<tr>
<td>Pos</td>
<td>8 (57.1)</td>
<td>19 (11.9)</td>
<td>9.9</td>
<td></td>
</tr>
<tr>
<td>Maternal viral load (IU/ml)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;200 000</td>
<td>8 (57.1)</td>
<td>154 (96.2)</td>
<td>1</td>
<td>5.1–73.2</td>
</tr>
<tr>
<td>&gt;200 000</td>
<td>6 (42.9)</td>
<td>6 (3.8)</td>
<td>19.3</td>
<td></td>
</tr>
</tbody>
</table>
Addis Ababa from January 2019 to May 2021 were included in a prospective, observational study. Maternal hepatitis B e-antigen (HBeAg) status, HBV DNA viral load, and demographic information was collected at birth. HBV birth-dose vaccine was recommended to all study participants, but was not part of the national policy, thus not all infants received it. All infants, however, received three doses of pentavalent HBV vaccine at 6, 10, and 14 weeks of age as part of the national immunization program. The infants were followed up and tested for HBsAg using an ELISA assay at 9 months of age; a positive HBsAg at 9 months was taken as evidence of MTCT. Logistic regression analysis was used to identify factors associated with MTCT of HBV.

**Results:** Of 12,318 pregnant women screened, 369 (3.0%) were HBsAg positive and 300 were included in this study. The current analysis included 174 infants who had a follow-up evaluation at 9 months of age. Five of 139 (3.6%) infants who received birth-dose vaccine were HBsAg positive at 9 months of age, compared to 9 of 35 (25.7%) who did not receive birth-dose vaccine (p < 0.001). Transmission of HBV occurred both in HBeAg positive and negative mothers, and in mothers with high (>200 000 IU/ml) and moderate/low (<200 000 IU/ml) viral load at birth. In multivariable logistic regression analysis, high maternal viral load and the absence of HBV birth-dose vaccine were significantly associated with MTCT of HBV (Table 1).

**Conclusion:** Administration of birth-dose vaccine significantly reduced the risk of MTCT of HBV. Improved coverage of birth-dose vaccine will be needed to control the HBV epidemic in Africa.

**FRI-198**

**Complete and maintained elimination of hepatitis C in patients in methadone substitution program**

Esther Rodríguez Candelaria1, Ana Laserna Ramos2, Silvia Acosta-López3, Pilar Diaz Ruiz4, Magdalena Lara4, Teresa De la Rosa Vilas2, Luz Goretti Santiago Gutiérrez2, Francisco Andrés Pérez Hernández2, 1Hospital Universitario Nuestra Señora de La Candelaria, Aparato Digestivo, Spain; 2San Miguel Adicciones, Spain; 3Hospital Universitario Nuestra Señora de La Candelaria, Farmacia, Spain; 4Hospital Universitario Nuestra Señora de La Candelaria, Microbiología, Spain

Email: estherrg65@gmail.com

**Background and aims:** To achieve WHO goals on hepatitis C (HCV) plans are necessary in populations with high prevalence and low adherence like users of centers for addiction treatment (CAT). We designed a Fast Track protocol demonstrating high cure rates (>90%). A meta-analysis estimates the incidence of reinfection in these patients in 6%. Main objective: evaluate effectiveness of our protocol to achieve HCV elimination in Santa Cruz San Miguel CAT (CATSC). Secondary aims: know prevalence, results of treatment, rate of reinfections and incidental new cases.

**Method:** All CATSC users of Opioid Substitution Therapy (OST) were included. We analyzed with descriptive statistical prevalence of HCV before and after the elimination program, number of patients treated and cured. Patients cured more than a year ago were included for reinfection screening. CATSC new patients, included after the programme initiation, were also analyzed for new incidental cases.

**Results:** We include the 231 users of OST of CATSC. At the beginning we knew the HCV status in 72%. Among this patients, HCV prevalence was 42.5%; of negative RNA patients 43% were after treatment. These positive HCV patients weren’t under treatment. After the implementation of screening program at CATSC we found out HCV diagnostic situation in 95.4%. Prevalence of viremic patients was 41% (55): prevalent genotypes were 1a (42%) and 3a (28%), 37.5% had advanced fibrosis or cirrhosis. None with negative serology before the study had been infected later. 50 patients (91%) were treated; one didn’t receive treatment due to terminal illness. Virological cure was achieved in 49 (98%), the other abandoned treatment. In 2022 a new HCV screening was carried out in these users: 85% adhered. Only 3 were viremic: one wasn’t treated due to severe comorbidity and the other two refused treatment. 49 patients received antivirals more than a year ago, reinfection screening was done in 46 (94%): 100% negative. After the study, 46 new OST users were admiten at CATSC: in 44 patients (95.6%) HCV status was known. 6 patients were RNA positive and 5 of them were treated.

**Conclusion:** Among the OST users of the CATSC, we achieve the WHO objective of eliminating hepatitis C with 97% of patients diagnosed and 90% treated with a cure rate of 98%. The elimination has been maintained after one year with 0 reinfections and 0 new infections. Screening and linkage to care of new patients is necessary to maintain these results.

**FRI-199**

**Hepatitis delta virus infection in Turkey: A meta analysis of prevalence**

Mehlika Toy1, Begüm Güler Şentürk2, Kayra Somay2, Genco Gencdal3, Cihan Yurdaydin3, 1Stanford University School of Medicine, Palo Alto, USA, Department of Surgery, United States; 2Koç University, School of Medicine, Department of Internal Medicine, Turkey; 3Koç University, School of Medicine, Department of Gastroenterology and Hepatology, Turkey

Email: gencogencdal@yahoo.co.uk

**Background and aims:** Turkey is a region that has a high burden of hepatitis delta virus (HDV) infection, and is considered an endemic country for the virus, occurring in large proportions of HBsAg-positive individuals. To provide a current and updated HDV prevalence, the authors performed a meta-analysis of prevalence to estimate country and region-specific prevalence of HDV infection in Turkey.
Method: A total of 462 studies with original data on the prevalence of HDV in Turkey and published between 2006 and 2022 were identified through a search of electronic databases, by reviewing citations, and by contacting authors. After a systematic assessment, the authors included 43 studies, divided into blood donor studies, outpatient clinic studies that comprised of asymptomatic and only non-cirrhotic chronic hepatitis B, and inpatient clinic studies that comprised of cirrhotic patients. Turkey was divided into three regions: West-, Central-, and Southeast Turkey. MetaXL software was used to calculate the prevalence.

Results: Using a quality effects model, we estimated that the prevalence for blood donors, outpatient clinic patients, and inpatient clinic patients was 3.65% (CI: 1.88–5.59), 4.41% (CI: 3.02–6.04), and 23% (CI: 5.2–47), respectively. The prevalence for West-, Central-, and Southeast Turkey was 3.28% (CI: 2.37–4.33), 2.09% (CI: 1.31–3.05), and 7.79% (CI: 4.33–12.12), respectively.

Conclusion: The findings of this study suggest that Turkey is still an endemic country for delta hepatitis, with regional differences. The public health efforts should be focused accordingly.

FRI-200
Sofosbuvir/Velpatasvir (S/V) for the treatment of HCV infection among vulnerable inner-city residents: extending the results of clinical trial part 2
Brian Conway1,2, Rosittsa Yung1, David Truong1, Shawn Sharma1, Shana Yi2, Giorgia Tonato1,1 Vancouver Infectious Diseases Centre, Vancouver, Canada; 2Simon Fraser University, Burnaby, Canada
Email: brian.conway@vaid.ca

Background and aims: The combination of Sofosbuvir/Velpatasvir (S/V) is approved for the treatment of chronic HCV infection. In registration trials, cure rates of 95% or more were achieved when administered as one pill once a day for a period of 12 weeks regardless of genotype or disease stage. To achieve HCV elimination by 2030, there is a need to develop and evaluate systems of care in populations that are more challenging to engage in care than those enrolled in clinical trials. With this in mind, we evaluated the safety and efficacy of S/V in a prospective study of HCV-infected inner-city residents enriched for risk behaviors for non-adherence to therapy, including problematic drug use and unstable housing.

Method: Through dedicated outreach events, including regular community pop-up clinics (CPCs), we identified HCV-infected patients who were not currently engaged in health care and who were eligible to receive government-funded antiviral treatment for HCV infection. We offered them the opportunity to enroll in a multidisciplinary program of care to address medical, psychological, social, and addiction-related needs, and provide S/V therapy in this context, with daily or weekly supervision of adherence as appropriate. The end point of this preliminary analysis is the achievement of cure (SVR4/12) in those who initiated therapy.

Results: In this ongoing study, we have, to date, identified and started treatment in 203 eligible subjects. We note median age 46 years, 28.8% female, 49.5 and 42.3% GT1 and 3, 13.6% cirrhotic, 99.0% active drug users, 10.2% co-infected with HIV and over 80% unstably housed. The median time from CPC attendance to HCV treatment initiation is 6 weeks. Of 203, 178 have completed treatment, 21 are currently on treatment, 2 died of overdose, 2 discontinued prematurely. Of 178 subjects who have completed treatment, 155 are confirmed as cured (SVR 12), 2 achieved SVR4 (awaiting SVR12), 12 are awaiting SVR4, 4 (2.2%) have a documented virologic relapse and 5 (2.1%) have been lost to follow-up. In the context of an opioid crisis with 6 documented deaths/day in the province of British Columbia, we have observed x deaths in the treated study population from time of initial identification at CPC events to the present (median follow-up 30 weeks. Of participants in whom a final outcome can be ascertained, the cure rate is 97.5% (157/161).

Conclusion: Among inner city residents living with HCV infection, most of whom are active fentanyl users and unstably housed, the administration of S/V in the context of a robust program of engagement in care has led to HCV cure rates that exceed those achieved in clinical trials, with minimal opioid-related morbidity and loss to follow-up within our system of care. The data we present validate the development of multidisciplinary programs as an important tool for HCV elimination in this vulnerable population.

FRI-201
Screening for hepatitis C virus using rapid diagnostic test (RDT) coupled with mammography in women aged from 50 to 74 years in Montpellier (France), (Mamm\'OCTC05067374)
Magdalena Meszaros1, Severine COURSIER1, Nicolas Nugot1, Lionel MOULIS1, Patrice TAOUREL1, Emma PAGES1, Nathalie Fabre DEMARD1,2, Muriel TRENITT3, Georges-Philippe PAGEAUX1, Hélène DONNADIEU-RIGOLE1, 1Hospital Center University De Montpellier, Montpellier, France; 2Clinique du Millénaire, Montpellier, France; 3MACAM-Radiologie, Sénologie, Centre Victor Hugo, Montpellier, France; 4Clinique Beau Solet, Montpellier, France
Email: m-meszaros@chu-montpellier.fr

Background and aims: The seroprevalence of hepatitis C virus (HCV) in the general French population is less than 1%; nevertheless, according to estimations, more than 75,000 people living in France are unaware of their seropositivity. In order to achieve the goal of elimination of hepatitis C by 2025 in France targeted screening of high-risk population is essential to identify asymptomatic carriers prior to development of advanced chronic liver disease. The most common risk factors associated with HCV infection are injection drug use, blood transfusions prior to 1992 and parenteral contamination. It was estimated that the seroprevalence of hepatitis C among women over 60 is higher than that among men of the same age. Organized breast cancer screening was introduced in France in 2004 and more than 70% of women aged from 50 to 74 are participating. We hypothesized that some women between 50 and 74 years may have previously undergone invasive surgical or obstetrical procedures and/or other at risk behaviours associated with HCV infection and may be unaware of their HCV status. Thus, screening for hepatitis C coupled with mammography may represent an efficient HCV micro-elimination strategy. The objective of the study was to assess acceptability rate to breast cancer screening coupled with hepatitis C testing using rapid diagnostic test (RDT) among women aged from 50 to 74 years old. Secondary objective was seroprevalence of HCV in this population.

Method: All women between 50 and 75 years participating in the national organized systematic breast cancer screening were prospectively enrolled in the study after signing informed consent. Adherence to HCV screening as well as data regarding HCV care cascade was recorded.

Results: Among 1430 women prospectively enrolled between March 2022–January 2023, 1173 accepted the two coupled exams (acceptability rate: 82%); The three main reasons for refusal were: recent HCV testing (51%), not feeling at risk of HCV (17%), and anxiety due to HCV testing (12%). The median age of the participants was 61.28 (±7.08) years; 44% were employed and 44% were retired. Among the participants, 86% had never had a blood transfusion, but 83% reported other risk factors such surgery or invasive procedure prior to 1992. Eight (0.68%) participants had a positive HCV RDT. One (0.08%) participant was HCV RNA-positive and was treated and cured (SVR 100%) during the study period.

Conclusion: The acceptability of HCV screening using RDT coupled with mammography is high. Seroprevalence of hepatitis C in women aged from 50 to 74 years is low, similar to that of the general population.
Background and aims: Certain population groups have an increased risk for hepatitis B and C virus (HBV and HCV) infections due to their profession and/or behaviour. Thus, they constitute potential reservoirs for the spread of these infections to the general population. Despite this, comprehensive studies, including screening for most viral markers in many different risk groups are lacking in Africa. In this study, we investigated viral markers of HBV, HCV and hepatitis D virus (HDV) infections among nine high-risk populations in order to propose interventions for a better control of these infections.

Methods: A cross-sectional study was carried out in the two main cities of Burkina Faso, Ouagadougou and Bobo-Dioulasso, and one village (Fandjora). The study population included sex workers (SW), men who have sex with men (MSM), prisoners (P), health care workers (HCW), lorry drivers (LD), illegal gold miners (IGM), hairdressers (H), haemodialysis patients (HD) and human immunodeficiency virus (HIV) patients. From each participant, socio-demographic data and blood were collected by well-trained personnel.

All serum samples were screened for viral markers of HBV, HCV and HDV infections using serological and molecular tests. Data analysis was performed using STATA SE version 14.0 software (Texas, USA).

Results: A total of 1373 participants were enrolled. HBsAg seroprevalence was 13.5%, ranging from 9.9% in SW to 25.9% in MSM, and anti-HBc seroprevalence was 75.5%. Among HBsAg positive samples, HBeAg, anti-HBe antibodies, and HBV DNA were detected in 18.3%, 79.4%, and 30.1%, respectively. Total anti-HDV antibodies were detectable in 4 (2.1%) samples and HDV RNA in 3 (75.0%). A vaccine profile (isolated anti-HBs) was found in 70.0%. Being male was significantly associated with HBsAg (aOR: 1.6) and anti-HBc (aOR: 1.8) positivity. HD (aOR: 2.13) and SW (aOR: 2.6) had a higher risk of HBsAg positivity than all other groups. Anti-HCV prevalence was 8.5%, ranging from 5.3% in H to 12.4% in HD. HCV RNA was detected in 13.7% of anti-HCV positive samples. The odds of being HCV positive were nearly five times higher in participants with no education (aOR: 4.7) compared to those with other education levels, while it was low in participants between 35 and 49 years of age (aOR: 0.5). Active HBV/HCV coinfection was found in 4 (0.3%) cases. Dual exposure to HBV and HCV was confirmed in 93 (9.0%) cases, and prior exposure to all three hepatitis viruses was detected in one (0.07%) case.

Conclusion: The results show much higher prevalences of HBV and HCV infections than in the general population. They underline the need of targeted programs comprising awareness, screening and treatment for these high-risk groups to support the 2030 hepatitis elimination goals.
increase with age. Our aim was to propose HCV screening serology to patients undergoing digestive endoscopy with general anesthesia, to determine if HCV screening from 40 years of age before endoscopy is feasible and accepted, and to evaluate if the prevalence after 40 years of age is higher than in the general population.

**Method:** Minimal-risk interventional research study; proposal to all patients, men and women, aged over 40 years and having an indication for digestive endoscopy, to undergo HCV serological screening at the time of the gastroenterology consultation prior to the examination. There was no control group. Patients known to have positive HCV serology or negative HCV serology less than one year old and patients already hospitalized were excluded. Study proceeds as follows: 1/inclusion of patient with the provision of an information leaflet and signature of a consent form 2/prescription of HCV serology by the hepato-gastroenterologist during the pre-endoscopy consultation 3/serology performed on site or in a local laboratory 4/possible catch-up of serologies in outpatient hospitalization if serology not done. The objective is to evaluate the feasibility and acceptability of the screening, not the conditions of its realization, which have been adapted to the conditions and habits of each participating center. 5/ Patients with a positive HCV serology will be offered a C viral load and management according to good practice recommendations. Expected results are an acceptability higher than 95% and a prevalence higher than the prevalence in the general population (0.86%).

**Results:** As of December 31th, 2022, 314 patients were included; 56% men 44% women; average age 56 years (40–85), 90% men, liver elastometry 8.5 Kpa; 9 patients patients had positive HCV viral load (2.9%) and will be treated. More detailed results on a larger number of patients will be presented at the congress.

**Conclusion:** The feasibility and acceptability of hepatitis C screening before digestive endoscopy is demonstrated. The prevalence seems to be higher than in the general population.

**FRI-205 Progress in hepatitis C screening as part of the hepatitis C elimination program in Georgia**
Vladimer Getia1, Tamar Gabunia2, Maia Tsereteli1, Ekaterine Adamia2, Davit Baiaishvili3, Irina Tsikhomelidze4, Sophia Surguladze3, Shaun Shadaker4, Senad Handanagic4. 1National Center for Disease Control and Public Health Georgia, Tbilisi, Georgia; 2Georgian Ministry of IDPs, Labour, Health and Social Affairs, Tbilisi, Georgia; 3The Task Force for Global Health, Tbilisi, Georgia; 4Centers for Disease Control and Prevention, Division of Viral Hepatitis, Atlanta, United States
Email: kh.getia@ncdc.ge

**Background and aims:** The country of Georgia, with a population of 3.7 million and an estimated 150,000 adults with current hepatitis C virus (HCV) infection, initiated a national hepatitis C elimination program in April 2015. One aim of the program is to identify 90% of adults infected with HCV by providing hepatitis C screening (anti-HCV) to all citizens free of charge. Screening increased overall since the start of the program but declined sharply in 2020 due to the Covid-19 pandemic. Screening started increasing gradually after pandemic restrictions started to lift, but more needs to be done to reach elimination goals. The aim of this analysis is to describe coverage in hepatitis C testing by age and sex as part of the HCV elimination program.

![Figure: (abstract: FRI-205).](image-url)
**Background and aims:** We have previously communicated our hepatitis C (HCV) elimination programme developed in several phases: 1) Treatment of known patients or new patients referred to our clinics. 2) Screening and treatment of patients in Primary Care (PC) and in Drug Dependency Care Units (DCU) or Prison. 3) Recovery of patients diagnosed from microbiology registers. But to complete the elimination we must also access new HCV diagnoses. 1. To describe the origin and characteristics of the new hepatitis C diagnoses. 2. To assess the efficiency of referral of these patients to hepatitis C consultations (CH). 3. To review the clinical and laboratory history of these patients.

**Method:** A list of patients with positive RNA for HCV from January 1st to November 30th of 2022 was requested from the Microbiology Service. The clinical and laboratory history of these patients was reviewed.

**Results:** 148 patients were HCV RNA positive. There were 77 (52%) new diagnoses, 21 females and 56 males. However, in 23 (29%) patients a previous positive serological history was identified but the diagnosis had not been completed. The diagnosis had been made: in 40 (52%) in PC, in 16 (21%) digestive consultations in the context of study because of hypertransaminasemia; the rest were widely distributed: nephrology (2), psychiatry (2), paediatrics (2), emergency unit (2), medical oncology (2), endocrinology (1), pneumology (1), orthopaedics (1), DCU (2), intensive care unit (1). From the epidemiological background, it should be noted that in 27 (35%) patients there was a history of parenteral drug use; only in 3 (4.7%) the origin was attributed to post-transfusion, although 3 other patients had remote surgeries and did not know whether or not they had been transfused. 1 patient attributed the origin to accidental injection and in 5 (7.8%) patients there was a multiple history of sexually transmitted diseases. In 19 (24.7%) patients there had been appropriate referral to CH and they were already on treatment or had been treated at the time of analysis.

**Conclusion:** Despite a large and prolonged HCV elimination plan, new diagnoses are still occurring in 2022. Some of these patients are not newly infected: they either have a previous positive serological result or an epidemiological history suggestive of remote infection. The population with a history of injecting drug use remains the main source. The majority of new HCV diagnoses occur in primary care or in digestive consultations due to hypertransaminasemia, although in up to a third of cases the diagnosis occurs in other contexts.

**FRI-207**

**Hepatitis C screening and elimination strategy: implementation of the FOCUS program in Almería, Spain**

Anny Camelo Castillo1, Manuel Rodríguez Maresca1, Teresa Cabezás Fernandez1, Teresa Maria Jordan Madrid1, Antonio Duarte Carazo1, Alba Carrodeguas2, Diogo Medina3, José Luis Vega Sáenz2, Marta Casado1, Torrecárdenas University Hospital, Spain; 2Gilead Sciences Madrid, Spain, Spain; 3Gilead Sciences –Lisboa, Portugal, Portugal

Email: mm.casado.m@gmail.com

**Background and aims:** Spain may be one of the first countries to achieve the World Health Organization’s goal of eliminating viral hepatitis C by 2030. A survey by the Ministry of Health 2017–2018 estimated a 0.22% hepatitis C virus (HCV) active infection prevalence among the general Spanish population, with 29.4% unknown infections. Increasing HCV screening is key. Emergency Departments (ED) often act as safety nets due to health equity issues for key populations affected by viral hepatitis, as they often lack optimal links with their primary care providers. We aimed to evaluate HCV screening efficacy in the ED of Torrecárdenas University Hospital, in Almería, Spain.

**Method:** We implemented opportunistic HCV screening in the ED (FOCUS Program), using existing infrastructure and staff. Patients ages 18 to 69 were eligible for testing if they did not have a known diagnosis or test performed in the previous year and required blood tests at the current ED visit. We used the LIAISON® X–Diasorin assay for HCV antibodies (anti-HCV) and the Roche Cobas® 6800 for viral RNA (HCV RNA) in the same specimen. Appropriate follow-up or discharge was given regardless of test results. We contacted positive patients to ensure linkage to care.

**Results:** We screened 9,384 patients from August 2021 to December 2022, finding 159 (1.69%) anti-HCV positive patients (average age of 56, 76% male) and 38 (0.40%) HCV RNA positive patients (82% males). We identified risk exposures in 64% of viremic patients’ records. Injected drug use (36%), HIV or HBV coinfection (36%), a history of incarceration (14%), and origin from countries with medium or high HCV prevalence (11%) were the top and only recorded risk exposures of the guidelines’ 11 criteria. 93% of viremic patients had previously visited ED, and as of reporting, 16 patients have started antiviral treatment.

**Conclusion:** Undocumented HCV infection among our population is twice that estimated in the Spanish population. Hepatitis C screening in EDs is an effective strategy and should be considered in more hospitals.

**FRI-208**

**Low prevalence found in HCV micro-elimination program among HIV-negative MSM and TW in a community center in Spain**

Angel Rivera Calaf1,2,3, Felix Pérez Tejera1, Albert Dalmay-Bueno1, Pep Coll Verd1,2,3, Jose Miguel Cabrera Guarin1,2,3, Mariusz Lucejko1,2,3, Joan Reguant Guittart1,2,3, Javier Fernandez Perez1,2,3, Jorge Calderon Torres1,2,3, Jaime Romero Rodriguez1,2,3, Federico Caballero1,2,3, Giovanni Marazzi1,2,3, Carlos Oro1, Daniel Jacobs1, Horacio Vicioso1, Lisandro Moises Enrique1, Hector Taboada Gonzalez1, Jorge Sz Berges1, Ferran Pujol Roca1, Michael Meulbroek1
Background and aims: Since 2000, multiple HCV outbreaks have been reported in Men who have Sex with Men and Transgender Women (MSM/TW) living with HIV, but to a much lesser extent in their HIV-negative peers. New developments (U = U, PrEP implementation and extension of ChemSex) may have contributed to the transmission chain. A community center with experience of early HIV detection, linkage to care and treatment might be able to create a model with Point-of-Care (PoC) HCV detection in this understudied population. The study aims to determine the prevalence of acute and chronic HCV infection in HIV-negative MSM/TW community and to assess associated risk factors.

Method: All clients who entered the center for routine HIV testing, PrEP and non-PrEP users, were offered to be screened for HCV. A PoC serology test (Abbott® Bioline®) was performed. Positive results were immediately confirmed by a PoC PCR test (Xpert® HCV VL Fingerstick). Additionally, clients with a negative serology and pre-defined criteria (e.g. ChemSex, fisting, recent HIV diagnosis) were offered the PCR test to detect a potential acute infection. All confirmed cases were referred to start treatment rapidly. Sexual behavior and drug use were assessed with questionnaires.

Results: Between 23 August 2021 and 19 December 2022 a total of 8,570 MSM/TW were included (27.9% PrEP users). A total of 11 HCV active infections were found (3 among PrEP users), HCV prevalence 0.13% (IC95%: 0.07%-0.23%). From 43 (0.53%) users with previously known HCV infection 3 (7.0%) were reinfections. Also, 23 (0.53%) serologic scars were found in people without previously known HCV history. From 921 (10.7%) participants with negative serology who were tested for HCV antibodies (anti-HCV) and those reactive are tested for HCV infection. A PoC method: All clients who entered the center for routine HIV testing, PrEP and non-PrEP users, were offered to be screened for HCV. A PoC serology test (Abbott® Bioline®) was performed. Positive results were immediately confirmed by a PoC PCR test (Xpert® HCV VL Fingerstick). Additionally, clients with a negative serology and pre-defined criteria (e.g. ChemSex, fisting, recent HIV diagnosis) were offered the PCR test to detect a potential acute infection. All confirmed cases were referred to start treatment rapidly. Sexual behavior and drug use were assessed with questionnaires.

Risk Factor over last 6 months | HCV+ | HCV−
--- | --- | ---
Alcohol | 27.3% | 31.4%
Cocaine | 36.4% | 28.5%
GHB | 36.4% | 19.4%
Ketamine | 0.0% | 7.1%
MDMA | 9.1% | 21.0%
Marijuana | 9.1% | 11.4%
Mephedrone | 18.2% | 11.0%
Amphetamines | 0.0% | 6.3%
Methamphetamine | 27.3% | 12.2%
Sildenafil/Tadalafil | 0.0% | 4.3%
Popper (Amyl Nitrite) | 0.0% | 13.4%
Sharing sniffing roll for drug consume | 63.6% | 61.2%
Sharing Needles | 0.0% | 0.8%
Infection by Venereal Lymphogranuloma, syphilis or genital herpes (12 months) | 18.2% | 29.1%
Practice of fisting | 27.3% | 20.9%
Anal penetration with someone who practices slaming | 36.4% | 6.3%
Receptive anal sex with occasional partners | 45.5% | 62.4%
Group sex without condom | 54.5% | 32.7%
Group Sex with Chemsex involved | 54.5% | 34.4%
Slamming | 27.3% | 1.8%
Tattoos or Piercings | 27.3% | 15.9%
Sharing sexual toys for anal sex | 0.0% | 20.1%

Conclusion: Results show a low prevalence of HCV in HIV-negative MSM/TW. This study produced criteria that allow a follow-up phase of targeted screening to establish effective HCV testing and treat strategies. Community centers play an important role in detecting cases not linked to the health system or subpopulations with difficulties in accessing the public system.

FRI-209 Late presentation for hepatitis C treatment; prevalence and risk factors in the Swiss hepatitis C cohort

Nathalie Brunner1, Thomas Grischott2, Philip Bruggmann3, 1Arud Centres for Addiction Medicine, Switzerland; 2University Hospital Zurich, University of Zurich, Institute of Primary Care, Switzerland

Background and aims: Patients with ‘late presentation’ (LP) of chronic hepatitis C infection (HCV) have already developed advanced or late-stage liver disease before entering specialised care and direct-acting antiviral (DAA) treatment. Even after successful treatment of HCV, the risk of morbidity and premature death remains elevated in this population of LP, leading to an unnecessary burden of disease. HCV LP should therefore be considered a healthcare system failure, primarily in high-income economies. This study aimed to assess the prevalence of LP within the prospective observational Swiss hepatitis C cohort (SCCS) since the introduction of DAAAs, and evaluate demographics, clinical and behavioural factors as determinants of LP.

Method: Treatment-naive participants of SCCS who received DAA treatment between 2014 and 2022 were included. LP was specified as the presence of advanced or late-stage liver disease at the treatment initiation. Demographic (age, gender, origin, education), clinical (e.g., psychiatric treatment, HIV status), and behaviour (e.g., substance use, history of alcohol) data were summarised for the whole study population and compared between the LP and non-LP strata. LP prevalence was calculated over time. LASSO regression was used in a stacked multiply imputed dataset to identify potential risk factors for LP, and odds ratios were calculated by refitting logistic regression models to the same multiply imputed data.

Results: Of the total SCCS population at the end of 2022 (n = 5829), 1258 patients (21.6%) matched the inclusion criteria. The LP prevalence decreased from mid-2015 and stabilised at 46.3% (n = 583) by the end of the study period. Among the assessed factors, male gender, higher age, and a history of alcohol drinking were associated with a higher risk of LP.

Conclusion: A startling percentage of patients with LP was found in the SCCS compared to similar studies. A particular limiting selection bias must be acknowledged, as SCCS recruits mainly in tertiary treatment centres, representing more severe cases. Regardless, LP prevalence remains higher than anticipated, considering the period of availability of DAAAs. As the appearance of LP is directly linked to the disease burden, LP must be included as a mandatory parameter in surveillance response systems of viral hepatitis elimination programs.

FRI-210 Characterizing individuals who remain to be screened and those lost to follow-up from Georgia’s HCV elimination program

Sophia Surguladze1, Davit Baiashvili1, Irina Tskhomelidze1, Tamar Gabunia2, Vladimir Getia3, Maia Tserteli3, Paige A. Armstrong4, Senad Handanagic4, Shaun Shadaker4, The Task Force for Global Health, Georgia; 2Ministry of Labour, Health and Social Affairs of Georgia, Tbilisi, Georgia, Georgia; 3National Center for Disease Control and Public Health, Georgia; 4Centers for Disease Control and Prevention, United States

Email: sophiesurguladze@gmail.com

Background and aims: Georgia initiated a National Hepatitis C Virus (HCV) Elimination program in 2015, aiming to diagnose 90% of those infected with HCV and treat 95% of those diagnosed. Individuals are tested for HCV antibodies (anti-HCV) and those reactive are tested for...
viremia (HCV RNA or core antigen). By 2023, 83.4% of adults were screened, 86.3% of those anti-HCV reactive were tested for viremia, and 84.7% of those with current infection initiated treatment. This study aims to characterize those left to screen, anti-HCV-reactive individuals with no viremia testing, and currently infected persons who have not initiated treatment.

**Method:** This study used nationwide hepatitis C screening and treatment databases. The unscreened population was estimated by comparing the number of screened adults with 2021 adult population data from the Georgian National Statistics Office. Individuals without viremia testing and treatment were identified by linking screening and treatment databases using the Georgian unique 11-digit personal ID; children were included in these analyses. Persons with documented death dates in vital statistics and those screened anonymously at harm reduction sites (n = 150, 288) were excluded.

**Results:** As of April 2022, there were an estimated 848,100 adults (around 30% of the total adult population) to be screened, 21,597 anti-HCV reactive persons to be tested for viremia, and 14,435 persons with current HCV infection to be treated.

The majority of those not screened were male (51.1%); among unscreened males, the highest percentage were aged 60–69 years (20.2%) and the lowest were aged >80 years (4.8%). Among unscreened females, a plurality were aged 50–59 years (20.4%) and the lowest percentage were aged 18–29 years (6.6%). The majority of 21,597 anti-HCV-reactive persons without viremia testing were male (66.7%). A plurality of both males and females not tested were aged 40–49 years (28.5% and 17.4% respectively); the lowest percentage in males were aged >80 years (1.9%) and in females aged <18 years (4.0%). Loss to follow-up before viremia testing was more common among those screened in blood banks (38.2%) and prisons (36.0%) compared to other screening settings.

Among 14,435 persons with untreated HCV infection, 73.4% were male. Most individuals not initiating treatment were among those aged 40–49 years for males (30.6%) and 70–79 years for females (19.1%). The percentage of individuals with current HCV infection who had not initiated treatment was highest in those screened in hospital inpatient settings (34.5%).

**Conclusion:** Georgia has made substantial progress towards elimination, but loss-to-follow-up remains a challenge. While screening and testing in certain settings may be prone to loss-to-follow-up, retention in care should be ensured, especially in settings such as prisons. Innovative approaches to beneficiary retention are needed to reach elimination.

**FRI-211**

**Cantabria on the way to HCV elimination. Differential prevalence of hepatitis C in Cantabria: @CohorteCantabria vs ETHON cohort**

Joaquin Cabezas1,2, Marta Alonso-Peña2, Susana Llerena1, Paula Iruzubeta1,2, Antonio Cuadrado1,2, María Elíceo Cano1, Carlos Fernández-Carrillo4,5, José Luis Calleja Panero4,5, Javier Crespo1,2.

1University Hospital Marqués de Valdecilla, Gastroenterology and Hepatology Department, Santander, Spain; 2Valdecilla Research Institute-IDIVAL, Santander, Spain; 3University Hospital Marqués de Valdecilla, Microbiology Department, Santander, Spain; 4University Hospital Puerta de Hierro, Gastroenterology and Hepatology Department, Madrid, Spain; 5Research Institute Puerta de Hierro Majadahonda-IDIPHIM, Madrid, Spain.

Email: joweycabezas@gmail.com

**Background and aims:** The overall prevalence of anti-HCV in the ETOHN cohort (EC; general population of Cantabria) in 2016 was 1.1%, with a prevalence of viremia of 0.34%. It is likely that the universal treatment of patients with HCV hepatitis in recent years has brought us closer to its elimination in our region.

**Aims:** 1) To determine the prevalence of seropositivity and chronic HCV infection and to analyze the associated factors in the Cantabria Cohort (CC, CohorteCantabria) in the year 2022. 2) To determine the incidence of new cases of hepatitis C and analyze the associated factors. 3) To compare these results with those obtained in the EC (year 2016).

**Method:** 1) CC: Cross-sectional study in the general population participating in the CC project, which includes volunteers and random sampling of the entire population of Cantabria between 40 and 70 years old. In the blood sample at baseline, HCV antibody (anti-HCV) detection was carried out and, in positive cases, automatic viremia quantification was performed. The volunteers included in this cohort between March 2021 and March 2022 were analyzed. 2) EC: Population-based cross-sectional epidemiological study, carried out during the years 2015–2016, exclusively including the population of the Santander node. 3) Analysis of the set of all viremic subjects in Cantabria in the same period.

**Results:** CC: 11,074 subjects were included (4,355 from 40 to 49 years; 3,823 from 50 to 59 years and 2,916 from 60 to 69 years), 38% male. Anti-HCV was detected in 102 cases (0.9% prevalence). Excluding 10 cases pending definitive study, positive HCV-RNA was detected only in 7 cases (0.06% prevalence). The remaining anti-HCV positive subjects are divided into 18 cases with spontaneous clearance and 77 cases with SVR. The total incidence of viremic patients of the entire population of Cantabria (585,000 subjects) in this period was calculated (112 cases, 19 cases/100,000 inhabitants/year), of which 65 (58%) were previously known, accordingly the incidence rate of new cases was 10 cases/100,000 inhabitants/year. When we compare these results with those obtained in the EC (previously published, doi: 10.1111/jvh.13238) we observed a lower prevalence (1.1% vs 0.9%, p < 0.001) and a great decrease in the viremia rate among seropositives in CC (34% vs 6%, p < 0.0001). The CC showed 11.8% (1310) of volunteers with elevated transaminases levels, compared to 17.8% of the population analyzed in the EC.

**Conclusion:** The current prevalence (2022) of anti-HCV was slightly lower than that reported previously (2016) in the same population; In addition, and as the most outstanding fact of the study, the prevalence of viremia was less than 10% of the seropositives. This fact, associated with an incidence of 10 new-cases/100,000 inhab./year, places Cantabria close to the goals set by the WHO for the definition of HCV elimination in a certain geographical region.

**FRI-212**

**Risk of developing cancer-comparison of HBV, HCV and smoking**

Homie Razavi1, Devin Razavi-Shearer1, Sarah Blach1, Kathryn Razavi-Shearer1, Alexis Voeller1, Iwane Gamkrelidze1, Chris Estes1.

1Center for Disease Analysis Foundation, Lafayette, United States.

Email: hrazavi@cdafound.org

**Background and aims:** Hepatitis B and C viruses (HBV and HCV) are oncoviruses, but the risk of developing cancer is often stated in an annual rate which is difficult to interpret by patients and healthcare workers. The objective of this work was to quantify the risk of cancer from viral hepatitis as compared to a known cancer-causing agent-smoking.

**Method:** A literature search was conducted to find longitudinal studies that reported the adjusted hazard ratio and odd ratio of developing hepatocellular carcinoma (HCC) among HBV/HCV infected individuals and cancer among active smokers.

**Results:** Fourteen studies were found, and the results are shown below. Adjusted hazard ratio of developing HCC for individuals infected with HBV or HCV was comparable to the risk of developing cancer for someone who is an active smoker. The odds ratio of developing HCC from HBV/HCV infection was 4–8 times higher than someone who actively smokes one pack of cigarette per day.
Conclusion: HBV/HCV infections are highly oncogenic and infected individuals have a similar or significantly higher risk of developing cancer than an active smoker or someone who smokes one pack of cigarette per day.

FRI-213
Pandemic preparedness and viral hepatitis—Global survey of hepatitis program managers and healthcare providers
Nida Ali, John Ward, Neil Gupta, Lindsey Hiebert. 1Coalition for Global Hepatitis Elimination - Task Force for Global Health, Decatur, United States
Email: nida.ali4883@gmail.com

Background and aims: At the advent of COVID-19 pandemic, hepatitis programs testing, and clinical care resources were repurposed for pandemic response before the direct investments for pandemic were operationalized. The Coalition for Global Hepatitis Elimination (CGHE) conducted a survey of hepatitis program managers (PMs) and hepatitis healthcare providers (HCPs) to assess 1) the contribution of viral hepatitis care and treatment infrastructure to pandemic response and 2) potential opportunities for leveraging the pandemic response capacity for delivery of viral hepatitis care.

Method: A web-based survey was designed in RedCAP in English for PMs and HCPs with a separate set of questions for each. The study team sent targeted solicitations via email to professional societies and CGHE networks, alongside promotions over CGHE website and social media.

Results: In all, 79 HCPs and 21 PMs responded to the survey from 46 countries across regions of the Americas (53%), Africa (26%), Eastern Mediterranean (13%), Europe (7%) and Western Pacific (1%).

In some cases, the full requested information was not completed by the respondents, hence the denominators for assessment of some variables differ (particularly for multivariate questions). More than 80% (17/21) of PMs provided direct support to the pandemic response. 73% (58/78) of HCPs provided clinical care to COVID-19 patients and 20% (16/78) are still providing care to COVID-19 patients in addition to hepatitis. 63% (49/78) of HCPs reported that space in their hepatitis clinics was re-purposed for COVID-19 patients. 66% (14/21) of PMs and 71% (56/79) of HCPs reported that PCR platforms for hepatitis testing were repurposed for COVID-19 testing during pandemic. As reported by PMs, there was an increase in PCR testing capacity at national reference laboratories (48%, 10/21), provincial public laboratories (43%, 9/21) and private laboratories (43%, 9/21). 50% (8/16) of PMs and 66% (49/74) of HCPs reported that PCR equipment acquired for COVID-19 is now also being used for hepatitis testing. 67% (10/15) of PMs reported that PCR testing shifted from manual to automated at labs. Almost all (99%, 78/79) HCPs reported...
that COVID-19 PCR turnaround time is faster than that for hepatitis B and C. Regarding teleconsultation, 72% (51/71) HCPs reported that teleconsultation was not in use before pandemic, 59% (38/64) reported that teleconsultation was introduced during pandemic and 37% (26/71) of HCPs reported that the use of teleconsultation increased during the pandemic. 42% (33/78) HCPs in the survey prefer in-person consultation, 5% (4/78) telemedicine and 53% (41/78) prefer mix of both approaches.

**Conclusion:** PMs and HCPs from a diverse set of countries reported that the resources of hepatitis testing and care were repurposed for the pandemic response, demonstrating the utility of robust hepatitis testing and treatment programs for health system resilience and epidemic response. Data suggests that COVID-19 response continues to require the use of care staff and clinic space previously used for delivery of hepatitis services. Respondents reported the expansion of COVID-19 testing services that are now being utilized for hepatitis testing. This reflects how investments in pandemic response have the potential to bolster hepatitis programs.

---

**FRI-214**

**New tools reaching hepatitis C elimination: automatic hepatitis C virus detection in presurgical evaluations**

Pablo Miles Wolfe García1, Marina Eliana Millan Lorenzo1, Marta González1, Eduardo López Fernández2, Carlos Rodríguez1, Rafael Godino Vázquez1, Rafael Ruiz Zorrilla1, Laura García Alles1, Jose Luis Fernández Forceledo1, Roya Taheri1, Pablo Palomares Rivas1, Rosa Ortiz De Diego1, Hospital Sierrallana, Torrelavega-Cantabria, Spain

Email: marinamillan@gmail.com

**Background and aims:** Hepatitis C virus (HCV) eradication is one of the many goals the WHO has set for 2030. Nevertheless, despite the efforts from the administration, scientific societies and the health care workers, it is still a defying feat. Our strategy for increasing HCV detection focuses on screening every single patient scheduled for a surgical procedure, taking advantage of the blood work extraction during their presurgical evaluation.

**Method:** We've included patients between 39 and 70 years old (age group with higher HCV prevalence). HCV antibodies (anti-HCV) were automatically added to their blood work requests by the anesthesiologists in the presurgical appointment. Prior to this, the patients are given an informative brochure where HCV is explained and verbal consent is requested, and if it is given, an additional blood sample is extracted for this specific matter. If anti-HCV antibodies come back positive, viral load is automatically added to the blood work. Both results are posteriorly sent to the Hepatology Unit, where the patients are given an appointment in order to perform a thorough physical examination, abdominal ultrasound, transient liver elastography (TLE) and broaden their blood analyses. If no counter-indication is found, antiviral therapy is initiated, which is provided by the Hospital's pharmacy.

**Results:** 1697 presurgical evaluations were carried out between February and March, 2022. No patients declined the serology extraction. Mean patient age was 56 years old, 52% of them were men. Our strategy entailed an increase by 23.5% in HCV serologies during this period (p < 0.001). We detected 17 anti-HCV positive patients, two of which presented a positive viral load, which represent a prevalence of 0.11%. Both patients were provided with a single-act HCV appointment in our unit. One patient presented a low HVC load, thus a second blood sample was extracted, resulting in a negative viral count; the patient was never treated for VHC. The second patient was a 61-year-old male who was unaware of his diagnosis. The patient presented a history of altered liver function tests and moderate alcohol consumption. In 2016, an Anti-HCV test was requested, which was positive, but no viral load was performed and the patient did not return to the follow-up consultation. While at our single-act HCV appointment, severe steatosis and liver fibrosis grade 2 were detected on ultrasound and TLE. Treatment with Sofosbuvir/Velpatasvir was initiated for 12 weeks, pending verification of sustained viral response.

**Conclusion:** These results demonstrate that the automation of the HCV serology testing in all patients who require blood work extractions, regardless of the reason and the medical unit that requests it, significantly increases the diagnosis of HCV.

---

**WEDNESDAY 21 TO SATURDAY 24 JUNE**

**TOP-055**

**Clinical features of portal hypertension and their prognostic implication in patients with Wilson's disease**

Lukas Burghart1,2, Oleksander Petrenko1, Peter Ferenci1, Michael Trauner1, Matthias Mandorfer1, Michael Gschwantler2, Thomas Reiberger1, Albert Stättermayer1, 1Medical University of Vienna, Gastroenterology and Hepatology, Vienna, Austria; 2Klinik Ottakring-Wiener Gesundheitsverbund, Gastroenterology and Hepatology, Wien, Austria

Email: burghartlukas@gmail.com

**Background and aims:** Wilson’s disease (WD) is a rare inheritable liver disease mediated by hepatic copper overload. Natural history studies indicate half of all WD patients will ultimately progress to advanced chronic liver disease (ACLD). Consequently, portal hypertension (PH) may develop, which in turn drives hepatic decompensation and impairs transplant-free survival (TFS). We therefore assessed (i) the prevalence and incidence of CSPH in the Vienna WD cohort, and (ii) evaluated the impact of CSPH on hepatic decompensation and TFS.

**Method:** Patients with verified WD diagnosis (Leipzig score ≥4), attending regular clinical visits at the Vienna General Hospital between Q3/2005-Q4/2021, were included in this retrospective study. Clinical information including CSPH-specific features and complications was recorded from individual medical records.

**Results:** Among 140 WD patients (mean age: 41.8 years, 50% women) 50 (35.7%) showed features of CSPH at diagnosis: 14 (10.0%) had gastroesophageal varices (GEV), 41 (29.3%) splenomegaly, 20 (14.3%) ascites, 19 (13.6%) hepatic encephalopathy (HE) and 3 (2.1%) experienced acute variceal bleeding. Only 10 (20.0%) WD patients with CSPH received NSBB, and only 1 (2.0%) was treated by TIPS. During a median follow-up of 9.2 years, 8 (5.7%) WD patients died with 3 deaths attributable to CSPH-related complications. GEF were associated with an increased 5-year (5Y) risk of decompensation (11.1%) and an impaired 5Y-TFS (71.4%), whereas the occurrence of HE or ascites was associated with a profound decrease in 5Y-TFS to 42.1% and 35.0%, respectively (C). Patients with compensated ACLD (cACLD) had a comparable 5Y-TFS (96.0%) to non-ACLD patients (100%), which was contrasted by the steep decline of 5Y-TFS (42.3%) in patients with decompensated ACLD (dACLD). Importantly, the combination of liver stiffness <15 kPa and platelets ≥150G/L indicated excellent prognosis (5Y decompensation rate: 0%, 5Y-TFS of 97.7%),
while patients with either liver stiffness \( \geq 15 \text{kPa} \) or platelets <150G/L showed a 5Y decompensation rate of 4.0% and a 5Y-TFS of 85.1% (B) (D).

**Conclusion:** WD patients often develop CSPH with the presence of GEV indicating a significant risk for hepatic decompensation. WD patients with ascites and/or HE show a dismal prognosis with impaired survival without liver transplantation. Hence, regular CSPH screening—as by the non-invasive markers liver stiffness \( \geq 15 \text{kPa} \) or platelets <150 G/L—is warranted in patients with WD.

**TOP-056**

**Modeling Alagille syndrome in vitro using complex induced pluripotent stem cell-derived human liver organoids**

Marie-Agnès M’Callum¹, Silvia Selleri¹, Toan Pham¹, Alexandre Archambault-Marsan¹, Kristen Vieira Lomasney¹, Massimiliano Paganelli¹. ¹CHU Sainte-Justine, Université de Montréal, Liver Tissue Engineering and Cell Therapy, Montreal, Canada

**Email:** m.paganelli@umontreal.ca

**Background and aims:** Alagille syndrome (ALGS) is an autosomal dominant hereditary multisystemic disease. In the liver, ALGS is characterized by bile duct paucity, cholestasis, fibrosis, as well as other heterogeneous clinical manifestations. The genes involved (JAG1, NOTCH2) belong to the Notch signalling pathway. No direct genotype-phenotype correlation has been established. The aim of the study was to develop a representative human model of ALGS to better understand the pathophysiology of the disease.

**Method:** We developed a new 3D in vitro model of ALGS by generating liver organoids from human induced pluripotent stem cells (iPSC). Two iPSCs clones with mutations in exon 23 of JAG1 were obtained with CRISPR/Cas9: clone A2 had a large deletion, whereas clone B3 presented a single base substitution. We generated hepatic (HPC), mesenchymal (MPC) and endothelial (EPC) progenitor cells from JAG1-mutated iPSC clones and from isogeneic control and used them to create the liver organoids. We previously showed that, within the organoids, these cells interact to become hepatocytes, cholangiocytes/biliary epithelial cells, stellate and sinusoidal cells, and form ductal plate and bile ducts (Raggi et al. Stem Cell Reports 2022). In order to determine which progenitor cell type is more predominant to obtain the disease phenotype, we generated generate hybrid organoids mixing different progenitor cell types obtained from the mutated clones and the control. We studied the impact of the mutations on the different liver cell types, and assessed the ductal plate, bile duct formation and fibrogenesis in the organoids.

**Results:** HPCs from the two clones with different JAG1 mutations showed different gene expression profiles representing the heterogeneity of ALGS: expression of hepatic markers and Notch pathway targets was strongly decreased in HPCs-A2 compared to HPC-B3 or HPC from control iPSC. Moreover, HPCs-A2 and -B3 showed a strong expression of YAP1, which attests to a dedifferentiation of HPCs. Nevertheless, a strong expression of cytokeratin genes was observed in mutated HPCs compared to healthy cells, which is commonly observed in fibrosis and cholestasis. Organoids from the two mutated clones lacked biliary structures compared to healthy organoids (Figure 1), reproducing the phenotype of ALGS. Mutated organoids from both clones showed an overexpression of inflammatory markers and increased fibrosis, as well as a loss of bile duct-associated markers, compared to control organoids. Among the 18 hybrid organoid conditions generated, only organoids with healthy HPCs were able to form proper biliary structures, attesting that mutation in HPCs (i.e., bipotent hepatic progenitors), hepatocytes and biliary epithelial cells drives the disease phenotype.

**Conclusion:** We were able to generate a representative human developmental model of Alagille syndrome using complex liver organoids derived from iPSC. These organoids recreate the hepatic niche and reproduce the histological phenotype of Alagille syndrome, which makes them an ideal model to study the pathophysiology of the disease and discover new therapeutic targets.
Long-term efficacy and safety of odevixibat in patients with progressive familial intrahepatic cholestasis: results with 96 weeks or more of treatment

Richard Thompson1, Ozlem Durmaz2, Tassos Grammatikopoulos1,3, Angelo Di Giorgio4, Quanhong Ni5, Philip Stein5, Christine Clemson5, Ekkehard Sturm6.

1Institute of Liver Studies, King’s College London, United Kingdom; 2Istanbul University, Istanbul Faculty of Medicine, Istanbul, Turkey; 3Paediatric Liver, GI, and Nutrition Centre and MowatLabs, King’s College Hospital NHS Trust, United Kingdom; 4Paediatric Hepatology, Gastroenterology, and Transplantation, ASST Papa Giovanni XXIII, Italy; 5Albireo Pharma, Inc., Boston, United States; 6Paediatric Gastroenterology and Hepatology, University Children’s Hospital Tübingen, Germany

Email: richard.j.thompson@kcl.ac.uk

Background and aims: Patients with progressive familial intrahepatic cholestasis (PFIC) may present with elevated serum bile acids (sBAs), intractable pruritus, impaired hepatic function, and growth deficits. The phase 3 studies in patients with PFIC that evaluated odevixibat, an ileal bile acid transporter inhibitor, are called PEDFIC 1 and PEDFIC 2. Using pooled data from these studies, we describe key outcomes in a subgroup of patients treated with odevixibat for ≥ 96 weeks.

Method: PEDFIC 1 was a 24-week, randomised, placebo-controlled study in children with PFIC1 and PFIC2. PEDFIC 2 is an ongoing 72–week open-label extension study that enrolled patients from PEDFIC 1 or new patients of any age with any type of PFIC. Following 72 weeks of treatment in PEDFIC 2, there is an optional extension period, with visits every 16 weeks. Patients could have reached 96 weeks of odevixibat treatment in various ways, including by receiving 24 weeks of active treatment in PEDFIC 1 plus 72 weeks of treatment in PEDFIC 2 or by receiving 96 weeks of open-label treatment in PEDFIC 2 and its optional extension. This pooled analysis spans from patients’ first dose of odevixibat to a cut-off date of 31 January 2022. The following outcomes were evaluated in patients with ≥96 weeks’ odevixibat exposure and an sBA measurement at week 96: sBAs, scratching scores, hepatic parameters, growth, and safety. Scratching scores range from 0 to 4, with higher scores indicating worse symptoms. Pruritus data were collected through week 72 of PEDFIC 2.

Results: Of the 111 patients in the pooled population (69 of whom continue on treatment at data cut-off), 36 had ≥96 weeks’ odevixibat exposure and an sBA measurement at week 96. Among these 36 (50% female), 36 had PFIC1, 61% had PFIC2, and 3% had MYO5B deficiency. At baseline, patients had elevated mean sBA, transaminase, and total bilirubin levels, moderate-to-severe pruritus, and impaired growth (Table). After 96 weeks of odevixibat treatment, there were significant reductions in mean sBAs, transaminase levels, and scratching scores and improvements in growth; only minimal changes in bilirubin levels were observed (Table). All 36 patients (100%) had treatment-emergent adverse events (TEAEs); most were mild or moderate in severity. Serious TEAEs were recorded in 6 of 36 patients, but none were drug related.

Conclusion: Odevixibat treatment for ≥96 weeks was associated with improvements in sBAs, pruritus, transaminase levels, and growth. Odevixibat was generally well tolerated.

Table: (abstract: TOP-057).

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Baseline</th>
<th>Week 96</th>
<th>p valuea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum bile acids, μmol/L</td>
<td>26.52(22)</td>
<td>11.80(20)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Scratching score</td>
<td>2.6(0.1)</td>
<td>0.9(0.2)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>ALT, U/L</td>
<td>102(23)</td>
<td>38(7)</td>
<td>0.022</td>
</tr>
<tr>
<td>AST, U/L</td>
<td>96(10)</td>
<td>49(5)</td>
<td>0.001</td>
</tr>
<tr>
<td>Total bilirubin, μmol/L</td>
<td>56(13)</td>
<td>50(17)</td>
<td>0.713</td>
</tr>
<tr>
<td>Height Z score</td>
<td>-1.5(0.3)</td>
<td>-0.9(0.2)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Weight Z score</td>
<td>-0.9(0.3)</td>
<td>-0.2(0.2)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

a p values are based on 1-sample t test for changes from baseline to the week 96 visit window; b the average of daily scratching scores from weeks 85–96 are reported; ALT, alanine aminotransferase; AST, aspartate aminotransferase; PFIC, progressive familial intrahepatic cholestasis.
TOP-058
Metabolomic profiles facilitate differential diagnosis of porto-sinusoidal vascular disorder versus liver cirrhosis
Georg Semmler1,2, Oleksandr Petrenko1,2,3,4,5, Behrang Mozayani6, Lorenz Balcar1,2, Benedikt Simbrunner1,2,5, Philipp Schwabl1,2,3,4, Lukas Hartl1,2, Mathias Jachs1,2, Kerstin Zinober1,2,5, Katharina Lampichler7, Michael Trauner1, Juan Sánchez-Avila8, Nara Marella8, J. Thomas Hannich8, Mattias Mandorfer1,2, Thomas Reiberger1,2,3,9, Bernhard Scheiner1,2,9, 1Medical University of Vienna, Division of Gastroenterology and Hepatology, Department of Internal Medicine III, Austria; 2Medical University of Vienna, Vienna Hepatic Hemodynamic Lab, Division of Gastroenterology and Hepatology, Department of Internal Medicine III, Austria; 3CeMM Research Center for Molecular Medicine of the Austrian Academy of Sciences, Austria; 4Ludwig Boltzmann Institute for Rare and Undiagnosed Diseases (LBI-RUD), Austria; 5Medical University of Vienna, Christian Doppler Laboratory for Portal Hypertension and Liver Fibrosis, Austria; 6Medical University of Vienna, Department of Pathology, Austria; 7Medical University of Vienna, Department of Biomedical Imaging and Image-Guided Therapy, Austria; 8CeMM Research Center for Molecular Medicine of the Austrian Academy of Sciences, CeMM Molecular Discovery Platform Metabolomics, Austria; 9Imperial College London, Department of Surgery and Cancer, United Kingdom
Email: thomas.reiberger@meduniwien.ac.at

Background and aims: Porto-sinusoidal vascular disorder (PSVD) is a rare vascular liver disease characterized by specific histological findings in the absence of liver cirrhosis (LC). Diagnosis and differentiation from LC remains challenging and importantly requires invasive liver biopsy. The aim of this study was to investigate metabolomic signatures of patients with PSVD, liver cirrhosis (LC) and healthy volunteers (HV) in regards to facilitating diagnosis and identifying metabolites involved in pathogenesis.

Method: We analyzed 20 serum samples from patients with histologically verified PSVD and LC as well as HV (Figure A). Participants were matched by age and gender (all three groups) as well as by BMI, MELD and current/previous hepatic decompensation (PSVD and LC). Following extraction, serum concentrations of lipids, hydrophilic metabolites and free-fatty acids were measured by LC-MS. Metabolites with ≥20% missing entries were excluded. Data were analyzed in R environment (tidyverse, rstatix). Missing values were imputed using k-nearest neighbors algorithm. Concentrations of each run were log2-normalized, scaled by Pareto technique and merged (POMA package). Partial least squares-discriminant analysis (PLS-DA) was performed for data exploration. Differential metabolites (PSVD vs LC vs HV) were identified using pairwise Limma contrasts and the Wilcoxon test. The diagnostic/discriminative value of metabolites was evaluated with MetaboAnalystR.

Results: From 539 identified metabolites, n = 208 (38.6%) were excluded, and n = 74 (13.7%) were complemented with imputation. PLS-DA discriminated LC and HV with component #1, however, PSVD

Figure: (abstract: TOP-058).
patients were partly present in both clusters (Figure B). Pyruvic acid, glutamine, triacylglycerols and isovaleric acid were key metabolites of the first component, while phosphatidylethanolamine and cholesteryl icosatetraenoate contributed to PSVD discrimination (component #2). We identified 165 differential metabolites in LC and PSVD versus HV (padj ≤ 0.01, Figure C), of which n = 39 (23.6%) were unique to the respective groups. The metabolites that contributed to most of the dataset variation were mainly down-regulated in PSVD and even further in LC (Figure D). When analyzing single differential metabolites, 1-palmitoleyl-2-eicsoate identified PSVD vs HV (mean AUROC = 0.958), while tyrosine (AUROC = 0.859) and adipic acid (AUROC = 0.821) were among the best-performing discriminators between PSVD and LC.

Conclusion: High-throughput metabolomics identified common and unique metabolic profiles in PSVD and LC. Independent validation of the metabolomic signatures is required. If confirmed, mechanistic studies should investigate the underlying molecular mechanisms to gain insights into PSVD pathophysiology.

THURSDAY 22 JUNE

THU-249

Inhibition of the renal apical sodium-dependent bile acid transporter prevents cholemic nephropathy

Ahmed Ghallab1,2, Daniela González1, Ellen Strängberg3, Ute Hofmann4, Maiju Myllys1, Reham Hassan1,2, Tom Lüdde5, Peter Akerblad3, Jan Mattsson3, Hanns-Ulrich Marschall6, Paul Dawson2, Guido Stirnimann8, Peter Boor9, Karolina Edlund1, Michael Trauner10, Erik Lindström3, Jan G. Hengstler1.

1Department of Toxicology, Leibniz Research Centre for Working Environment and Human Factors, Technical University Dortmund, Germany; 2Department of Forensic Medicine and Toxicology, Faculty of Veterinary Medicine, South Valley University, Egypt; 3Albirea Pharma, Inc., Boston, MA, United States; 4Dr. Margarete Fischer-Bosch Institute of Clinical Pharmacology and University of Tübingen, Germany; 5Department of Gastroenterology, Hepatology and Infectious Diseases, University Hospital Düsseldorf, Medical Faculty at Heinrich-Heine-University, Düsseldorf, Germany; 6Department of Molecular and Clinical Medicine/Wallenberg Laboratory, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden; 7Division of Pediatric Gastroenterology, Hepatology, and Nutrition, Emory University School of Medicine, United States; 8University Clinic for Visceral Surgery and Medicine, Inselspital University Hospital and University of Bern, Bern, Switzerland; 9Institute of Pathology and Department of Nephrology, University Hospital RWTH Aachen, Germany; 10Hans Popper Laboratory of Molecular Hepatology, Division of Gastroenterology and Hepatology, Department of Internal Medicine III, Medical University of Vienna, Austria

Email: ghallab@ifado.de

Background and aims: Cholemic nephropathy (CN) is a severe complication of several liver diseases. Since no specific treatment is currently available, we revisited the pathophysiology and tested the therapeutic strategy of inhibiting renal bile acid (BA) uptake.

Method: Cholestasis was induced by bile duct ligation (BDL) in mice. Bile flux in kidneys and livers was visualized by intravital imaging, supported by matrix-assisted laser desorption/ionization-mass spectrometry imaging (MALDI-MSI) and liquid chromatography-tandem mass spectrometry (LC-MS/MS). AS0369, a selective and orally systemically available inhibitor of the apical sodium-dependent bile acid transporter (ASBT) was developed, and its renal and hepatic effects were tested by RNA sequencing, histological, serum, and urine

Renal apical sodium-dependent bile acid transporter inhibition by AS0369 in cholemic nephropathy

ASBT, apical sodium-dependent bile acid transporter; BA, bile acid; MRP, multidrug resistance-associated protein; NTCP, sodium-laurocholate co-transporting polypeptide; OST, organic solute transporter.

Figure: (abstract: THU-249).
analyses. Translational relevance was evaluated by ASBT immunostaining in renal biopsies from CN patients.

Results: Intravital imaging showed that BAs were reabsorbed from the renal tubular lumen into specific renal tubular epithelial cells (TEC). BA enrichment led to cell death of TEC within the first days after BDL. At week 3 and later, damage of peritubular capillaries and massive leakage of BAs into the renal interstitium were observed, followed by leukocyte infiltration and fibrosis. Renal ASBT expression was maintained in TEC of BDL mice and CN patients, and treatment of BDL mice with AS0369 strongly elevated urinary BA excretion, blocked the uptake of BAs in TEC, and decreased renal tissue BA levels. In addition, AS0369 almost completely prevented kidney injury up to 6 weeks after BDL. All CN hallmarks (ie, cell death events of TEC, tubular casts, immune cell infiltration, and fibrosis) were almost completely absent in AS0369-treated mice. Also, the kidney injury marker neutrophil gelatinase-associated lipocalin (NGAL) in urine was strongly reduced by AS0369 treatment. RNA-Seq analysis demonstrated that ASBT inhibition strongly ameliorated BDL-induced gene expression changes in the kidney, while the corresponding effects in the liver were smaller but still statistically significant. The efficacy of AS0369 is not sex specific since the results were reproducible in both female and male mice.

Conclusion: BA enrichment in TEC followed by cell death is an early key event in CN. Inhibiting renal ASBT and consequently BA uptake into TEC efficiently prevents CN under conditions where serum and urinary BA concentrations are massively increased (Figure). Moreover, ASBT inhibition reduces endothelial exposure by blocking transepithelial transport. The increased urinary excretion of BAs leads to decreased blood concentrations systemically, which is favourable for all cell types that are compromised by exposure to the circulating high BA concentrations. The present findings may have clinical relevance since TEC ASBT expression is also preserved in CN patients.
Background and aims: Monogenic liver disease is caused by rare, pathogenic mutations. Exome and genome sequencing frequently identifies variants of unknown significance in these genes. It is not clear whether such non-pathogenic variants confer increased risk of liver injury beyond childhood. Here, we found that these variants increase the severity of liver damage and may act as a ‘second hit’ in adults.

Method: We identified 77 monogenic paediatric liver diseases. For each gene, we searched for evidence of a liver phenotype in individuals not known to have genetic disease using population-based datasets. We identified genome-wide significant associations (p < 5 × 10^{-8}) between variants (e.g. single nucleotide polymorphisms) and liver biochemistry (ALT, bilirubin, GGT, ALP) in n = 1,654,950 participants from the Common Metabolic Disease Portal and n = 394,841 from UK Biobank using GeneBass.

Results: We found 89 genome-wide associations for biomarkers of liver injury in otherwise apparently healthy individuals across genes from 44/77 (57%) monogenic disorders (Fig 1). For example, common variants in ABCB11 (the cause of PFIC type 2) were associated with GGT (p = 2.0 × 10^{-33}) and ALT (p = 8.4 × 10^{-39}). Similarly, common polymorphisms in JAG1 (that do not cause Alagille syndrome) were associated with GGT (p = 2.3 × 10^{-8}) and ALT (p = 5.9 × 10^{-10}). Phenotypes were found most frequently in 5/7 (71%) of cholestatic disorders and 5/7 (71%) of bile acid metabolism disorders, compared to 3/8 (38%) of congenital fibrotic disorders. In addition to affecting liver enzymes, serum lipid profile (e.g. total cholesterol) was affected by genes from 23/44 (52%).

Conclusion: Common variants in genes that cause rare monogenic liver disease also confer a risk of liver injury later in life. Understanding the mechanisms of these genes and applying them as predictors for future disease progression in adults may provide an opportunity for treatment of common liver diseases.

THU-251
CD73 high biliary tract cancer (BTC): a molecularly-defined subtype with distinct clinical implications

Massimiliano Salati1, Anna Barbato2, Fabiola Piscopo2, Lorenzo Evangelista2, Gennaro Gambardella2, Sergio Sarnaturo2, Angelica Petrillo1, Bruno Daniele1, Pasquale Pisapia4, Maria Salatiello4, Umberto Malapelle4, Giancarlo Troncone4, Antonella Iuliano5, Luca Reggiani-Bonetti6, Colm O Rourke7, Jesper Andersen7, Massimo Dominici1, Brunella Franco2, Pietro Carotenuto2,8. University Hospital of Modena, Modena, Italy; 2Department of Oncology and Hematology, Italy; 3Tigem (Telethon Institute of Genetics and Medicine), Pozzuoli, Italy; 4Ospedale del Mare, Medical Oncology Unit, Napoli, Italy; 5University of the Studies of Napoli-AOU Federico II, Department of Public Health, Napoli, Italy; 6DIMIE, Potenza, Italy; 7Section of Pathology, Azienda Ospedaliero-Universitaria Policlinico di Modena, Modena, Italy, Modena, Italy; 8Biotech Research and Innovation Centre, Department of Health and Medical Science, København, Denmark; 9Università degli Studi Federico II di Napoli, DISMET, Napoli, Italy

Background and aims: Tumour heterogeneity and the immunoregulatory microenvironment are driving forces of biological aggressiveness and treatment refractoriness in BTCs. Recently, CD73, an ecto-5′-nucleotidase, has been increasingly implicated in cancer promotion and treatment resistance, acting through the enzymatic conversion of AMP to immunosuppressive adenosine and the non-catalytic promotion of cancer plasticity, invasion and migration. Interestingly, CD73 has become a clinically validated target with several compounds undergoing advanced-phase development across various cancer types. Here, we aimed at comprehensively characterizing the role of CD73 in a well-annotated cohort of BTC patients.

Method: Medical records and FFPE tissue blocks from 70 radically-resected BTCs were retrospectively retrieved at the University of Modena. Immunohistochemistry for CD73, CD4/CD8 and FOXP3 as well as bulk whole-transcriptomic sequencing were performed (Illumina Platform). Silencing of CD73 was achieved by transient transfection of CD73-siRNA, while genetic Knock-out (KO) was performed using CRISPR-Cas system technology in two BTC cell lines (HuCCt01; RBE). Tumor growth was assessed in 2D and in 3D cell culture by using MTS assay and spheroid growth analysis before and after treatment with selected drugs. Statistical analyses were performed SPSS software (version 26; SPSS Inc., Chicago, IL, USA).

Results: Overall, 60% of BTC patients showed high CD73 expression (CD73high) and this was associated with older age (p = 0.01), gallbladder subsite (p = 0.03), and nodal involvement (p = 0.04). CD73high tumours were significantly enriched in infiltrating FOXP3+ T lymphocytes (p < 0.001) and BTC cells genetically depleted for CD73 were more sensitive to killing by reactive T cells. Transcriptomically, CD73high tumours were characterized by a distinct gene signature over-represented in EMT, TNF-alpha/NFKB, hypoxia and G/M checkpoint signaling pathways. Clinically, CD73high status was an independent predictor of poorer prognosis in multivariate analysis (p = 0.03) with ECOG PS ≥ 2 (p = 0.001) and the pathological stage (p = 0.025); consistently, the negative prognostic significance of CD73 was externally validated in transcriptome datasets of 436 resected BTC patients from three different cohorts globally (Dong et al., Jasakul et al., Nakamura et al.). Notably, CD73high tumours derived lesser benefit from adjuvant chemotherapy: relapse-free survival was 12.69 vs 6.54 months in chemoreacted and non-chemoreacted patients, compared to not reached vs 14.37 months in CD73low BTCs. In vitro models, siRNA-mediated depletion and CRISPR-CAS9 gene KO of CD73 sensitized BTC 2D and 3D culture to cisplatin/gemcitabine treatment. Moreover, the pharmacological inhibition of CD73 by AMCP enhanced the sensitivity of BTC cell lines to cisplatin/ gemcitabine treatment.

Conclusion: We demonstrated that CD73high disease represent a distinct BTC subtype characterized by an aggressive biological phenotype, resistance to standard chemotherapy and poorer prognosis. Interestingly, we provided proof-of-concept evidence that targeted genetic or pharmacologic inhibition of CD73 enhanced chemotheraphy efficacy in both 2D and 3D in vitro models of BTC. The clinical targeting of this adenosinergic ectonucleotidase holds promises of improving the efficacy of the recently-established chemo-immunotherapy standard-of-care in BTC.

THU-252
Human cytomegalovirus (HCMV) infection of macrophages induces abnormal development of cholangiocytes in an organoid co-culture model for biliary atresia

Syyd Mushifigur Rahman1, Allen KL Cheung2, Kenneth KY Wong1, Paul KH Tam3, Vincent CH Lui1. 1The University of Hong Kong, Surgery, Hong Kong, Hong Kong; 2Hong Kong Baptist University, Biology, Hong Kong, Hong Kong; 3Macau University of Science and Technology, Macao, Macao

Background and aims: Biliary atresia (BA) is a devastating biliary disease of neonates, but its pathogenesis is unclear. Human cytomegalovirus (HCMV) has been implicated to contribute to BA development from clinical association without mechanistic evidence. Macrophages mediate innate immune responses against HCMV infection. This study addresses how the interactions between HCMV, macrophages and cholangiocytes (bile duct epithelial cells) contribute to BA.

Method: Human induced pluripotent stem cell (iPSC)-derived macrophages infected by HCMV (multiplicity of infection = 1.0) and then cleansed of free viruses were co-cultured with iPSC-derived cholangiocytes in 1:1 ratio. We performed morphological examination; expression analysis of genes relevant for viral propagation/immune responses/cholangioyte development; single cell RNA-
sequencing (scRNA-seq) of infected and un-infected co-cultures at different post-infection days (PD).

**Results:** We detected expression of HCMV latent viral genes (UL138 and LUNA), elevated level of pro-inflammatory genes (IL-1β, TNF-α, CD86) in PD5 infected co-cultures; deformed cholangiocyte organoids in PD7 infected co-cultures. Bioinformatics analysis of the scRNA-seq data on PD5 co-cultures revealed two clusters of cholangiocytes (BCL2-expressing small cholangiocytes and BCL2-non-expressing large cholangiocytes). Viral genes were highly expressed in the large cholangiocytes, suggesting that large cholangiocytes were susceptible to HCMV infection. Moreover, we detected downregulation of cholangiocyte markers (KRT19, KRT18, KRT7, KRT8, EPCAM), pro-apoptotic genes (BAX and CYCS), and pro-apoptotic pathways (MYC-target v1, oxidative phosphorylation and reactive oxygen species pathway) in HCMV-infected cholangiocytes.

**Conclusion:** Our data showed that (i) HCMV-infected macrophages could transfer the virus to the large cholangiocytes; (ii) HCMV-infected cholangiocytes exhibited dysregulated cholangiocytic development; (iii) HCMV-infection induced upregulation of pro-inflammatory genes. HCMV infection could cause abnormal development of bile duct epithelium, promote inflammatory responses in the liver and contribute to disease initiation/progression of BA.

**THU-253**

**Bacterial vesicles associated virulence factors and epitope mimics in autoimmune hepatitis patients**

Swati Thangariyal¹, Chhagan Bihari², Aakriti Jain³, Manish Kumar⁴, Guresh Kumar¹, Shiv Kumar Sarin⁴, Sukriti Sukriti¹. ¹Institute of Liver and Biliary Sciences, Molecular and Cellular Medicine, New Delhi, India; ²Institute of Liver and Biliary Sciences, Department of Pathology, New Delhi, India; ³University of Delhi, Department of Biophysics, New Delhi, India; ⁴Institute of Liver and Biliary Sciences, Department of Hepatology, New Delhi, India

Email: sukritibiochem@gmail.com

**Background and aims:** Autoimmune Hepatitis (AIH) is a self-perpetuating, non-resolving hepatic inflammation of unknown cause. Possible mechanism could be epitope mimicry, where antigen shares sequence similarity with self-antigens. We aim to investigate bacterial vesicles BV proteins associated with virulence factors, epitope mimicry, and their role in inducing autoimmune like condition.

**Method:** Fractionated pre-therapy plasma of AIH patients [n = 61, biopsy proven, Hepatic Activity Index (HAI) score >2, ALT (148 ± 58.4); AST (160.7 ± 60.2)] and healthy controls (HC) n = 30 for BVs using density gradient ultracentrifugation. Confirmed by transmission electron microscopy, western blot of OMP-A and nanoparticle tracking assay. The BV associated proteins were assessed by
proteomics, which was further mapped for virulence factors (VF) using VFDB database (mgc.ac.cn/VFs/main.htm) and epitope mimicry using miPrepbase (proteininformatics.org/mkumar/mipepbase/) (database of experimentally verified mimicry peptides for both host and pathogen). Further, AIH and Healthy (HC)BV were adaptively transferred intravenously in C57BL/6J female mice. The biochemical, histological and molecular markers of hepatic injury were investigated. The immune cells infiltration was estimated in liver, spleen and whole blood using flow cytometry.

**Results:** Plasma BV were significantly higher in AIH patients than HC [10.5 vs 3.7; p = 0.003, 87.7 vs 10.3; p = 0.015]. Also, the AIH plasma BEVs progressively increase with increasing Histological Activity Index score [r = 0.62; p = 0.001], transaminases [ALT, AST] [r = 0.59; p = 0.001, r = 0.57; p = 0.001] and IgG antibodies [r = 0.37; p = 0.018]. Based on BV associated proteins identified by proteomics, upon VF mapping, we found 23% of proteins were associated with virulence factors mainly the elongation factors in AIH plasma, whereas 0% in HC-BV (p = 0.0009). Depending on the number of residue and homologues sequences, miPrepbase mapping identified an experimentally verified peptide sequence IYQIDNHQQARKPIAD of methyltransferase family mimicking component of pyruvate dehydrogenase complex of the host mitochondria. Next, upon AIH-BV administration in WT mice within 12 h, the liver enzymes, Liver weight index were elevated [AST (p = 0.0286); ALT (p = 0.0452); LI (p = 0.008)] than HC-BV. The liver histology showed raised focal acute inflammation in AIH-BV than HC-BV (p < 0.001) with significantly high infiltration of F4/80+ macrophages and Ly6G+ neutrophils in the liver (p < 0.001).

**Conclusion:** Patients with AIH carry 23% of virulence factors in BV associated proteins and associated Methyltransferase family as the epitope of pyruvate dehydrogenase complex. Also, AIH-BV upon adoptive transfer in WT mice induce AIH-like systemic inflammation, suggesting a role of bacterial products carried through BVs in the pathogenesis of autoimmune hepatitis.

**THU-254**

Transcriptomic analysis of biliary atresia finds ongoing hepatic hematopoiesis with elevated IGF2

Jake Mann1, Ye Htun Oo2, Girish Gupte1, Philip N Newsome2.

1Birmingham Children’s Hospital, Liver Unit, Birmingham, United Kingdom; 2University of Birmingham, Centre for Liver Research, United Kingdom

Email: jpmann.gsy@gmail.com

Figure: (abstract: THU-254).
Background and aims: Recent single-cell transcriptomic data has implicated foetal immune cells in the pathogenesis of biliary atresia (BA) with the role of immature B-cells in the postnatal liver particularly remaining unclear. To understand the mechanisms behind this, we performed a meta-analysis of RNA sequencing data from infants with BA at the time of Kasai and age-matched controls. Previous analyses had been limited by small numbers of controls; however, here, we have increased power to detect associations.

Method: We obtained transcriptomic data from n = 177 children with BA and n = 78 controls from Gene Expression Omnibus. After filtering and quality control, we performed differential gene expression analysis comparing BA versus control (using DESeq2), with p value adjustment for multiple testing.

Results: We identified 1,815 significantly differentially expressed genes (Fig. 1A). Many were involved in extracellular matrix remodelling/fibrosis (e.g. CAPG, TGFBI) and phagocytic activity (e.g. CHIT1, CYBA). We observed increased expression of TREM2 (Fig. 1B), which is implicated in profibrogenic scar-associated macrophages in adults and has not previously been described in children. Patients with BA had increased expression of multiple markers of haematopoiesis, including erythroid lineage (e.g. GYPH, HBAT) and early B-cell (e.g. RAG2) (Fig. 1C). We identified up-regulation of insulin-like growth factor 2 (IGF2, log2 fold change 2.5, pFDR = 2.8 × 10^-40; Fig. 1D). IGF2 is a growth factor for haematopoietic stem cells in the foetal liver. IGF2 is secreted by hepatocyte progenitors and we observed upregulation of markers of these progenitors (e.g. DLK1, Fig. 1E).

Conclusion: Postnatal liver haematopoiesis is active in children with BA but not controls, and we speculate that interactions between haematopoietic and other immune cells may exacerbate intrahepatic injury in BA. These data suggest that immature B cells producing IGF2 may be driven by IGF2 secreted by hepatocyte progenitors. Future mechanistic studies exploring interaction of immature immune cells and extracellular matrix remodelling by macrophages will provide pathogenesis mechanism of biliary injury in biliary atresia.

THU-255

Immune cell incompetence and hepatocyte differentiation defects explain mild fibrosis in a model of Alagille syndrome

Jan Mašek1,2, Jana Šimečková1,2, Iva Filipovič3, Simona Hankeova2, Jínyang He4, Noémi K. M. Van Hul2, Lenka Belicova2, Anna Maria Frontino1, Noémi K. M. Van Hul2, Lenka Belicova2, Anna Maria Frontino1.

Background and aims: Alagille syndrome (ALGS), caused by mutations in the Notch ligand JAGGED1, presents with cholestasis due to bile duct paucity. Remarkably few patients develop severe fibrosis or cancer, while recurring infections are common. Notch regulates liver and immune system development, but how these interact in ALGS is unknown. We aimed to determine whether Jag1 regulates the immune system in a model of ALGS, and how this affects inflammation and liver disease progression.

Method: In a cancer-prone genetic background, fibrosis and liver cancer prevalence were analysed in Jag1Ndr/Ndr mice, an ALGS mouse model Liver cell populations were analysed using single-cell transcriptomics, and liver, thymus and spleen with flow cytometry. Immune cell function was tested using adaptive immune cell transplantation into Rag1−/− mice, challenged with dextran sulphate sodium (DSS, ulcerative colitis model), 3,5-Diethoxycarbonyl-1,4-Dihydronicotinamide (DNC, hepatocellular cholestasis) or bile duct ligation (BDL, biliary cholestasis).

Results: Forty-five percent of Jag1Ndr/Ndr mice on C3H/C57Bl6 developed liver tumors, but no Jag1Ndr/Ndr mice developed tumors. Instead, Jag1Ndr/Ndr mice developed mild, ALGS-like, chicken-wire hepatocellular fibrosis, delayed hepatocyte differentiation with blunted cholestasis-induced inflammation, and decreased liver infiltration of CD4+ T cells. The splenic CD4+/CD8+ T cell ratio and Regulatory T-cell numbers were increased. Transplanted Jag1Ndr/Ndr lymphocytes were less reactive in a model of ulcerative colitis, with reduced CD4+ and CD8+ T-cell activation. Finally, Jag1Ndr/Ndr lymphocyte-transplanted Rag1−/− mice subjected to BDL, but not DDC, displayed three-fold less periportal fibrosis than Jag1−/−transplanted Rag1−/− mice.

Conclusion: Jag1 mutation results in delayed hepatocyte differentiation blunting inflammatory signaling. Jag1 regulates immune cell development and competence, modifying the response to bacterial infection and cholestatic liver insult. The compromised immune response of thymocytes leads to milder-than-expected fibrosis. Our study shows that the immune system interacts with liver disease to modulate fibrosis, in an insult-specific manner, with implications for progression to liver cancer. The compromised immunocompetence further concurs with the reported frequent infections in patients with ALGS. Whether Notch-modulating agents could be utilized to fine-tune fibrosis and prevent liver cancer is thus a key question for future research.

THU-256

SARS-CoV-2 productively infects human hepatocytes and induces human cell death

Cho-Chin Cheng1, Chunkyu Ko1,2, Shubhankar Ambike, Julia Sacher1, Suyyan Velkov1, Bo-Hung Liao1, Romina Bester1, Merve Gültan1, Constanze Jakwerth2, Carsten Schmidt-Weber3,4, Joachim Bugert5, Roman Wölfl3,6, Vincent Grass1, Sandra Essbauer2, Oliver Keppler4,7, Carolin Mogler1, Florian Vondran5,9, Andreas Pichlmair1,6, Ulrike Protzer1,5, 1Institute of Virology, Technical University of Munich, Munich, Germany; 2Infectious Diseases Therapeutic Research Center, Korea Research Institute of Chemical Technology, Korea, Rep. of South; 3Center of Allergy and Environment, Technical University of Munich, Germany; 4German Center for Lung Research, Germany; 5Department of Virology and Intracellular Agents, Bundeswehr Institute of Microbiology, Germany; 6German Centre for Infection Research, Germany; 7Max von Pettenkofer Institute and Gene Center, University of Munich, Germany; 8Institute of Pathology, Technical University of Munich, Germany; 9RefMedIES, Hannover Medical School, Germany.

Background and aims: Growing evidence suggests a liver tropism of SARS-CoV-2. However, it is unknown whether SARS-CoV-2 directly infects primary hepatocytes, how the virus enters the cell, and whether and to which extent the virus replicates and is cytopathic in hepatocytes. We therefore characterized the features of hepatic SARS-CoV-2 infection.

Method: We analyzed mRNA and protein expression of two major cellular entry factors of SARS-CoV-2, ACE2 and TMPRSS2, in primary human hepatocytes (PHH) and hepatoma cell lines and investigated permissiveness to SARS-CoV-2 and the capacity to replicate and spread the virus. Virus-induced cytopathic effect was monitored by real-time live-cell imaging.

Results: PHH and hepatoma cell lines express ACE2 and TMPRSS2, and their expression levels are comparable to those of lung-derived epithelial cells. Upon SARS-CoV-2 infection of hepatocytes with European lineage B.1.177 or Omicron sublineage BA.1, viral markers were readily detectable, whereas remdesivir treatment reduced viral load by 1.8–4.0 log10, indicating productive replication. Knockdown of ACE2 or TMPRSS2 in hepatocytes impaired virus replication, corroborating the use of the canonical entry pathway exploited by SARS-CoV-2 in cells of the respiratory tract. Progeny viruses shed by infected hepatocytes showed the typical coronavirus morphology with “crown-like” appearance and induced plaques after secondary
infection, indicating that hepatocytes can support the complete SARS-CoV-2 replication cycle and may thus contribute to virus spread outside of the respiratory tract. Furthermore, SARS-CoV-2 infection of hepatocytes was cytopathic, suggesting that liver damage observed in COVID-19 patients may result from virus-induced cytotoxicity.

**Conclusion:** SARS-CoV-2 productively infects human hepatocytes via ACE2 and TMPRSS2 and induces hepatocyte death. Our findings help to explain hepatotropism of SARS-CoV-2 and liver damage observed in COVID-19 patients.

**THU-257**

**Characterizing the role of human cytomegalovirus infection associated with biliary atresia**

Zuodong Ye1, Vincent CH Lui2, Allen KL Cheung1. 1Hong Kong Baptist University, China; 2The University of Hong Kong, China

Email: akcheung@hkbu.edu.hk

**Background and aims:** Congenital Human cytomegalovirus (HCMV) infection cause a broad spectrum of neonatal diseases including biliary atresia (BA), which is the major cause of infantile obstructive jaundice. Although previous studies have implicated a correlation between HCMV and BA, the pathogenesis of HCMV associated BA remains poorly understood. This study aims to illustrate the intrinsic link between HCMV infection and BA and elucidate the molecular mechanism of HCMV-associated BA.

**Method:** Liver tissue with BA and non-BA (choledochal cysts [CC] and hepatoblastoma [HB]) were used to perform DNAscope assay to detect HCMV-DNA. Moreover, human induced pluripotent stem cell (iPSC)-derived cholangiocyte-like cells (CLC) organoids were used to establish a direct HCMV infection model to investigate the role of HCMV in the development of BA. Mock and HCMV-infected CLC organoids were used to examine morphological features, mode of virus infection and bulk RNA-seq analysis.
Results: A total of 49 human liver tissues (29 with BA and 20 with non-BA) were investigated for HCMV infection. Among them, 19 of BA (65.5%) and 7 of non-BA (35%) were HCMV-DNA positive. The infection of CLC organoids by HCMV strain TB40/E encoding enhanced green fluorescent protein (TB40/E-eGFP) resulted in reduced organoid growth and induced deformation. DNAscope data showed an overall higher presence of HCMV-DNA than GFP+ cells in infected CLC organoids. Very lower viroses production in the supernatant of infected CLC organoids was observed. Bioinformatics analysis of the bulk RNA sequencing data showed that the differential expression genes (DEG) between mock and HCMV infected organoids are highly enriched in the epithelial-mesenchymal transition (EMT) pathway. qRT-PCR and immunostaining data verified that HCMV infection decreased the E-cadherin expression and increased N-cadherin expression. Moreover, HCMV infection induced upregulation of pro-inflammatory genes.

Conclusion: Our data showed that: (1) higher percentage of HCMV infection in BA patients than non-BA patients and HCMV infection is closely related to BA pathogenesis; (2) HCMV infection of CLC organoids exhibited low-level productive or persistent infection; (3) HCMV infection promoted the EMT process of CLC organoids. The persistence of HCMV infection likely induce inflammation and EMT that contribute to the development of BA.

THU-258
Rescue of PKU disease phenotype using hepatic progenitor by cytosine base editor and prime editor in vitro
Myounghoi Kim1,2, Sung-Ah Hong2, Hayoon Kim1,2, Elsy Soraya Salas Silva1,2, Michael Adisasmita1,2, Ji hyun Shin1,2, Sangsu Bae4, Dongho Choi1,2.
1Hanyang University College of Medicine, Korea, Rep. of South; 2Hanyang University, Research Institute of Regenerative Medicine and Stem Cells, Korea, Rep. of South; 4Seoul National University College of Medicine, Department of Biomedical Sciences, Korea, Rep. of South
Email: crane87@hanyang.ac.kr

Background and aims: Phenylketonuria (PKU) is an autosomal recessive liver disease caused by point mutation. The PKU patient suffers from seizures, skin rashes, and a musty odor in the breath, skin, or urine due to highly accumulated L-phenylalanine (L-Phe) in the blood by the dysfunction of phenylalanine hydroxylase (Pah). Genome editors such as cytidine base editor (CBE) and prime editor (PE) promise great precise and safe editing of DNA. The CBE converts cytosine to thymine (C > T) using deaminase and the prime editor corrects multiple nucleotides (∼80 bp) using reverse transcriptase. To overcome genetic-based PKU diseases, genome editors are powerful treatments option.

Method: Mouse primary hepatocytes (mPHs) were isolated from the PKU disease mouse model liver. To generate mouse chemically derived hepatic progenitors (mCdHs), the mPHs were cultured with a reprogramming medium for 7 days by Kim et al in 2019. The mCdHs were transfected with CRISPR-Cas9 and guide RNA (gRNA) plasmids by electroporation and performed sequencing of the Pah locus to validate the gene correction efficiency.

Results: We generated normal mCdHs (Pah+/+, Wild-mCdHs) and disease mCdHs (Pah−/−, Homo-mCdHs) to demonstrate the similar properties between them. Then, we transfected the editing tools into Homo-mCdHs and expanded them clonally to enhance the correction rate, demonstrating that the cytosine base editor (CBE) group increased the editing rate from 5.5% to 93%. Next, we used prime editor 3, PE3, and its modified version, PE5 to confirm the editing efficiency and showed a 5-fold increase in PE5 than PE3 (PE3, 1.8% to PE5, 10.7%) without clonal expansion. Finally, we analyzed the Tyr level in all hepatic differentiated groups (Wild-mCdH-Heps, Homo-mCdH-Heps, and Homo-edited-mCdH-Heps) and indicated

Figure: (abstract: THU-258).
increased Tyr level in the edited group indicating restoration of L-Phe metabolism.

Conclusion: These findings demonstrate an effective and safe gene editing system with high efficiency of gene correction and low frequency of insertion/deletion (indel) mutation for the rescue of PKU disease phenotype in vitro.

Supported by: This research is funded by grants from National Research Foundation of Korea (2021M3A9H3015390) and National Research Foundation of Korea (2022R1F1A1073058).

THU-259
ARBM-101 as an emerging potent therapeutic option for Wilson disease
Banu Akdogan1, Eun-Jung Kim2, Emilie Munk3, Dasol Kim2, Judith Nagel4, Eok Park5, Byong-Keol Min2, Hongjie Lee2, Dongsik Park2, Chunjiai Jung2, Weonbin Im2, So-Young Eun2, Thomas Damgaard Sandahl3, Hans Zischka1-4. 1Helmholtz Munich, Germany; 2ArborMed Co. Ltd, Korea, Rep. of South; 3Aarhus University Hospital, Denmark; 4Technical University Munich, Germany; 5University of Michigan, United States; 6Iowa State University, United States; 7LMU Munich, Germany
Email: zischka@helmholtz-muenchen.de

Background and aims: Wilson disease (WD) is a rare genetic disorder manifested by acute or chronic liver dysfunction due to copper overload. WD is caused by failure of copper homeostasis in the liver due to disruptive mutations of a copper transporter, Atp7b. Current copper-chelating drugs in clinical use cannot promptly reduce copper levels to normal physiological range. Besides unwanted drug reactions and non-adherence issues, the progression of liver disease is frequently inevitable due to copper toxicity, representing a highly unmet medical need. As previously introduced, methanobactins are natural, bacteria- originated, high-affinity copper distribution, mobilization, and excretion patterns by ARBM101 were studied by PET-scans in live animals using 64Cu. HepG2 cell lines with or without intact Atp7b were tested for impacts of ARBM-101 on copper-dependent enzymatic activities (e.g., SOD1). In the same cells, we investigated ADME of ARBM-101 using ARBM-101-specific monoclonal antibodies and quantified copper levels using ICP-MS.

Results: As recently introduced, ARBM-101 demonstrated its superior efficacy of reducing copper overload from WD rat livers. Its uniqueness is in its rapid removal of excess copper via biliary/fecal excretion accompanied by profound ameliorations in liver function. PET-scans further validated these results. In vitro cellular assay results, including enzyme activity assays, revealed a strong safety profile of ARBM-101 as well as providing first clues on its ADME.

Conclusion: Our data highlight an unprecedented therapeutic potential with a convincing safety profile of ARBM-101 as an emerging potent therapeutic option for WD.

THU-260
Novel pathogenic ABCC2 variants identified in patients with Dubin-Johnson syndrome and further functional evidence in abnormal bilirubin metabolism
Wenting Tan1, Yunjie Dan1, Xing Wan1, Weimei He1, Josiah T. George1, Yan Zhu1, Xiaomei Xiang1, Yi Zhou1, Guohong Deng1. 1Department of Infectious Diseases, Southwest Hospital, Third Military Medical University, China
Email: gh_deng@hotmail.com

Background and aims: Dubin-Johnson syndrome (DJS) is an inherited disorder of bilirubin metabolism, characterized by conjugated hyperbilirubinemina, darkly pigmented liver and presence of brown pigment in hepatocytes due to defective bilirubin excretion into bile. This rare condition is caused by mutation in ABC2 gene which encodes the transmembrane protein MRP2 acting as a transporter in bilirubin metabolism. However, only a few pathogenic variants were identified. In this study, we aimed to investigate mutation spectrum and related functional explanation for this condition.

Method: An idiopathic jaundice cohort with 229 patients who visited our hospital between Oct 2017 to Sep 2022 were included in this study. We developed a targeted next-generation sequencing panel in which 43 disease-causing genes known to be associated with inherited metabolic liver disease were involved in, including those resulting in unconjugated (UGT1A1 for Gilbert syndrome, Crigler-Najjar syndrome) and conjugated hyperbilirubinemia (ABCC2 for DJS, SLCO1B1 and SLCO1B3 for Rotor syndrome). All patients applied this panel to explore relevant causing mutations and identify DJS patients as well as its mutation spectrum. Furthermore, we investigated how the ABC2 variants affect the function of MRP2 protein in terms of their production, location, and transport activities in HEK293T cells by construction MRP2 expression plasmids with candidate mutations.

Results: Among all patients, 11 cases were diagnosed as DJS (7 males) by biopsy and genetic test. The median age was 26 years (range 18–51 years). All of them had conjugated hyperbilirubinemia with a median DBIL level of 57.1 μmol/L (32.2–119.0 μmol/L) and total serum bilirubin levels of 128.3 μmol/L (64.8–170.2 μmol/L), meanwhile with normal liver enzyme, kidney and coagulation function. In accordance with the ACMG guidelines, we identified 12 pathogenic variants on ABC2, as follows, of which 11 are novel including six frameshift variants which finally resulting protein translation termination (Y396X40, I452fsX11, A1413fsX49, S1476X13, E1462fsX7, I1512fsX11), two nonsense (Y1275X, R911X), three missense (V1419G, R393W, IT1489_1491GPQ), and one previously reported pathogenic splice donor mutation (c.1815+2T>A). We
established HEK293 cell lines expressing the first three identified DJS-related variants. Compared to the wild-type, expressed E1462fsX7 and ITI 1489_1491GPQ MRP2 (both in nucleotide-binding domain) were mislocated and mainly retained in the endoplasmic reticulum, meanwhile led to a 50% decreased protein production and 50% decreased transport activity, suggesting defective bilirubin excretion into bile in this condition. No MRP2 protein was expressed from HEK293 cells transfected with a 452fsX11 mutant (located at membrane-spanning domain), suggesting loss-of-function of transporting substrates like bilirubin. Additionally, 8 of

Figure 1. Novel pathogenic ABCC2 variants identified in patients with Dubin-Johnson syndrome and functional analysis. A-B: Liver biopsies stain for DJS Case 1 (A) and Case 2 (B), large amounts of pigment deposits found in the hepatocytes, and extensive intrahepatic cholestasis, no evidence of fibrosis was observed. C-D: Genogram and mutation patterns for DJS Case 1 (C) and Case 2 (D). Affected individuals are denoted by solid symbols. The mutations were inherited from father and mother respectively for both pedigrees. E: Summary of the basic characteristics and pathogenic variants detected in the 11 DJS patients. e.g., I452fsX11 indicates amino acid changed at 452 (Isoleucine, I) due to frameshift mutation and resulting translation termination after 11 amino acids shifting (stop at 453aa). F: Western blot analysis of mutant (I452fsX11, E1462fsX7 and ITI 1489_1491 GPQ) MRP2 expressed in HEK293 cells, showing decreased or non protein production. Loading 0.8 µg (left) and 1.6 µg (right) protein. G: Export of glutathione-conjugated monochlorobimane (GS-MCLB) by mutant MRP2 from HEK293 cells showing decreased transport activity. H: Indirect immunofluorescence for subcellular distribution of mutant MRP2 in HEK293 cells by confocal laser scanning microscopy.

Figure: (abstract: THU-260).
11 cases also presented known pathogenic mutations in UGT1A1 gene, which suggested an explanation for their accompanying raised serum indirect bilirubin level.

**Conclusion:** We described here eleven novel pathogenetic ABC2 mutations in DJS. The functional analysis indicated that these mutations caused deficient maturation and dysfunction/loss-of-function of MRP2 protein in transport activity. These results expand on the spectrum of ABC2 mutations and provide further evidence that these mutations involved in the defective bilirubin excretion in DJS.

**THU-261**

**Albumin levels are associated with portal hypertension in patients with porto-sinusoidal vascular disorder**

Lucia Lapenna1, Simone Di Cola1, Marco Mattana1, Stefania Gioia1, Manuela Merli1. 1Sapienza University Rome, Department of Translational and Precision Medicine, Italy

**Background and aims:** Porto sinusoidal vascular disorder (PSVD) is a term recently introduced to identify a group of patients with a rare vascular liver disease characterized by hepatic sinusoidal and portal venules lesions, with or without portal hypertension. Little is known about the natural history of these patients and why some patients will develop specific signs of portal hypertension and others will not. The aim of this study was to investigate differences between these two groups: patients with clinically significant portal hypertension (PSVD/PH+) and patients without it (PSVD/PH−).

**Method:** we retrospectively evaluate data from 32 patients actively followed at our department with diagnosis of PSVD according to VALDIG criteria. T-test and Fisher statistical analysis were performed.

**Results:** 32 patients were identified. Among them 21 patients were men (66%) and mean age at diagnosis was 43.9 years. Nineteen patients were PSVD/PH+ and showed specific and non-specific signs of portal hypertension at diagnosis (mainly esophageal or gastric varices (75%)). Thirteen patients were PSVD/PH− with no specific signs of portal hypertension. No significant histological differences were observed between the two groups. Albumin levels at diagnosis were normal in all patients as expected, but PSVD/PH+ patients showed significantly lower albumin level compared to those PSVD/PH− (3.85 vs 4.27, p < 0.05, respectively) (Table 1). During a median follow-up of 131 ± 64 months, 5 patients in the PSVD/PH+ group developed clinically significant portal hypertension. Interestingly, basal albumin level in this sub-group were significantly lower compared to the sub-group of patients that did not develop portal hypertension (3.72 vs 4.43 p < 0.05) in the same time frame.

**Table:**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>PSVD/PH+ (19)</th>
<th>PSVD/PH− (13)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex (M) n (%)</td>
<td>13 (68)</td>
<td>8 (61)</td>
<td>0.72</td>
</tr>
<tr>
<td>Age (yrs)</td>
<td>46 ± 7</td>
<td>39 ± 11</td>
<td>0.23</td>
</tr>
<tr>
<td>- Histological lesions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Obliterative portal</td>
<td>4</td>
<td>4</td>
<td>0.68</td>
</tr>
<tr>
<td>- Venopathy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Incomplete septal</td>
<td>6</td>
<td>2</td>
<td>0.41</td>
</tr>
<tr>
<td>- Fibrosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Nodular regenerative</td>
<td>5</td>
<td>2</td>
<td>0.67</td>
</tr>
<tr>
<td>- Hyperplasia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Portal tract</td>
<td>17</td>
<td>11</td>
<td>0.99</td>
</tr>
<tr>
<td>- Abnormalities</td>
<td>8</td>
<td>7</td>
<td>0.72</td>
</tr>
<tr>
<td>- Sinusoidal fibrosis</td>
<td>10</td>
<td>10</td>
<td>0.26</td>
</tr>
<tr>
<td>Albumin at diagnosis</td>
<td>3.65 ± 0.45</td>
<td>4.27 ± 0.36</td>
<td>0.003</td>
</tr>
</tbody>
</table>

**Conclusion:** albumin level at diagnosis is associated with the presence of portal hypertension in PSVD patients, despite having the same histological lesions. Furthermore, it may predict which patients are more likely to develop specific signs of portal hypertension during the natural history of the disease. Further prospective studies are needed in order to confirm this evidence and to be able to implement a prognostic model for this rare disease.

**THU-262**

**Genetic modifiers of liver phenotypes in pediatric Wilson disease: liver biopsy and transient elastography based study**

Marcin Krawczyk1,2, Wojciech Janczyk2, Wiktor Smyk2, Diana Kaminska2, Piotr Milkiewicz2, Susanne N Weber3, Wieslawa Grajekowska4, Maciej Pronicki5, Piotr Socha1. 1Department of Medicine II, Saarland University Medical Center, Saarland University, Homburg, Germany; 2Laboratory of Metabolic Liver Diseases, Medical University of Warsaw, Warsaw, Poland; 3Department of Gastroenterology and Hepatology, Medical University of Gdansk, Gdansk, Poland; 4Liver and Transplant Medicine Unit, Medical University of Warsaw, Warsaw, Poland; 5Department of Pathology, The Children’s Memorial Health Institute, Warsaw, Poland

**Background and aims:** Wilson disease (WD) is a rare, chronic liver disease caused by mutations in the ATP7B gene leading to impaired copper metabolism. The progression of WD varies among patients, but fatty liver is present in most cases. In the current study, we investigate potential genetic modifiers of liver disease progression in children with WD, including fatty liver-associated polymorphisms.

**Method:** Prospectively, we recruited 84 children (boys 50%, mean age 9 ± 5 years) with WD. There were eight pairs of siblings in this cohort, and one sib from each was randomly picked for further analysis. Liver function tests, including copper metabolism parameters, were measured before the initiation of the treatment. A liver biopsy was conducted in 59 children at diagnosis of WD. During the follow-up (median 3.6 years, range 6 months–10 years), a total of 46 patients underwent non-invasive assessment of liver stiffness measurement (LSM) and controlled attenuation parameter (CAP). Genotyping of the seven variants known to modulate liver injury (i.e., PNPLA3 p.I148M, TM6SF2 p.E167K, MTAR1 p.A165T, HSD17B13 rs72613567, MBOAT7 p.G17E, ABCB4 p.T175A and ABCB4 c.711) was performed using TaqMan assays with fluorescence detection. Genotype frequencies in WD patients were compared to 313 adult controls without liver diseases.

**Results:** A total of 79% of patients displayed steatosis S1-S2 in liver biopsy; fibrosis F2-F4 was present in 75% of patients, whereas 5% had no fibrosis at baseline. At the follow-up, the median LSM was 5.3 (range 3.1–9.0) kPa and CAP was 248 (range 171–363) dB/m. Patients with steatosis S0, S1, S2 and S3 in liver biopsies presented with increasing median CAP at the follow-up, i.e., 218, 240, 255, and 266 dB/m, respectively. The TM6SF2 p.E167K polymorphism was more frequent in children with WD (p = 0.035) as compared to controls. Carriers of this variant presented with higher CAP at the follow-up despite receiving WD treatment (p = 0.04). The PNPLA3 polymorphism was linked with a trend of increased risk of developing steatosis ≥S2 (OR = 2.40 p = 0.06) at baseline. Finally, carriers of the variants associated with protection against fatty liver, namely HSD17B13 and MTAR1, had lower risk of microsteatosis at liver biopsy (OR = 0.34, p = 0.02), and presented with a lower CAP at follow-up (p = 0.01), respectively.

**Conclusion:** Common genetic polymorphisms can modulate the course of WD in pediatric patients. Since steatosis is frequent in pediatric WD and persists during follow-up, testing of these genetic variants might help stratify patients risk of disease progression.
**THU-263**

**In vivo adenine base editing reverts C282Y in an HFE-mouse model and improves iron metabolism**

Simon Krooss1, Alice Rovai2, Michael Ott1, 1Medizinische Hochschule Hannover, Gastroenterology, Hepatology and Endocrinology, Hannover, Germany; 2Medizinische Hochschule Hannover, Transfusion Medicine, Hannover, Germany

Email: krooss.simon@mh-hannover.de

**Background and aims:** Hereditary Hemochromatosis (HH) is one of the most common genetic diseases in the European population, with a prevalence of 1:200/400. Among the four different types, the most common form is Type 1, a homozygous p.C282Y mutation in the HFE gene, in which a guanosine is replaced by an adenosine (c.845 G > A). This mutation results in the misfolding of the HFE protein, thereby losing its ability to work as a sensor for the iron content in the bloodstream. This can cause accumulation of iron in various organs, mostly in the liver, heart and pancreas, thus leading to the development of chronic diseases. Using adenine base editing, we aimed to correct this most common mutation in vivo in an HFE-mouse model.

**Method:** We have developed a precise and sensitive GFP-based reporter system to screen for potent adenine base editor gRNAs targeting the C282Y mutation in the HFE gene. Subsequently 129-Hfetm.1.Nca mice were treated with an AA V8 split-vector coding for the adenine base editor ABE7.10 and a mutation-specific gRNA. After vector administration, animals were fed with iron-enriched chow and the adenine base editor ABE7.10 and a mutation-specific gRNA. After 4 months, the experiment was terminated. Liver sections and vector administration of a high vector dose (1 × 10^{12} vector genomes), we achieved an in vivo editing efficiency of 10.65 ± 1.24% and further reduction of hepatic iron accumulation as measured via Prussian blue staining. In addition, using RNAseq analysis of isolated hepatocytes, we could observe the beneficial effect of our therapeutic vector in highly iron-overloaded HFE-mice on transcriptional level.

**Conclusion:** Both low- and high dose administration of our therapeutic adenine base editing vector led to physiological levels of hepcidin in the blood and significant reduction of hepatic iron overload. Therefore, we consider our therapeutic approach as an important proof-of-principle for future in vivo gene correction therapies for monogenic liver diseases.

**THU-264**

**Alpha-1 antitrypsin inclusions sequester 78 kDa glucose-regulated protein in a bile-acid inducible manner**

Igor Spivak1, Nurdan Gueldiken1, Valentyn Usachovy1, Lei Fu1,2, Fa-Rong Mo1, Gökce Kobazi Ensari1, Franziska Hufnagel1, Malin Fromme1, Christian Preisinger1, Pavel Strnad1, University Hospital RWTH Aachen, Aachen, Germany; 2Ruikang Hospital Affiliated to Guangxi University of Chinese Medicine, Nanning, China

Email: ispivak@ukaachen.de

**Background and aims:** The homozygous PiZ mutation (PizZ genotype) is the predominant cause of severe alpha-1 antitrypsin (AAT) deficiency and leads to liver disease via the polymerization and accumulation of AAT in hepatocytes. To better understand this relationship, we systematically analyzed the composition of AAT aggregates in mice and humans. Since a subset of PiZZ subjects develops neonatal cholestasis, we investigated the impact of cholic acid (CA) challenge in PiZ mice, an animal model of PiZZ-associated liver disease.

**Method:** AAT inclusions were isolated from PiZ mouse livers via fluorescence-activated and immunomagnetic sorting (FACS/MACS), while Triton X-insoluble proteins were obtained through high salt extraction. Wild-type (WT) mice and individuals without AAT mutation (PIMM genotype) served as controls. Inclusion composition was evaluated by mass spectrometry (MS), immunoblotting, and immunostaining. Mice were administered 2% CA-supplemented chow for seven days.

**Results:** In insoluble fractions from PiZ mouse livers, MS identified the endoplasmic reticulum chaperone 78 kDa glucose-regulated protein (GRP78) as the most prominent non-AAT protein. This finding was confirmed via immunoblotting of insoluble fractions and reproduced in FACS/MACS isolates (panel A). In PiZ mice, CA feeding resulted in higher serum liver enzymes than in their WT littermates (AST: 390 ± 680 vs. 180 ± 185 U/l, p < 0.05; ALT: 480 ± 241 vs. 213 ± 82 U/l, p < 0.01; AP: 170 ± 20 vs. 100 ± 43 U/l, p < 0.01; panel B) and higher levels of apoptotic hepatocytes (3.3 ± 0.5 vs. 1.2 ± 0.3 cells/200x-field; p < 0.01). This was accompanied by stronger accumulation of GRP78 in the AAT inclusions of CA treated versus untreated PiZ mice (32 ± 12% vs. 4.8 ± 5.2%, p < 0.05; panel C) that was seen via immunoblotting and immunostaining, while the total AAT and GRP78 protein levels remained unaltered. The accumulation of GRP78 within AAT inclusions was confirmed in human PiZZ livers (panel D).

**Conclusion:** Our results demonstrate that GRP78 is a major constituent of AAT inclusions, and its increased retention after CA feeding may promote cholestatic liver injury.
THU-265

Human induced pluripotent stem cells-derived hepatocytes: a very effective tool for functional studies of rare liver diseases

Benedetta Blarasin1,2, Valentina Tiriticco2, Sara Maggiore1,2, Eva Dariol1,2, Gabriele Codotto1,2, Claudio Tiribelli2, Cristina Bellarosa2. 1University of Trieste, Department of Life Sciences, Italy; 2Fondazione Italiana Fegato-Italian Liver Foundation, Italy

Email: benedetta.blarasin@fegato.it

Background and aims: Among the models for the study of rare liver diseases, established cell lines and primary hepatocytes have numerous limitations, including short survival time, incomplete cell polarization, and invasiveness. Induced Pluripotent Stem Cells (iPSCs) represent an important resource since they can be obtained from the patient in a non-invasive way, expanded indefinitely, and differentiated into hepatocytes, carrying the individual-specific genetic background. Moreover, iPSCs obtained from healthy donors are an ideal tool since they can be genetically modified using CRISPR-Cas9 technology, introducing specific disease-related mutations before differentiation into hepatocytes. This study aims to obtain human-derived, polarized, and genetically modifiable hepatocytes to study the molecular mechanisms and perform drug screening for rare hepatic diseases.

Method: iPSC-derived human hepatocytes were obtained from urine samples as described by Zhou (Nat Protoc, 2012, doi: 10.1038/nprot.2012.115) and Matakovic (Methods Mol Biol 2022, doi: 10.1007/978-1-0716-2557-6_4.). Urine was collected from healthy donors, children, and adults of both sexes. Exfoliated renal epithelial cells (i.e. urinary cells) were isolated from the specimen and characterized both morphologically and by RT-qPCR. Urinary cells were de-differentiated through lentiviral vector transduction containing the
four Yamanaka factors, maintained in culture until iPSC colonies appeared and characterized by RT-qPCR. Differentiation of iPSCs was obtained by sequential changing of culture mediums enriched with specific molecules and growth factors involved in the differentiation process (definitive endoderm, hepatic progenitors, and induced hepatocytes).

**Results:** Urinary cells m-RNA quantitative PCR analyses confirmed the positive expression of epithelial genes (claudin, E-cadherin) and renal tubular genes (L1CAM, NR3C2) together with the absence of fibroblast gene expression (SLUG). The cells showed to be resistant, enduring without problems with both passaging and thawing. Urinary cells de-differentiated into iPSCs presented the expression of embryonic genes (h-ERT, NANOG and LIN-28). iPSCs showed an unlimited replication potential and sustained repeated freezing and thawing cycles with success. The differentiation of iPSCs to definitive endoderm, hepatic progenitors, and induced hepatocytes was followed morphologically.

**Conclusion:** We obtained induced hepatocytes from urine-derived iPSC. This model will be used to insert specific disease-related mutations, to study the molecular mechanism of the disease, and to evaluate suitable treatments on iPSC-derived hepatocytes. Urinary cells and iPSCs could be used to establish a biobank. Unfortunately, the entire procedure requires a long time to be performed (2–3 months).

**THU-266**
Ancillary diagnostic biomarkers in autoimmune hepatitis
Chhagan Bihari$^{1}$, S Muralikrishna Shasthry$^{1}$, Shabir Hussain$^{1}$, Archana Rastogi$^{1}$, Shiv Kumar Sarin$^{1}$, 1Institute of Liver and Biliary Sciences, Delhi, India
Email: drcbsharma@gmail.com

**Background and aims:** There are no specific tests for the diagnosis of autoimmune hepatitis, and it also has overlapping histological features with other conditions like primary biliary cholangitis (PBC), acute hepatitis (AH), drug-induced liver injury (DILI), and chronic hepatitis (CH). We aimed to identify the circulatory and histological repertoires that can serve as auxiliary tests for autoimmune hepatitis.

**Method:** Serum samples from age and gender matched treatment naïve histologically confirmed cases of autoimmune hepatitis (PBC, AH, DILI, CH, and healthy control, n = 10 each) were subjected to label-free proteomics analysis as a derivation phase. Uniquely expressed proteins in AIH were validated on age and gender matched different subsets of AIH, AH, DILI, CH (N = 50 each), and PBC (n = 26) by ELISA on serum samples and immunohistochemistry (IHC) on liver biopsies. These proteins were also assessed in seropositive and seronegative cases of AIH, and with the disease activity.

**Results:** In the initial analysis of autoimmune hepatitis as compared to disease and healthy controls, there were 41 differential proteins compared to CH, 28 compared to PBC, 86 compared to healthy controls, 37 to DILI, and 24 to acute hepatitis. After comparing all the groups, 5 uniquely different protein molecules were identified (afamin, epididymis tissue protein Li-173, gelsolin, vitronectin, and interferon alpha inhibitor Ig delta fc region (IGHD)). On validation, serum samples of afamin, gelsolin, epididymal tissue protein Li-173, and vitronectin were high in AIH cases, whereas IGHD was lowest in AIH cases as compared to other groups (Fig 1A). Seropositive AIH cases (ANA+, ASMA+) had significant elevation of these proteins than seronegative AIH (Fig 1B) except IGHD, where it was lower in seropositive cases. On tissue IHC the expression of afamin, epididymal tissue protein, gelsolin, and vitronectin was most significant in AIH (Fig. 1C). In autoimmune hepatitis cases, serum levels of epididymis tissue protein and gelsolin correlated with histological activity index (HAI) ($r = 0.721$ and 0.616, $p < 0.001$), respectively.

**Conclusion:** Afamin, Epididymis tissue protein Li-173, Gelsolin, Vitronectin and IGHD can be used as non-invasive auxiliary biomarkers for the diagnosis and severity of autoimmune hepatitis.
**THU-267**
Identification of correctors for traffic-defective ABCB4 variants by a high-throughput screening approach

Mounia Lakli1, Julie Dumont-Ryckembusch2, Veronica Crespi3, Julie Charton2, Virginie Vauthier4, Amel Ben Saad1, Elodie Mareux1, Manon Banet1, Martine Lapidus5, Emmanuel Gonzalez6, Emmanuel Jacquin7, Florent Di Meo8, Benoît Deprez9, Florence Léroux10, Thomas Falguieres11, 1Université Paris-Saclay, UMR S 1193 Inserm-Physiopathogenesis and Treatment of Liver Diseases, Oksal, France; 2Institut Pasteur de Lille, U1177 Inserm, University of Lille-Drugs and Molecules for Living Systems, Lille, France; 3U1248 Pharmacology and Transplantation-Ω Health Institute, Centre de Biologie et de Recherche en Santé-Université de Limoges, Limoges, France; 4Sorbonne Université, Saint-Antoine Research Center, UMR S 938 Inserm, Paris, France

Email: thomas.falguieres@inserm.fr

**Background and aims:** The ABCB4 (ATP-binding cassette subfamily B member 4) transporter, also known as multidrug resistance protein 3 (MDR3), is a transmembrane protein located at the canalicular membrane of hepatocytes and it ensures the secretion of phosphatidylcholine into bile canaliculi. Phosphatidylcholine is a fundamental component of bile. Through the formation of mixed micelles, it allows the solubilization of cholesterol and the protection of the biliary epithelium from the detergent action of bile salts. Many missense variations in the ABCB4 gene cause several rare cholestatic diseases, the most severe one being one progressive familial intrahepatic cholestasis type 3 (PFIC3), which appears during the first years of life and can evolve into cirrhosis and liver failure before adulthood. To date, more than 50% of patients do not respond to conventional treatments, making liver transplantation the ultimate alternative therapy. Thus, this research project is dedicated to characterize and validate new pharmacological correctors of the maturation and canalicular localization of the I541F and L556R variants. On the other hand, these three correctors seem to have a variant-specific effect since they do not significantly rescue ABCB4-I541F and -L556R variants with only one of these molecules (CPD-3). Moreover, these drug candidates inhibit ABCB4-WT activity at different levels. Dose-response analyses were subsequently performed with the three correctors of interest to find a compromise between correction of ABCB4 traffic and inhibition of the secretory function using lower drugs concentrations. These analyses allowed us to decrease the inhibitory effect of the drugs and partially rescue the function of ABCB4-I541F with CPD-2.

**Conclusion:** Our results allowed us to validate, on the one hand, three pharmacological correctors of the maturation and canalicular localization of ABCB4-I541F and -L556R variants. On the other hand, these three correctors seem to have a variant-specific effect since they do not significantly rescue ABCB4-I490T traffic. Moreover, these molecules inhibit ABCB4-WT function at different levels. These results might be explained by the direct interaction of these molecules with ABCB4 key functional residues during the protein folding process. However, we were able to compass the inhibitory effect by lowering drug concentration in treated cells, and thus partially rescue the function of ABCB4-I541F and -L556R variants. This study opens the path to chemical optimization of these molecules to increase their benefit/inhibition ratio and further considering their validation in preclinical models.

**THU-268**
Schistosoma mansoni infection-associated oxidative stress triggers hepatocellular proliferation

Verena von Buelow1, Nicola Buss2, Jakob Lichtenberger2, Lukas Härtle2, Christoph G. Grevelding3, Martin Roderfeld4, Elke Roeb5, 1Department of Gastroenterology, Justus Liebig University Giessen, Giessen, Germany; 2Department of Gastroenterology, Justus Liebig University Giessen, Giessen, Germany; 3Institute for Parasitology, Justus Liebig University Giessen, Giessen, Germany

Email: verena.von-buelow@innere.med.uni-giessen.de
Background and aims: Schistosomiasis is one of the most common parasitic infections of humans worldwide. The eggs of Schistosoma mansoni induce chronic granulomatous liver inflammation. Recent data from animal models and cell culture experiments suggest that this parasite may predispose patients for hepatocellular carcinoma (HCC). Therefore, we analysed whether S. mansoni infection-induced oxidative stress provokes hepatocellular replicative stress in a hamster infection model.

Method: Female hamsters (n = 5) were infected either with male and female cercariae of S. mansoni (bisex, bs; producing eggs) or cercariae of one gender (monosex sex, ms; no eggs produced) or non-infected (control). Hepatocellular markers for proliferation, DNA repair, oxidative stress, and cell cycle control were analyzed by qRT-PCR, western blotting and immunohistochemistry. The mechanistic interaction of the aforementioned cellular processes were analyzed by gain and loss of function experiments in human hepatoma cells (HepG2) and proliferation was determined by a Bromodesoxyuridin (BrdU)-Assay.

Results: The hepatic expression of Minichromosome maintenance 7 (Mcm7)-mRNA was significantly increased in bs-infected hamsters compared to ms- or non-infected hamsters suggesting the involvement of schistosome eggs. Moreover, in vitro treatment of HepG2 cells with soluble egg antigens (SEA) led to an increase of Mcm7-mRNA. We next investigated hepatic Cyclin D1, required for cell cycle G1/S transition and PCNA, which is central to both DNA replication and repair. Both Cyclin D1 and DNA polymerase processivity factor proliferating cell nuclear antigen (PCNA) were elevated on the protein level in livers of bs-infected hamsters. The addition of GSH diminished SEA-induced Cyclin D1 and PCNA to control levels. p-H2AX, a marker for DNA damage and the proliferation marker Ki67 were colocalized in nuclei of perigranulomatous hepatocytes. SEA-induced proliferation was diminished by the reactive oxygen species (ROS) scavenger GSH.

Conclusion: Recently, S. mansoni infection has been discussed as a predisposition for HCC. We demonstrate that S. mansoni infection, and in particular schistosome egg antigens, not only disturb the DNA replication but also induce aberrant cell cycle regulation and proliferation by hepatocellular oxidative stress. Our results explain at least partially how S. mansoni infection promotes the development of HCC.

THU-269
Biliary atresia human cholangiocyte organoids demonstrate increased oxidative stress response
Yara Hamody¹, Adi Har-Zahav², Keren danan³, Raanan Shamir², Irit Gat-Viks⁴, Orith Waisbourd-Zinman². ¹Tel Aviv universty, Schneider Children’s Medical Center of Israel, Petach Tikva, Israel; ²Schneider Children’s Medical Center of Israel, Petach Tikva, Israel; ³Tel Aviv universty, Israel
Email: yarahamody@gmail.com

Figure: (abstract: THU-269).
**Background and aims:** Biliary atresia (BA) is a form of biliary fibrosis typically diagnosed in previously healthy newborns before the age of 3 months, with extrahepatic bile duct obstruction and progressive liver fibrosis. The etiology of the disease is unknown. Here we aimed to identify the pathophysiology of the primary cholangiocyte injury in human BA and the potential for recovery, using bulk and single cell gene expression data from different BA patients.

**Method:** We cultured human cholangiocyte organoids (HCOs) derived from BA patients and non-BA controls, in order to identify pathways involved with BA cholangiocyte injury. Differentially expressed pathways were further studied using qPCR and western blotting in a candidate gene approach.

**Results:** BA derived HCOs display deformed shape and lumen obstruction. RNA sequencing results identified differentially expressed genes in BA HCOs involved in several biological pathways, including endoplasmic reticulum (ER) stress, unfolded protein response, generation of reactive oxygen species, and drug metabolism (Figure 1A). The results were validated at the RNA and protein levels. We used RT-PCR to compare differences in gene expression-related ER stress between BA patients and non-BA controls. Superoxide dismutase 3 (SOD3) is an extracellular antioxidant defense against oxidative damage, which deficiency induced spontaneous liver injury and fibrosis. SOD3 was downregulated by 7 fold \((p = 0.0067)\) in BA patients compared to control (Figure 1B). WFS1 is a component of the IRE1 and PERK signaling pathways which negatively regulates the ER stress response, was downregulated by 5 fold \((p = 0.0062)\) in BA patients compared to control (Figure 1C).

**Conclusion:** BA derived HCOs are characterized by ER stress and unfolded protein response, which may be result in dysfunctional cell-to-cell adhesion. These findings shed light on mechanisms of injury in BA and may contribute to the discovery of potential therapies.

**THU-270**

Clinical characteristics and pathogenic mechanism of five new ABCB4 missense mutations in progressive familial intrahepatic cholestasis type 3

Yuhang Weng1,2,3, Yufeng Zheng1, Dandan Yin1, Qingfang Xiong1, Wei Chen1, Jinlong Li1, Yongfeng Yang1. The Second Hospital of Nanjing, Affiliated to Nanjing University of Chinese Medicine, China; The Second Hospital of Nanjing, Affiliated to Nanjing University of Chinese Medicine, Department of Hepatology, China

**Background and aims:** This study analyzed five new missense variants associated with progressive familial intrahepatic cholestasis type 3 (PFIC-3).

**Method:** We recruited seven PFIC-3 patients and studied five ABCB4 [adenosine triphosphate (ATP)-binding cassette 4] missense mutations in clinical characteristics and vitro cell model. Especially focus on clinical pathology, ABCB4-mRNA expression, multidrug resistance protein 3 (MDR3) level, cellular sublocalization, stability and phosphatidylcholine functional activity.

**Results:** We identified five missense mutations in the clinical cohort of this study. Their clinical manifestations are mainly cholestasis. Under HE staining, bile duct injury could be seen, and the immunohistochemical expression could be normal or decreased. In the cell model, the c.1865G>A (p.G622E) mutation resulted in decreased ABCB4-mRNA expression \((p < 0.05)\) and endoplasmic reticulum retention in a cell model; the mutations c.1757T>A (p.V586E) \((p < 0.01)\), c.2362C>T (p.R788W) and c.3250C>T (p.R1084W) \((p < 0.0001)\) reduce MDR3 phosphatidylcholine secretion activity.

**Conclusion:** The main clinical manifestation of PFIC3 is cholestasis. All five missense mutations were pathogenic in vitro. And the results were also consistent with liver pathology. This further confirms that missense mutations affect clinical outcomes.
THU-271
Immortalized patient-derived cell models for analysis of liver disease
Matthias Weiand¹, Vanessa Sandfort¹, Oksana Nadzemova¹, Iyad Kabar², Jonel Trebicka¹, Hartmut Schmidt³, Andree Zibert¹.
¹Münster University Hospital, Medical Clinic B, Münster, Germany; ²Raphaelsklinik Münster, Münster, Germany; ³Essen University Hospital, Essen, Germany
Email: andree.zibert@ukmuenster.de

Background and aims: For many diseases, including rare monogenic liver diseases, patient-derived cells are the gold standard of experimental studies. However, materials derived from biopsies are limited and the proliferation of primary cells is frequently restricted to a few days. Epithelial cells found in the urine (UCs) represent a non-invasive source for establishment of continuously growing cell lines. The aim of this study was to establish cellular platforms that were used to recapitulate pathomechanisms of liver diseases employing (i) gene transfer of oncogenes and (ii) by reprogramming to induced pluripotent stem cells (iPSCs) followed by differentiation into hepatocyte-like cells (HLCs).

Method: UCs were collected from patients having different liver disease (Wilson disease (WD), hereditary transthyretin amyloidosis (hATTR), HFE-related hemochromatosis, or autosomal dominant polycystic liver disease (ADPLD). Cells were subjected to immortalization by oncogenes (HPVE6E7, cyclinD1/CDK4R24C and hTERT/p53DD) or subjected to reprogramming and differentiation. Cells were analyzed using proliferation assay, flow cytometry, qRT-PCR, and Cyto-ID autophagosome staining.

Results: Gene transfer of several oncogenes led to a stable proliferation of primary cells. Oncogene-immortalized UCs showed similar high expression of epithelial, fibroblast and renal markers. Similarly, primary and immortalized UCs could be efficiently reprogrammed to iPSCs and differentiated to HLCs that showed typical markers of primary hepatocytes. Cells encoding a novel Sec61A1 mutation observed in an ADPLD patient showed a significant downregulation of autophagy suggesting that a reduced autophagy is related to liver cyst formation. Chloroquine could specifically promote autophagy in ADPLD-derived cells.

Conclusion: In summary, our data suggest that immortalization of primary cells by oncogene transfer or reprogramming/differentiation allow establishment of cellular platforms for molecular studies to explore pathways of pathomechanisms in liver disease and the evaluation of drugs for therapy.

THU-272
CRISPR/Cas9-mediated gene correction of Wilson disease H1069Q mutation in an iPSC cell model
Andree Zibert¹, Matthias Weiand², Oksana Nadzemova¹, Jonel Trebicka², Vanessa Sandfort¹.
¹Universitätsklinikum Münster, Medizinische Klinik B, Münster, Germany; ²Universitätsklinikum Münster, Medizinische Klinik B, Münster, Germany
Email: vanessa.sandfort@ukmuenster.de

Background and aims: Wilson disease (WD) is induced by an autosomal recessive gene defect in the copper transporting protein ATPase7B that leads to cytotoxic copper concentrations in the body, prominently in the liver. The most frequent mutation in the Caucasian population is the point mutation H1069Q. In this study, the H1069Q mutation was targeted by using the clustered regularly interspaced short palindromic repeats (CRISPR) associated nuclease 9 (Cas9) technology in WD specific induced pluripotent stem cells (iPSCs). We asked whether a gene correction is feasible, safe and efficient. Moreover, we studied whether gene-corrected iPSCs maintain the ability to differentiate into hepatocyte-like cells (iHeps) and whether such cells escape from toxic copper.

Method: Epithelial cells from freshly donated urine obtained from a WD patient carrying the compound heterozygous mutation H1069Q/N1270S were collected and reprogrammed into iPSCs. WD iPSCs were transfected with the plasmid PX459.H1069Q plus a set of single-stranded oligo DNA nucleotides (ssODNs) for homology-directed repair (HDR). Single iPSCs clones were analyzed by Sanger sequencing followed by hepatic differentiation and MTT assays.

Figure: (abstract: THU-271): Overview of two pathways for immortalization of primary cells. A The combined retroviral transfer of oncogenes into primary cells (UCs) was used to gain highly proliferative, immortalized cells (imUCs). B Primary cells were reprogrammed to induced pluripotent stem cells (iPSCs) and in vitro differentiation to hepatocyte-like cells (HLCs).
Results: After genome engineering, 46% of the cell clones indicated a gene correction of the H1069Q mutation. The second mutation N1270S was not affected indicating the high specificity of the methodology. Corrected iPSCs could be differentiated to ihepLS and indicated an improved resistance to a challenge by high copper concentrations.

Conclusion: The current study demonstrates that in vitro genome engineering with CRISPR/Cas9 has a remarkable therapeutic potential to efficiently correct WD, thus further contributing to novel therapeutic approaches for WD specifically and monogenetic rare diseases in general.

Liver transplantation for Wilson disease: single center experience

THU-273

Background and aims: Wilson disease (WD) is a rare genetic disorder with protean manifestations. Even if liver transplantation (LT) could represent an effective therapeutic option for patients with end-stage liver disease, LT however, remains controversial in the presence of neuropsychiatric involvement. We present our experience on transplantation in Saudi patients with WD.

Method: All patients who had LT in King Faisal Specialist Hospital during the period January 2004-January 2021 were included in the analysis. The medical records were accessed for all the information, including the demographics of the patients, genetic screen, MELD score and evidence for neuro-psychiatric WD. Graft and patient survival was determined using Kaplan Meier analysis.

Results: A total of 34 patients with WD were transplanted in our center. Females were 18 (53%). The mean age at the onset of symptoms was 24.7 years [range 13–45 years] were included. WD was diagnosed by genetic testing and or Leipzing scoring system using 24-hours urinary collection. The mean MELD score at the time of transplantation was 23.9 and 70% of the patients had Child-C score. Isolated hepatic phenotype was the referral phenotype for LT in 23 patients (67.6%). The combination of neuro-psychiatric and decompensated liver disease was present in 3 patients (8.8%); 5 patients (14.7%) presented with neurological impairment on decompensated liver disease and one patient had isolated neuro-psychiatric WD. Two patients had LT for acute liver failure. One patient had hepatopulmonary syndrome (HPS) and another presented with hepatocellular carcinoma (HCC). Living-related LT was performed in 18 patients (53%). Post-transplant, 5 patients with neuropsychiatric symptoms recovered completely (14.5%). Biopsy proven, acute cellular rejection occurred in 11 and all responded to treatment. Biliary anastomotic strictures developed in 6 patients, managed successfully with ERP/PTC intervention. PTLD was diagnosed in one patient, 7 years post LT. Four deaths occurred during the study period (11.7%) and two of them within 30-days post LT. The one, five and ten-years survival rates were 94%, 90% and 80% respectively.

Conclusion: WD remains an uncommon, indication for LT. There was a trend of improvement in the neuro-psychiatric manifestations of WD post transplantation, but more studies are needed. The overall graft and patient survival was excellent and accordingly, LT provides a viable management option for WD with hepatic decompensation.

Effects of tetrathiomolybdate, trientine, and penicillamine on intestinal copper uptake: a randomized placebo-controlled 64Cu PET/CT study

THU-274

Background and aims: In Wilson Disease (WD), ATP7B protein dysfunction leads to copper accumulation with hepatic and neurologic disease. Treatments include D-penicillamine (PEN) and trientine tetrahydrochloride (TRI), which chelate Cu and cause cupriuresis, and the investigational copper binder bis-choline-tetrathiomolybdate (TTM). We hypothesized that inhibition of intestinal uptake of copper could be an additional mechanism of action for these drugs. We used PET/CT to investigate the effects of TTM, TRI, PEN and placebo (PLA) on intestinal 64Cu uptake. The study was conducted in healthy volunteers as ATP7B is not involved in intestinal copper absorption.

Method: Healthy subjects (n = 32) were included in a partly double blinded placebo-controlled randomized trial. Subjects underwent 64Cu PET/CT before treatment and after 7 days of treatment with TTM, TRI, PEN or PLA, each serving as their own controls. Subjects fasted 1 h before and after treatment doses, with final dose 1–2 h prior to 64Cu ingestion. Participants were scanned 1 h and 15 h after an oral dose of 64CuCl2. Radiocopper was quantitated in liver and in blood (aorta). If a drug were to reduce intestinal copper absorption, less copper would be detected in the blood and liver. Subjects followed standardized diets, including a 6 h fast prior to 64Cu ingestion.

Results: Compared to pretreatment, hepatic 64Cu levels measured 1 h post-64Cu dose were reduced by 92% on TTM (p < 0.02), 53% on TRI (p < 0.02), 23% on PEN (p = 0.16), and 3% on PLA (p = 1.00) (Figure 1). At 15 h post-64Cu dose, hepatic 64Cu levels were reduced by 82% on TTM (p < 0.02), 50% on TRI (p < 0.02), 31% on PEN (p = 0.04) and increased 12% on PLA (p = 0.16). At 15 h, gallbladder 64Cu activity demonstrated biliary excretion after TRI, PEN and PLA, but not after TTM. TRI, PEN and PLA did not significantly change blood 64Cu activity at 1 h and 15 h post 64Cu administration. Even though TTM reduced hepatic 64Cu activity by 80–90%, blood activity was only 40% less at 15 h indicating reduced hepatic clearance. No compensatory increased 64Cu activity was detected in other organs. In summary, after TTM, a smaller percent of ingested 64Cu dose was present in blood and liver; it was absent in bile and not increased in other organs, indicating significant inhibition of intestinal 64Cu absorption. In addition, the reduced ratio of liver/blood 64Cu activity indicated reduced hepatic clearance, presumably due to formation of TTM-Cu-albumin complexes in blood.

Conclusion: 64Cu PET/CT is useful for evaluating the effect of medical therapy on intestinal copper absorption and copper distribution in the body. The greater inhibition of intestinal copper absorption of TRI compared to PEN may explain recent observations of more urinary copper excretion with PEN but equal efficacy in treating WD patients. TTM markedly reduced hepatic 64Cu uptake, reducing both intestinal absorption and hepatic clearance by TTM-Cu-albumin complex formation.
THU-275
Four-fold increased mortality rate in patients with Wilson’s disease: a population-based cohort study of 151 patients
Fredrik Åberg1, Ying Shang2, Rickard Strandberg2, Axel Wester2, Linnea Widman2, Hannes Hagström2. 1University of Helsinki, Finland; 2Karolinska Institutet, Sweden
Email: hannes.hagstrom@ki.se

Background and aims: Few studies have investigated mortality rates in patients with Wilson’s disease and compared these to the general population. Further, there is a lack of information on the risk of other potential outcomes. Here, we examined mortality and other outcomes in a population-based study of patients with Wilson’s disease in Sweden.

Method: We did a population-based cohort study, using nation-wide registers to identify all patients with a first diagnosis of Wilson’s disease between 2002 and 2020 in Sweden. Each patient was matched by age, sex and municipality with up to 10 reference individuals from the general population. Validated registers were used to investigate outcomes up to 19 years after baseline in patients and reference individuals. Cox regression was used to examine overall mortality, while Fine and Gray regression models were used for secondary outcomes, considering non-outcome death and liver transplantation as competing events. Validation of the ICD-10 code for Wilson’s disease was performed by comparing ICD-codes to medical journals from 26 patients seen at the Karolinska University Hospital.

Results: A total of 151 patients with a first diagnosis of Wilson’s disease were identified and matched with 1,441 reference individuals. The positive predictive value for the ICD-10-code for Wilson’s disease was 100%. Median age at baseline was 26 years (interquartile range [IQR] 17–42) and 50% were males. At baseline, previous diagnoses of neurologic disease were seen in 17%, and psychiatric diagnoses had been made in 24%, figures considerably higher than in reference individuals (7% and 10%, respectively, both p < 0.001). During a mean follow-up of 6.6 years (range 0–19), 10 (6.6%) patients with Wilson’s disease died, compared with 31 (2.2%) reference individuals. This translated to a hazard ratio of 3.84 (95%CI = 1.84–8.05). The excess risk of death was confined to patients aged 20 or more at diagnosis. Cumulative mortality at 10 years was estimated to

Figure: (abstract: THU-274): Fused coronal paired, representative images from one subject in each group of eight individuals, whole-body PET/CT images showing 64Cu activity in the liver, heart and parts of the small intestine and colon. 1 hour after 64Cu ingestion. Radioactivity scale 0 (black)-15 (white).
12.7% (95% CI: 7.0–22.5) in patients with Wilson’s disease, compared to 3.3% (95% CI: 2.2–5.0) in reference individuals. Higher risks of several secondary outcomes in patients with Wilson’s disease were identified (Table 1).

Conclusion: In this large, population-based cohort study, patients with Wilson’s disease had an almost 4-fold increased rate of death, as well as increased risks for several clinically important outcomes, compared to matched individuals from the general population.

THU-276
Risk of cirrhosis and hepatocellular carcinoma in hemochromatosis: a Swedish nationwide cohort study
Hanne Åström1, Axel Wester1, Linnea Widman1, Per Stål1,2, Hannes Hagström1,2,1 Karolinska Institutet, Department of Medicine, Huddinge, Sweden; 2Karolinska University Hospital, Division of Hepatology, Department of Upper GI, Sweden
Email: hanne.astrom@ki.se

Background and aims: Hereditary hemochromatosis (HH) is a common genetic disorder of iron metabolism characterized by excessive absorption and accumulation of dietary iron. Patients with HH are thought to be at increased risk of severe liver disease (SLD) and hepatocellular carcinoma (HCC) but current research have produced conflicting results. In this study, we aimed to establish the rates of SLD and HCC in a nationwide cohort study of patients with HH.

Method: Patients with administrative coding for HH (n = 7711) in the Swedish National Patient Register between years 1969–2016 were included. Patients with HH were matched for age, sex and municipality with 74089 controls. Patients were stratified into groups based on age, sex and year of diagnosis. Cox proportional hazards regression was used to determine the rates of SLD and HCC and cumulative incidence was illustrated using Kaplan Meier curves.

Results: In the entire cohort, SLD was diagnosed in 862 persons (HH: 133 [1.7%], vs. Controls: 91 [0.1%]). During the entire study period, patients with HH had a higher rate of SLD and HCC compared to matched controls (adjusted hazard ratio aHR 8.2; 95% CI: 7.1–9.5 and aHR 14.1; 95% CI: 10.4–19.2 respectively). The rate of SLD development decreased over time with highest rates in 1969–1980 (aHR 19.3; 95% CI: 7.4–50.3) and lowest in 2001–2010 (aHR 6.8; 95% CI: 5.5–8.4). Men experienced a higher rate of SLD development when compared to women (aHR 8.8; 95% CI: 7.4–10.4, vs. aHR 7.1; 95% CI: 5.3–9.4) and this was additionally reflected in rate of HCC development (aHR 17.3; 95% CI: 12.2–24.7 vs. aHR 6.2; 95% CI: 3.0–12.6). Patients older than 66 years of age experienced the highest rate of SLD development (aHR 10.4; 95% CI: 8.0–13.6) compared to younger subgroups where rates were observed to be similar (51–65: aHR 7.4; 95% CI: 6.0–9.2 and <50: aHR 7.8; 95% CI: 5.6–10.9).

Conclusion: In this nationwide cohort study, patients with HH experienced an increased rate of SLD and HCC compared to matched controls from the general population. Over time, the rate of SLD and HCC development in patients with HH seemed to decrease; possibly owing to improved diagnostic techniques and change in management over time. We identified a few subgroups of patients with diverging risk estimates of liver-related outcomes that may require different clinical follow-up strategies. Thus, further studies are warranted to optimize the management of patients with hemochromatosis.

THU-277
Association of circulating Z-polymer with adverse clinical outcomes and liver fibrosis in adults with the PiZz alpha-1 antitrypsin deficiency genotype
Malin Fromme1, Laura Rademacher1, Samira Amzou1, John Ripollone4, Christi Cook3, Isabel Zacharias2, Yang Chen2, Bing Han2, Pavel Strnad1.
1University Hospital RWTH Aachen, Aachen, Germany; 2Vertex Pharmaceuticals, Boston, United States
Email: pstrnad@ukaachen.de

Background and aims: The PiZ variant is the most clinically relevant variant in alpha-1 antitrypsin deficiency (AATD), leading to impaired AAT secretion from the liver and Z-polymer formation. To improve the limited knowledge about the biological role of circulating Z-polymers, we studied its association with adverse clinical outcomes, and with liver fibrosis.

Method: PiZZ adults from the European Alpha-1 Liver Cohort, recruited between 2015 and 2020, were included. Serum circulating Z-polymer was measured via an immunoassay method specific for the polymERIC form of AAT. Time-to-event analyses were conducted for PiZZ adults followed for adverse clinical outcomes over a median of approximately 4 years. Cox proportional hazards models were used to describe the association between binary circulating Z-polymer (>versus ≤analytic sample median circulating Z-polymer) and adverse clinical outcome (composite of first instance of liver-related hospitalization, listed/realized liver transplant, or all-cause mortality). Cross-sectional associations between circulating Z-polymer and baseline liver fibrosis (FibroScan stiffness) were evaluated using the Spearman correlation (rho). Analyses were stratified by augmentation therapy status because augmentation therapy may influence polymer, leading to inflated Z-polymer levels.

Results: There were 431 PiZZ adults (baseline: average age of 55 years, 46% female, average body mass index [BMI] of 25.1 kg/m²; 59% reported augmentation therapy use). Baseline mean circulating Z-polymer was higher among PiZZ adults on augmentation therapy (26.0 mg/L, n = 254) than those not on augmentation therapy (19.3 mg/L, n = 173). Of 292 PiZZ adults followed for adverse clinical outcomes, 28 (9.6%) had adverse clinical outcomes (4 liver-related hospitalizations, 4 listed/realized liver transplants, 20 deaths [6 liver-related, 4 lung-related, 10 other/unknown]). Higher circulating Z-polymer (median circulating Z-polymer = 21.5 mg/L) was associated with increased risk of adverse clinical outcome in an age-adjusted model (hazard ratio [HR]: 1.96, 95% confidence interval [CI]: 0.78–4.94, n = 289). Similar associations were observed after stratification by baseline augmentation therapy status (augmented HR: 2.97, 95% CI: 0.95–9.33, n = 182; non-augmented HR: 3.52, 95% CI: 0.73–17.1, n = 106). At baseline, among those not on augmentation therapy, circulating Z-polymer was positively correlated with FibroScan stiffness (rho: 0.29; n = 138).

Conclusion: Higher circulating Z-polymer was associated with shorter time to adverse clinical outcome, and positively correlated with FibroScan stiffness, in PiZZ adults. Circulating Z-polymer may identify patients at risk for rapid liver disease progression in AATD.
THU-278
Blood markers of immune activation help distinguish paediatric activated T-cell hepatitis from other causes
Tamir Diamond1,2, Catherine Chapin3,4, Adriana Perez1,2, Kathleen M. Loomes1, 2, Estella Alonso3,4.
1University of Pennsylvania, Pediatrics, Philadelphia, United States; 2Children’s Hospital of Philadelphia, Pediatrics, Philadelphia, United States; 3Northwestern University, Feinberg School of Medicine, Pediatrics, Chicago, United States; 4Ann and Robert H. Lurie Children’s Hospital of Chicago, Chicago, United States
Email: diamondt@chop.edu

Background and aims: Paediatric acute liver failure (PALF) and acute severe hepatitis of unknown cause has recently attracted increased attention due to reports since late 2021 of a possible worldwide increase in cases which may be related to adenovirus infection. To date, a direct viral cause has not been identified in most patients with indeterminate PALF. Instead, recent studies support that many cases of indeterminate acute hepatitis and PALF are driven by an overactive immune response involving effector memory CD8 T-cells, designated activated T-cell hepatitis. Here we describe a multicentre cohort of children with acute hepatitis and PALF presenting between March 2020 and August 2022 and demonstrate how patients can be differentiated by immune phenotype.

Method: Retrospective chart review to identify patients aged 3 months-18 years with acute severe hepatitis and PALF at Ann and Robert H. Lurie Children’s Hospital of Chicago and Children’s Hospital of Philadelphia. Patients with biochemical evidence of severe liver injury within 8 weeks of onset of illness measured by alanine aminotransferase (ALT) above 500 were included. PALF was defined per the PALF Study Group criteria as previously published. Patients with evidence of chronic liver disease or non-hepatic intrinsic causes for hepatitis were excluded. Demographic, clinical, laboratory, and pathology data were collected by chart review. Patients were classified as activated T-cell hepatitis based on liver biopsy with moderate-dense CD8+ T-cell inflammation (if available) and/or development of severe aplastic anaemia with negative evaluation for other causes. Patients were labelled unknown (IND-hep) if no aetiology of the liver injury was identified.

Results: 124 patients met inclusion criteria: 83 patients with known diagnoses (23 with PALF) (fig. 1A), 14 with activated T-cell hepatitis (3 PALF), and 27 with IND-hep (11 PALF) (fig 1B). Most patients (97%) had recovery with native liver. Total serum bilirubin and soluble IL-2 receptor at presentation were higher in activated T-cell hepatitis patients compared to IND-hep (fig 1C and 1D). Clinical T- and B-cell flow cytometry studies noted increased percentage of CD8+ T-cells (fig. 1E) and increased HLA-DR+ (activated) T-cells (fig. 1F) in the activated T-cell hepatitis compared to IND-hep group. An increase in CD8 T-cell perforin and granzyme B expression was only seen in patients with activated T-cell hepatitis (figure 1G).

Conclusion: In a multicenter cohort of children with acute liver injury we found that patients with activated T-cell hepatitis have distinctive differences in clinically available peripheral blood immune biomarkers compared to patients with IND-hep which can be used help to identify this diagnostic group. Better characterization of this group will facilitate additional understanding of the underlying pathophysiology, and development of targeted therapies, to improve transplant-free survival.

THU-279
Lorenz Michael Pammer1, Benedikt Schaefer1, Bernhard Pfeifer2,3, Sabrina Neururer4, Claudia Lamina4, Florian Kronenberg4, Herbert Tilg3, Heinz Zoller1.
1Medizinische Universität Innsbruck, Dept. of Internal Medicine I, Innsbruck, Austria; 2Landesinstitut für Integrierte Versorgung Tirol, Innsbruck, Austria; 3Landesinstitut für Integrierte Versorgung Tirol, Innsbruck, Austria; 4Landesinstitut für Integrierte Versorgung Tirol, Innsbruck, Austria; 5Medizinische Universität Innsbruck, Institute of Genetic Epidemiology, Innsbruck, Austria
Email: heinz.zoller@i-med.ac.at

Figure: (abstract: THU-278).
Background and aims: Hemochromatosis is a genetic disease characterized by increased transferrin saturation and liver iron overload. The most common disease-associated genotype is p.C282Y homozygosity in HFE. The reported incidence of iron overload in patients who are compound heterozygous for p.C282Y and p.H63D as well as for those patients who are homozygous for p.H63D varies widely between studies. The present study assesses disease penetrance in a large European cohort with a median follow-up of 10.6 years/follow-up of up to 25.1 years.

Method: We included 8839 patients, referred for HFE genotyping from Tyrol, Austria over a period of 25 years. Penetrant disease was defined as the presence of provisional iron overload (ferritin >300 µg/L for men and postmenopausal women, >200 µg/L for premenopausal women in association with transferrin saturation >55% for men and >45% for women). Using genotype frequencies from a health research database and general population data from Tyrol, expected number for both genotypes were calculated.

Results: In total, we identified 301 p.H63D homozygotes (3.41% of referred patients) and 507 p.C282Y/p.H63D compound heterozygotes (5.73% of referred patients). Lower bounds of lifetime disease penetrance were established at 8.45% for males and 3.23% for females in p.C282Y/p.H63D compound heterozygotes. For p.H63D homozygotes, male lifetime penetrance was 3.36% and female lifetime penetrance was 0.96%. The p.C282Y/p.H63D confers a higher risk of lifetime provisional iron overload. Compound heterozygous females have comparable lifetime risk to p.H63D homozygous males. Age at diagnosis/genotyping and sex are the strongest modifiers of disease penetrance.

Conclusion: The absolute life-time risk of developing provisional iron overload for p.C282Y/H63D compound heterozygotes and p.H63D homozygotes individuals is low, suggesting that environmental and behavioral risk factors determine disease penetrance.

THU-280
Does earlier introduction of azathioprine result in a reduced cumulative dose of corticosteroid therapy in the treatment of autoimmune hepatitis (AIH) and does this result in the same degree of biochemical response?

Sital Shah1, Yooyun Chung2, Maura Morrison2, Catherine McKenzie3, Michael Heneghan2. 1Kings College Hospital NHS Foundation Trust, Institute of Liver Studies, London, United Kingdom; 2King’s College Hospital, United Kingdom; 3University Hospital Southampton, Pharmacy and Critical Care, Southampton, United Kingdom

Email: sitalshah@nhs.net

Background and aims: Patients with autoimmune hepatitis (AIH) often receive variable steroid and azathioprine regimens. The purpose of this study was to determine whether earlier introduction...
of azathioprine for the treatment of AIH allows for reduced cumulative steroid burden in AIH.

**Method:** We performed a retrospective single centre cohort study. Two hundred and twenty six patients were divided into 2 groups: those who had received azathioprine therapy within 8 weeks of initiation of steroid therapy (early group) and those who had received azathioprine more than 8 weeks after steroid initiation (late group).

**Results:** The dose and cumulative dose of prednisolone (mg/kg) in the early group was lower compared to the late group at all time-points but this did not reach statistical significance (table 1). The number of patients continuing on steroids was higher in the late group (62%) compared to the early group (52%) at the end of the 5-year follow-up but did not reach statistical significance (p = 0.33). The proportion of patients achieving biochemical remission (normal AST and IgG) from induction therapy was 59.1% at 3 months, 71.7% at 6 months and 82% at 12 months. Serum ALT level was normalised in 80% of patients in the early azathioprine group compared to 64.5% in the late group (p = 0.01) at 6 months. IgG levels were normalised in 68% of patients in the early group compared to 54% of patients in the late group (p = 0.05) at 1-year. Over the 5-year follow-up, more patients in the early group achieved biochemical remission although this was not statistically significant. Within the first 12 months of commencing steroid therapy, 70% of patients experienced steroid related side effects. The odds of experiencing an infection, visual disturbances, fatigue, changes to bone health, weight gain and hyperglycaemia was higher in the late group.

**Conclusion:** Earlier introduction of azathioprine does not result in a reduced cumulative dose of prednisolone (mg/kg) during the first five years of treatment for AIH. However earlier introduction does result in a faster rate of normalisation of AST at 6 months and IgG at 12 months. The odds of experiencing steroid related side effects were higher in late azathioprine group.

**THU-281 Impact of alcohol consumption on the liver phenotype in alpha-1 antitrypsin deficiency**

Malin Fromme1, Carolin V. Schneider1, Nurdan Gueldiken1, Samira Amzou1, Yizhao Luo1, Monica Pons2,3, Joan Genesca2,3, Marc Miravitlles4, Katrine Thorhauge5, Johan Waern6, Jan Sperl7, 1University Hospital RWTH Aachen, Medical Clinic III, Gastroenterology, Malin Fromme1, Carolin V. Schneider1, Nurdan Gueldiken1, antitrypsin deficiency Impact of alcohol consumption on the liver phenotype in alpha-1

**Method:** We performed a retrospective single centre cohort study. Two hundred and twenty six patients were divided into 2 groups: those who had received azathioprine therapy within 8 weeks of initiation of steroid therapy (early group) and those who had received azathioprine more than 8 weeks after steroid initiation (late group).

**Results:** The dose and cumulative dose of prednisolone (mg/kg) in the early group was lower compared to the late group at all time-points but this did not reach statistical significance (table 1). The number of patients continuing on steroids was higher in the late group (62%) compared to the early group (52%) at the end of the 5-year follow-up but did not reach statistical significance (p = 0.33). The proportion of patients achieving biochemical remission (normal AST and IgG) from induction therapy was 59.1% at 3 months, 71.7% at 6 months and 82% at 12 months. Serum ALT level was normalised in 80% of patients in the early azathioprine group compared to 64.5% in the late group (p = 0.01) at 6 months. IgG levels were normalised in 68% of patients in the early group compared to 54% of patients in the late group (p = 0.05) at 1-year. Over the 5-year follow-up, more patients in the early group achieved biochemical remission although this was not statistically significant. Within the first 12 months of commencing steroid therapy, 70% of patients experienced steroid related side effects. The odds of experiencing an infection, visual disturbances, fatigue, changes to bone health, weight gain and hyperglycaemia was higher in the late group.

**Conclusion:** Earlier introduction of azathioprine does not result in a reduced cumulative dose of prednisolone (mg/kg) during the first five years of treatment for AIH. However earlier introduction does result in a faster rate of normalisation of AST at 6 months and IgG at 12 months. The odds of experiencing steroid related side effects were higher in late azathioprine group.
Conclusion: Moderate alcohol consumption seems to be tolerated in the majority of Pi*MZ and Pi*ZZ subjects.

THU-282
First nationwide genetic study on Wilson disease (Spanish Wilson registry): high diversity in mutations and in use of genetic evaluation, association with clinical data and influence on diagnosis and health costs

Background and aims: We had no wide study about mutations (MUT) and clinical data on Wilson Disease (WD) in Spain. Recently, a National Registry for WD (SWR) was started by the AEEH (Spanish Association for the Study of the Liver). We aimed to study WD mutations and its association with clinical phenotypes and the different use of genetic evaluation among regions.

Method: Multicentre study including genetic and clinical data from patients (pt) from the SWR during the first year. Ethical approval and informed consent was obtained for all cases.

Results: The SWR includes data from 29 hospitals (from 1 to 71 pt) of 13/17 regions (85% nation population). Genetics were available in 233/330 pt with a Leipzig score>2; with data of 2 alleles in 206/233 pt (homozygous 27%). More than 130 MUT were registered, the majority in less than 4 alleles, being the most prevalent: M645R (17.3% alleles, mainland and Canaries), L708P (12.6%, only Canaries) and H1069Q (6.5%, only mainland). Only 15 MUT were in homozygosis and 3 in more than 3 pt: L708P (24 pt), c.1708–1G>A (5 pt, restricted to gipsy ethnicity). M645AR (4 pt). Among regions, genetic data ranged from 0% to 100% pt (in 3 regions under 40% and in 4 regions above 85% of their pt). In regions with several centers, the difference among them was higher than 50%. Among the most prevalent MUT, we found differences in the proportion of cirrhosis at diagnosis (higher for L708P p = 0.002), asymptomatic pt (higher in H1069Q, p = 0.027), clinical presentation (chronic hepatic higher for M645R, recent neurological higher in c.1708–1G>A, chronic neurological higher in L708P p < 0.001). In homozygous pt, we only found differences in recent neurological cases (higher in c.1708–1G>A; p < 0.05) and age at diagnosis after 40 yo (low in L708P and high for M645R; p < 0.001). In the absence of genetic data up to 45% of pt would not have reached Leipzig score>3. In screening cases, genetics were used in 49/58 (85%); without genetics, two thirds would not have reached Leipzig>3 (33/49 pt).

Conclusion: We got the first genetic map for WD in Spain, with a great variability of MUT (except in Gran Canaria and the gipsy community, probably with higher inbreeding). The use of genetic testing in WD is very heterogeneous among regions and even within them. Its use is high for screening cases, saving time and costs to both patients and the health care system. The most frequent MUT (M645R) seems to associate with a milder phenotype (lower penetrance), while the Gran Canaria mut (L708P) seems to present earlier and with more severe cases. The MUT of the gipsy ethnicity is associated with recent neurological cases. These data will be confirmed and expanded with further data in the Spanish Wilson Registry.

THU-283
Myeloproliferative neoplasms and splanchnic vein thrombosis: results of a long-term UK prospective cohort study

Background and aims: Myeloproliferative neoplasms (MPN) confer an increased risk of thrombosis, including splanchnic vein thrombosis (SVT). SVT comprises portal-mesenteric-splenic axis thrombosis (PMVT) and hepatic vein thrombosis (HVT, Budd-Chiari syndrome). MPN-SVT carries a significant morbidity and clinical management is challenging, requiring surgical and radiological intervention in addition to aggressive anticoagulation. Long term prospective studies of this patient population are lacking. We report the results of a 5-year prospective cohort study assessing outcomes in MPN-SVT patients.
Method: The primary end point was a composite comprised of change in morbidity or portal circulation over 18 months. Secondary end points included 5 year outcome data and antithrombotic and cytoreductive usage, amongst others. Splanchnic thrombotic burden was assessed using cross sectional imaging in line with international standards.

34 patients with MPN-SVT were recruited from two UK specialist centres to an observational study that lasted between 2014 and 2021.

Results: 34 patients with MPN-SVT were recruited from two UK specialist centres to an observational study that lasted between 2014 and 2021. Median age at diagnosis was 45 (range 22–72) and 59% were female. Median time from SVT to registration was 34 months (range 1–167). There were 3 deaths, two were disease-related. 94% had a JAK2 V617F mutation. The underlying MPN was Polycythemia vera in 44% and Essential thrombocytocytosis in 35%. At 5 years, 39% of patients were taking hydroxycarbamide, 17% interferon, 28% ruxolitinib and 17% cyto-reduction. 28/34 (82%) were on anticoagulation, 68% were on warfarin and 21% on DOACs. HVT accounted for 21% of thrombosis and PMVT for 79%. Cavernoma formation was seen in 19/34 (56%). Imaging outcome data were obtained at 18 months and 60 months. At 18 months, 17/34 (50%) had unchanged abdominal thrombotic appearances, 13/34 (38%) had recanalization, 1 patient (3%) had extension and there were no recurrences. A reduction in thrombotic load was seen in 3 patients (8.5%). At 5 years, 25/29 (86%) had unchanged abdominal thrombotic appearances, 3/29 (10%) had further recanalization and 1/29 (3.4%) had recurrence despite therapeutic anticoagulation. Spleen size increased in 6/29 (21%), reduced in 14/29 (48%) and remained unchanged in 9/29 (31%).

Conclusion: To our knowledge, this is the first prospective study of MPN-SVT. The data show sustained recanalization and low recurrence rates over 5 years, which is a novel finding. Our data provide a contemporary perspective on the natural course of this rare disease entity treated at specialist centres and pave the way for future studies in MPN-SVT.

THU-284 Efficacy and safety outcomes with odevixibat treatment: Pooled data from the phase 3 ASSERT and ASSERT-EXT studies in patients with Alagille syndrome

Nadia Ochvinsky1, Madeleine Aumar2, Alastair Baker3, Ulrich Baumann4, Philip Buller5, Mara Cananzi6, Ozlem Durmaz7, Ryan Fischer8, Giuseppe Indolfi9, Wikrom Karnsakul10, Florence Lacaille11, Way Seah Lee12, Giuseppe Maggiore13, Philip Rosenthal14, Mathias Ruiz15, Etienne Soka16, Ekkelhard Sturm17, Wendy L. van der Woerd18, Henkjan J. Verkade19, Andrew Wehrman20, Christine Clemson21, Qifeng Yu21, Quanhong Ni21, Jessica Ruvido21, Susan Manganaro21, Jan Mattsson21, Piotr Czubkowski22, 1Division of Paediatric Gastroenterology, Hepatology, and Nutrition, Children’s Hospital at Montefiore, Albert Einstein College of Medicine, United States; 2Univ Lille, CHU Lille, Paediatric Gastroenterology, Hepatology, and Nutrition, Inserrir U1286 Infinite, CHU Lille Pôle Enfant, France; 3Paediatric Liver Centre, King’s College Hospital, United Kingdom; 4Paediatric Gastroenterology and Hepatology, Hannover Medical School, Germany; 5Department of Paediatric Gastroenterology, Nephrology, and Metabolic Diseases, Charité Universitätsmedizin Berlin, Germany; 6Paediatric Gastroenterology, Digestive Endoscopy, Hepatology, and Care of the Child With Liver Transplantation, Department of Children’s and Women’s Health, University Hospital of Padova, Italy; 7Istanbul University, Istanbul Faculty of Medicine, Turkey; 8Division of Paediatric Gastroenterology, Hepatology, and Nutrition, Children’s Mercy Hospital, United States; 9Paediatric and Liver Unit, Meyer Children’s University Hospital of Florence, Italy; 10Division of Paediatric Gastroenterology, Nutrition, and Hepatology, Department of Paediatrics, Johns Hopkins University School of Medicine, United States; 11Paediatric Gastroenterology–Hepatology–Nutrition Unit, Hôpital Universitaire Necker-Enfants Malades, France; 12Department of Paediatrics, Faculty of Medicine, University of Malaya, Malaysia; 13Hepatology, Gastroenterology, Nutrition, Digestive Endoscopy, and Liver Transplantation Unit, Bambino Gesù Children’s Hospital IRCCS, Italy; 14Department of Paediatrics, Division of Gastroenterology, Hepatology, and Nutrition, University of California San Francisco, United States; 15Department of Paediatric Gastroenterology, Hepatology, and Nutrition, Hospices Civils de Lyon, Hôpital Femme-Mère-Enfant, France; 16Université Catholique de Louvain, Cliniques St Luc, Belgium; 17Paediatric Gastroenterology and Hepatology, University Children’s Hospital Tübingen, Germany; 18Department of Paediatric Gastroenterology, Wilhelmina Children’s Hospital, University Medical Centre Utrecht, Netherlands; 19Department of Paediatrics, University of Groningen, Beatríx Children’s Hospital/University Medical Centre Groningen, Netherlands; 20Division of Gastroenterology, Hepatology, and Nutrition, Boston Children’s Hospital, United States; 21Alibero Pharma Inc., Boston, United States; 22Department of Gastroenterology, Hepatology, Nutritional Disorders, and Paediatrics, The Children’s Memorial Health Institute, Poland

Background and aims: Cholestasis in Alagille syndrome (AGS) is associated with accumulation of bile acids (BAs) and other biliary components in the liver with spill-over into the systemic circulation, as well as severe pruritus that can impair sleep. In the phase 3 ASSERT and ASSERT-EXT trials, odevixibat, an ileal BA transporter inhibitor, improved pruritus and sleep parameters and reduced BAs in patients with AGS. Using pooled data from these studies, we describe efficacy and safety outcomes with odevixibat in patients with AGS.

Method: In the completed 24-week ASSERT study, patients with AGS with history of significant pruritus and elevated serum BAs were randomised 2:1 to odevixibat 120 µg/kg/day or placebo, respectively. Patients who completed ASSERT could enter ASSERT-EXT, an ongoing, 72-week open-label extension study in which all patients receive odevixibat 120 µg/kg/day. This pooled analysis included all odevixibat-treated patients from ASSERT and/or ASSERT-EXT and spans from patients’ first dose of odevixibat to a data cut-off of 9 September 2022. Assessments through 36 weeks of treatment included change in observer-reported scratching scores and sleep parameters as well as levels of serum BAs, autotaxin (a proposed mediator of pruritus), and plasma 7-alpha-hydroxy-4-cholene-3-one (p-C4; a marker of reduced BA reabsorption). Safety evaluations included monitoring liver function parameters and treatment-emergent adverse events (TEAEs).

Results: At the data cut-off, 52 odevixibat-treated patients (mean age, 6.5 years; 48% female) comprised the pooled population. Compared with baseline, odevixibat treatment resulted in rapid (by week 4) and significant mean improvements in pruritus and reductions in BA levels, as well as significant mean decreases in autotaxin and increases in p-C4 levels (Figure). There were significant decreases from baseline to weeks 33–36 (n = 21) in multiple sleep parameters, including mean percentage of days seeing blood due to scratching, needing help falling asleep, needing soothing, and sleeping with caregiver (−30% −44%, respectively; all p < 0.001). No patients had concurrent elevations in alanine aminotransferase or total bilirubin that were indicative of drug-induced liver injury. TEAEs were reported in 43 of 52 (83%) odevixibat-treated patients. The most common drug-related TEAE
was diarrhoea (n = 6/52 [12%]). At the data cut-off, no patient had TEAEs that led to study discontinuation.

Conclusion: In patients with ALGS, odevixibat treatment for up to 36 weeks led to significant and sustained improvements in pruritus and sleep and significant reductions in BA levels. Consistent with effects on pruritus and BA levels, there were significant changes in autotaxin and p-C4 levels with odevixibat. Odevixibat treatment was generally well tolerated in patients with ALGS.

THU-285

Clinical features, histology and outcome of pediatric porto-sinusoidal vascular disease

Angelo Di Giorgio1, Lorenza Matarazzo1, Aurelio Sonzogni2, Emanuele Nicastro3, Andrea Pietrobattista3, Mara Cananzi4, Paola Gaio4, Marco Sciveres5, Grazia Di Leo6, Raffaele Iorio7, Antonio Marseglia8, Giuseppe Maggiori3, Maria Guido9, Lorenzo D’Antiga1.

1Paediatric Hepatology, Gastroenterology and Transplantation, Hospital Papa Giovanni XXIII, Bergamo, Italy; 2USC Anatomia Patologica ASST Bergamo Est, Italy; 3Hepatology, Gastroenterology, Digestive Endoscopy, Nutrition, and Liver Transplantation Unit, IRCCS Bambino Gesù, Pediatric Hospital Rome, Italy; 4Unit of Gastroenterology, Digestive Endoscopy, Hepatology and Care of the Child with Liver Transplantation, University Hospital of Padova, Italy; 5Paediatric Department and Transplantation, Ismett, Palermo, Italy; 6IRCCS Burlo Garofolo, Trieste, Italy; 7Department of Translational Medical Science, School of Medicine and Surgery, University of Naples Federico II, Naples, Italy; 8Fondazione IRCCS Casa Sollievo della Sofferenza, Division of Pediatrics, San Giovanni Rotondo, Italy; 9Department of Medicine-DIMED, University of Padova, Italy

Email: adigiorgio@asst-pg23.it

Background and aims: in paediatrics, porto-sinusoidal vascular disease (PSVD) is likely an underdiagnosed and misdiagnosed condition. We report data of a large cohort of children diagnosed with PSVD.

Method: retrospective, multicentre study of children with PSVD diagnosed by histological criteria in the last 15 years.

Results: 62 children with PSVD (M/F = 36/26, median age 6.6 years, range 3.3–10.6), from 7 centres, were included. Two expert liver pathologists reviewed histological features blindly. Thirty-six patients presented with non-cirrhotic portal hypertension, PH (PH-PSVD Group = 58%) while 26 had a liver biopsy because of chronic elevation of transaminases without PH (noPH-PSVD Group = 42%). On histology review, the two groups differed for the prevalence of
obliterative portal venopathy (more prevalent in PH-PSVD, \( p = 0.005 \)), and hypervascularised portal tract (more common in noPH-PSVD, \( p = 0.039 \)). At multivariate analysis, platelet count \( \leq 185,000/\text{mm}^3 \) was the only independent determinant of PH \( (p < 0.001) \). Linear regression analysis showed a significant reduction in platelet count with increasing age at time of diagnosis and at last follow-up (Pearson coefficient \( -0.4876 \), \( p = 0.02 \) at diagnosis; \( 0.4209 \); \( p \) value = 0.04 at last follow-up). After a median follow-up of 7 years (range 3.0–11.2), in PH-PSVD group 3/36 (8%) required TIPS placement, 5/36 (14%) developed pulmonary vascular complications of PH, and 7/36 (19%) required liver transplantation. In noPH-PSVD none progressed to PH nor had complications. At last follow-up 60/62 patients (97%) were alive.

**Conclusion:** PSVD present with two different clinical phenotypes, one characterised by PH and one by chronic elevation of transaminases without PH. PSVD should be included among the conditions causing isolated hypertransaminasemia. There is a clear trend to decreased platelet count by age and follow-up at linear regression. On histology, the differences between the two groups are subtle. Medium-term outcome is favourable in patients without PH; progression of the disease is observed in those with PH.

**THU-286**

Abstract withdrawn
THU-287
High-dose oral thiamine was not superior to placebo in reducing fatigue in patients with primary biliary cholangitis: a randomised, double-blinded, placebo-controlled crossover trial
Palle Bager1, Lars Bossen1, Rasmus Hvidbjerg Gantzø1, Henning Cronbæk1. 1Aarhus University Hospital, Department of Hepatology and Gastroenterology, Aarhus N, Denmark
Email: palleb@rm.dk

Background and aims: Fatigue in primary biliary cholangitis (PBC) is highly frequent and associated with reduced quality of life. The causes of fatigue are multifactorial and have led to a variety of interventions. Despite the impact of fatigue in PBC, only a few interventions have demonstrated clinical effects. However, in patients with inflammatory bowel disease, high-dose thiamine given for 4 weeks showed significant effects on fatigue. We aimed to investigate the effects of high-dose thiamine on fatigue in patients with PBC and conducted a randomised, double-blinded, placebo-controlled crossover trial.

Method: Patients with PBC and significant fatigue, normal renal function, and no obvious other reasons for fatigue were included. Patients were allocated 1:1 to Group 1 (high dose oral thiamine for 4 weeks, a 4 weeks wash-out period, followed by 4-week oral placebo) or Group 2 (oral placebo for 4 weeks, a 4 weeks wash-out period, followed by 4 weeks high dose oral thiamine). The doses of thiamine ranged between 600 and 1800mg/day, based on gender and body weight. Fatigue was measured using the PBC-40 questionnaire. A subscale including 11 questions measures the severity of fatigue (range 11–55). We defined significant fatigue as a score >32, based on data from the general population. The primary end point was a decrease of ≥5 points on the PBC-40 fatigue-subscale. The study adhered to the principles for Good Clinical Practice.

Results: Of 36 patients included and randomised, 32 completed the study. Of these, 30 participants (94%) showed >80% adherence to thiamine treatment and were included for further analysis. We observed no statistical differences between the groups at baseline and no carryover effect. At the end of study (week 12), 14 patients (47%) had a reduction ≥5 points in fatigue. The overall mean reduction of fatigue was 5.4 points (95% CI 2.8–8.0; p < 0.001). A delayed treatment model was assessed, showing a 3.7 points (95% CI 1.2–6.2) reduction in fatigue after thiamine treatment, compared to a 3.7 points (95% CI 1.9–5.6) reduction in fatigue after placebo (p = 0.98). Furthermore, 44% of Group 1 and 25% of Group 2 showed an improvement of more than 5 points while on thiamine treatment compared with 44% of Group 1 and 31% of Group 2 while on placebo (Figure 1). No serious adverse events were detected. Adverse events were sparse, temporary, and included sore throat and cold symptoms.

Conclusion: The treatment was well tolerated and safe for the patients. However, the effect of four weeks high-dose oral thiamine was not superior to placebo in PBC patients with significant fatigue. The overall effect could be ascribed to a convincing effect of placebo.

THU-288
Cancer incidence and survival in HFE hemochromatosis-A population-based cohort study
Benedikt Schaefer1, Lorenz Michael Pammer1, Bernhard Pfeifer2,3, Sabrina Neururer2,3, Maria Troppmair1, Marlene Panzer1, Sonja Wagner1, Elke Pertler1, Christian Gieger4,5, Florian Kronenberg6, Claudia Lamina7, Herbert Tilg1, Heinz Zoller1.
1Medical University of Innsbruck, Department of Medicine I, Gastroenterology, Hepatology and Endocrinology, Austria; 2UMIT Tirol, Division for Digital Medicine and Telehealth, Austria; 3Tirol Kliniken Gmbh, Tyrolean Federal Institute for Integrated Care, Austria; 4Helmholtz Zentrum München, Research Unit of Molecular Epidemiology, Germany; 5Helmholtz Zentrum München, Institute of Epidemiology, Germany, 6Medical University of Innsbruck, Institute of Genetic Epidemiology, Austria
Email: heinz.zoller@i-med.ac.at

Background and aims: Hemochromatosis is characterized by progressive iron overload affecting the liver and can cause cirrhosis and hepatocellular carcinoma. Most hemochromatosis patients are homozygous for p.C282Y in HFE, but only a minority of individuals with this genotype will develop the disease. The aim was to assess the penetrance of iron overload, liver fibrosis, hepatocellular carcinoma and life expectancy in hemochromatosis patients.

Method: A total of 8839 individuals from the Austrian region of Tyrol were genotyped for the p.C282Y variant between 1997 and 2021. Demographic, laboratory parameters and causes of death were ascertained from the national health insurance and cancer registry. Survival and cancer incidence were ascertained from the national health insurance and cancer registry. Outcomes were compared to a propensity score matched control population.

Results: Median age at diagnosis in 542 p.C282Y homozygous individuals was 47.8 years (64% male) and the prevalence of biochemical iron overload was 55%. Among all expected Tyrolean residents with p.C282Y homozygosity, biochemical iron overload was confirmed in 15.8% of men as compared to 8.9% of women aged 60 years. The proportion of p.C282Y homozygotes in whom significant fibrosis could be excluded by a FIB-4 score <1.3 decreased with age and was 95.6% in males and 97.3% in females at the age of 60 years. The overall effect could be ascribed to a convincing effect of placebo.
THU-289
Analysis of long-term treatment effects of odevixibat on clinical outcomes in children with progressive familial intrahepatic cholestasis in odevixibat clinical studies vs external controls from the NAPPED database


1Department of Epidemiology and Biostatistics, Erasmus MC, Rotterdam, the Netherlands; Toronto Centre for Liver Disease and TCHRI, University Health Network, Canada; IHPME, University of Toronto, Canada; 2Alibero Pharma, Inc., Boston, MA, United States; 3Pediatric Gastroenterology and Hepatology, University Medical Center Groningen, University of Groningen, the Netherlands; European Reference Network on Hepatological Diseases (ERN RARE-LIVER), Netherlands; 4Institute of Liver Studies, King’s College London, London, United Kingdom; 5Service d’Hépatologie et de Transplantation Pédiatriques, Bicêtre Hospital, AP-HP, Université Paris-Sud, Paris Saclay, Inserm UMR-S 1174, France; European Reference Network on Hepatological Diseases (ERN RARE-LIVER), France; 6European Reference Network on Hepatological Diseases (ERN RARE-LIVER); Gastroenterology, Hepatology, Nutritional Disorders and Paediatrics, The Children’s Memorial Health Institute, Poland; 7European Reference Network on Hepatological Diseases (ERN RARE-LIVER); Université; Catholique de Louvain, Cliniques St Luc, Brussels, Belgium; 8Service de Biochimie, Bicêtre Hospital, AP-HP, Université Paris-Sud, Paris Saclay, Inserm UMR-S 1174, France; 9Paediatric Gastroenterology, Hepatology and Nutrition Unit, Division of Paediatric Specialties, Department of Paediatrics, Gynaecology and Obstetrics, University Hospitals of Geneva, Switzerland; 10Liver and SB Transplant and Hepatobiliary-Pancreatic Surgery, King Faisal Specialist Hospital and Research Centre, Riyadh, Saudi Arabia; 11Alfaisal University, College of Medicine, Riyadh, Saudi Arabia; 12Translation Genomic Department, King Faisal Specialist Hospital and Research Centre, Riyadh, Saudi Arabia; 13Clinic Genomics Department, King Faisal Specialist Hospital and Research Centre, Riyadh, Saudi Arabia; 14European Reference Network on Hepatological Diseases (ERN RARE-LIVER); Liver Unit, Birmingham Women’s and Children’s Hospital, Birmingham, United Kingdom; 15Servizio Di Epatologia e Nutrizione Pediatrica, Fondazione Irscc Ca’ Grande Ospedale Maggiore Policlinico, Milano, Italy; 16European Reference Network on Hepatological Diseases (ERN RARE-LIVER); Paediatric Gastroenterology, Hepatology and Nutrition, Astrid Lindgren Children’s Hospital and Karolinska University Hospital, Karolinska Institutet, Stockholm, Sweden; 17Paediatric and Liver Unit, Meyer Children’s University Hospital of Florence, Italy; 18Koc
Background and aims: Progressive familial intrahepatic cholestasis (PFIC) is a group of rare cholestatic liver diseases characterized by intractable pruritus, elevated serum bile acids (sBAs), and progressive liver damage. NAPPED (NAtural course and Prognosis of PFIC and Effect of biliary Diversion) is a large retrospective database investigating the natural history of PFIC. Odevixibat, an ileal bile acid transporter inhibitor, reduced sBAs and pruritus in patients with PFIC in the phase 3 PEDFIC 1 and PEDFIC 2 studies. We compared clinical outcomes of surgical biliary diversion (SBD), liver transplantation (LT), and death in patients from NAPPED (not treated with odevixibat) with odevixibat-treated patients from the PEDFIC studies.

Method: The analysis population comprised odevixibat-naive patients from NAPPED and odevixibat-treated patients from PEDFIC 1 and/or PEDFIC 2. BSEP3 patients were excluded in both groups. Eligibility criteria were aligned across cohorts and included genetically proven diagnosis of PFIC1 or PFIC2, sBAs ≥100 µmol/L, alanine aminotransaminase and total bilirubin ≤10 × the upper limit of normal, and no prior SBD or LT. Propensity scores, inverse probability of treatment weighting analysis, and Cox regression were used to identify and balance baseline covariates, including PFIC type 1, PFIC2-BSEP1, or PFIC2-BSEP2. The primary end point was event-free survival (EFS; time to first event of SBD, LT, or death); secondary end points included native liver survival (NLS), SBD-free survival (DFS), and overall survival (OS). Survival outcomes were measured from study day 1; treatment differences were evaluated by weighted log-rank tests and Cox regression.

Results: A cohort of 80 NAPPED patients (controls) was compared with 69 odevixibat-treated patients. The median study duration in the odevixibat cohort was 22.6 months (range: 1.9–39.2 months). The follow-up duration in the NAPPED cohort was truncated accordingly. Odevixibat-treated patients showed significantly higher EFS and DFS than controls (hazard ratio [HR]: 0.20 and 0.13, respectively); numerical improvements in NLS and OS were also observed (Table). Results were consistent when different sensitivity analyses were performed. Additional subgroup analyses indicated that EFS was higher in odevixibat-treated patients with PFIC1 (HR [95% CI] = 0.10 [0.02, 0.55]) and PFIC2 (HR [95% CI] = 0.34 [0.12, 1.00]) vs controls.

Conclusion: Odevixibat treatment is associated with higher EFS in patients with PFIC without prior SBD, upon comparison to matched, non-odevixibat-treated patients from the NAPPED registry.

THU-290

Efficacy and safety of vaccination against SARS-CoV-2 in patients with vascular liver disease

Valeria Perez-Campuzano1, Rautou Pe2, Thomas Marjot3, Michael Praktiknjo4, Edilmir Alvarado-Tapia5, Laura Turco6, Luis Ibañez7, Carlos González-Valayón8, angela puente9, Elba Llop10, Macarena Simón-Taler11, Carmen Álvarez-Navaescu12, Thomas Reiberger13, Xavier Verhelst14, Luis Téllez15, Lara Orts1, Giuseppe Grassi1, Anna Baiges1, Payance Audrey1, Jonel Trelbica4, Cândid Villanueva1, Maria Cristina Morelli1, Sam Murray1, Georgina Meacham3, Marc Luettelghettman16, Julian Schulze zur Wiech17, Juan Carlos Garcia Pagan1,18, Eleanor Barnes1, Aurélie Plessier2, Virginia Hernandez-Gea1,18,1 Hospital Clinic Barcelona, Barcelona, Spain; 2DHU Unity, Pôle des Maladies de l’Appareil Digestif, Service d’Hépato-Gastroentérologie et Digestion, Centre de Référence des Maladies Vasculaires du Foie, Hôpital Beaujon, AP-HP, Clichy, France; 3Nuffield Department of Medicine, University of Oxford, Oxford, United Kingdom; 4Department of Medicine B, University Hospital Münster, Germany; 5Hospital de la Santa Creu i Sant Pau, Barcelona, Spain; 6IRCCS Azienda Ospedaliero-Universitaria di Bologna, Italy; 7Hospital General Universitario Gregorio Marañón, Madrid, Spain; 8Hospital Universitario de Canarias, Spain; 9Hospital Marqués de Valdecilla, Spain; 10Hospital Puerta del Hierro, Spain; 11Liver Unit, Digestive Diseases Hospital, University Doctor Vall d’Hebron, VHIR, Vall d’Hebron Barcelona Hospital Campus, UAB, CIBERehd, Barcelona, Spain; 12Hospital Universitario Central de Asturias, Spain; 13Division of Gastroenterology and Hepatology, Department of Medicine III, Medical University of Vienna, Austria; 14Department of Gastroenterology and Hepatology, Ghent University Hospital, Belgium; 15Hospital Universitario Ramón y Cajal, Madrid, Spain; 16German Center for Infection Research (DZIF), Partner Site Hamburg-Lübeck-Borstel-Riems, Germany; 17Department of Internal Medicine, University Medical Center Hamburg-Eppendorf, Germany; 18University of Barcelona, Barcelona Hepatic Hemodynamic Laboratory, Spain Email: vihernandez@clinic.cat

Background and aims: Patients with vascular liver diseases (VLD) are at considerable risk for thromboembolic events and are at higher risk of infection by SARS-CoV-2 and a severe course of COVID-19 disease. The immune response to the SARS-CoV-2 vaccination in patients with VLD is unknown. The effectiveness and safety of CoVID-19 vaccines, especially the potential risk of thromboembolic events has not been investigated in these individuals. We thus, aimed to determine the efficacy of vaccination against CoVID-19, incidence of adverse reactions and outcome post-vaccination in a large cohort of patients with VLD.

Method: International multicentre prospective observational study in patients with VLD. Patients were included at the time of vaccination, with a mean follow-up of 47 weeks (13–71 weeks). We analyzed the incidence of CoVID-19 infection after vaccination, severity of side effects, occurrence of thromboembolic events and hepatic decompensation. In a subgroup of patients, the humoral and cellular responses to vaccination were analyzed.

Results: A total of 909 patients from 14 European centers were included, 524 non-cirrhotic-non-malignant-splanchnic vein thrombosis (NCPVT), 234 Portosinusoidal Vascular Disorder (PSVD) and 140 Budd-Chiari Syndrome (BCS). A total of 151 patients were previously infected by CoVID-19. A total of 883 patients (97%) received two vaccine doses (fully vaccinated: FV), 681 (75%) also a third dose. In the 755 naïve FV, primary CoVID-19 infection occurred in 52 (6.9%), a
rate lower than reported for the un-vaccinated VLD population of 14%. Four FV patients required hospitalization including 2 ICU admissions, and two died from CoVID-19. Incidence of primary CoVID-19 infection after receiving a 3rd dose was 31/600 (5.2%). Prevalence of re-infection was 9/151 (6%), 3 after one dose of vaccination, 4 after two doses, and 2 after a third dose. At least one adverse event was reported in 42.6% patients, 40.6% after the first dose, and 74.9% after the second and third dose. The most frequently reported adverse events were local side effects at the injection site. Systemic side effects were asthenia (15%) and fever (9.4%). No serious adverse events were reported. Thirty-two (3.5%) thromboembolic events were identified, 28 SVT/PVT (23 re-thrombosis and 5 de-novo) and 4 extra-splanchnic. Two after the first dose (23- and 43-days post-vaccination), 23 (71.9%) after the second dose (median 52-days, 12–270), and 7 after a third dose (median 36-days, 19–270). No case of immune-thrombotic-thrombocytopenia (ITT) occurred. Twenty-two (2.4%) patients developed decompensations (median 25-weeks, range 13–42): ascites in n = 11, hepatic encephalopathy in n = 7 and portal hypertensive bleeding in n = 5 in VLD patients. Vaccine immunogenicity was longitudinally assessed in 36 patients receiving an mRNA vaccine. Immune responses were robust in this subgroup, with 36/36 (100%) of patients mounting detectable antibody and T-cell responses after two vaccine doses with comparable levels to those previously reported in healthy populations.

**Conclusion:** Patients with VLD present an adequate immune response to COVID-19 vaccines, and seem to be effectively protected from serious COVID-19 courses. No cases of vaccine-induced ITP were reported in this large cohort of VLD patients after repeated COVID19 vaccine doses.

**THU-291**

Serum bile acids are associated with native liver survival in patients with Alagille syndrome: results from the GALA study group

POSTER PRESENTATIONS

Maria Ragaliou1, Jennifer Garcia2, Maria Legarda Tamara3, Marisa Beretta4, Quais Mujawar5, Ermelinda Santos-Silva6, Cristina Molera Busoms7-9, Eberhard Lurz7,10, Cristina Goncalves7,8,11, Carolina Jimenez-Rivera12, Jesús M. Bañales13,8,12,13, Uzma Shah14, Richard Thompson15, Bettina Hansen16,18, Binita M. Kamath1.

1Section of Gastroenterology, School of Medicine, Lucile Packard Children's Hospital and CLINTEC, Karolinska Institutet, Stockholm, ERN Rare Liver, Gastroenterology, Hepatology and Nutrition, Karolinska University Hospital, The Children's Hospital of Philadelphia and the University of Pennsylvania Perelman School of Medicine, Division of Gastroenterology, Hepatology and Nutrition, Rochester, New York, United States, United States; 2Children's Hospital of Fudan University, The Center for Pediatric Liver Diseases, Shanghai, China, China; 3The Children's Memorial Health Institute, Department of Gastroenterology, Hepatology, Nutrition and Digestive Disturbances and Pediatrics, Warsaw, Poland, Poland; 4Pediatric Gastroenterology and Liver Transplantation Unit, National Reference Centre for Rare Pediatric Liver Diseases (Biliary Atresia and Genetic Cholestasis), FILIOE, ERS RARE LIVER, Bicêtre Hospital, AP-Hôpital Université Paris-Saclay, Le Kremlin-Bicêtre, France; 5Service d'Hépatologie et de Transplantation Hépatique Pédiatriques, Centre de Référence de l'Arrêté des Voeux Biliaires et des Cholestases Génétiques (AVB-GC), ESMR FILIOE, ERS RARE LIVER, Hôpital Bicêtre, AP-Hôp, France; 6Service de Généétique Moléculaire, Pharmaco-génétique et Hormonologie, Hôpitaux Universitaires Paris-Saclay, Assistance Publique-Hôpitaux de Paris, Centre Hospitalier Universitaire de Bicêtre, Le Kremlin-Bicêtre, France, France; 7Ospedale Papa Giovanni XXIII, Pediatric Hepatology, Gastroenterology and Transplantation, Bergamo, Italy, Italy; 8Astrid Lindgren Children's Hospital, Department of Paediatric Gastroenterology, Hepatology and Nutrition, Karolinska University Hospital and CLINTEC, Karolinska Institutet, Stockholm, ERS Rare Liver, Sweden; 9Astrid Lindgren Children's Hospital, Department of Paediatric Gastroenterology, Hepatology and Nutrition, Karolinska University Hospital and Department of Women and Children's Health, Karolinska Institutet, Stockholm, Sweden, Sweden; 10The Children's Hospital at Westmead, Department of Gastroenterology, Sydney, Australia, Australia; 11The Children's Hospital of Philadelphia and the University of Pennsylvania Perelman School of Medicine, Division of Gastroenterology, Hepatology and Nutrition, Philadelphia, Pennsylvania, United States, United States; 12University of Pittsburgh School of Medicine, Division of Pediatric Gastroenterology and Hepatology, Department of Pediatrics, Pittsburgh, United States, United States; 13Children's Healthcare of Atlanta and Emory University School of Medicine, Division of Pediatric Gastroenterology, Hepatology and Nutrition, Atlanta, United States, United States; 14Organ Transplantation Center, National Center for Child Health and Development, Tokyo, Japan, Japan; 15Pediatric Gastroenterology, Hepatology and Nutrition Department, Istanbul University Istanbul Medical Faculty, Istanbul, Turkey, Turkey; 16Cliniques Universitaires Saint-Luc, Service De Gastroentérologie et Hépatologie Pédiatrique, Brussels, Belgium, Belgium; 17Medical University of Silesia in Katowice, Department of Pediatrics, Katowice, Poland, Poland; 18Pediatric Gastroenterology and Nutrition, Necker-Enfants Malades Hospital, University of Paris, Paris, France, France; 19Pediatric liver unit, National Reference Centre for Rare Pediatric Liver Diseases (Biliary Atresia and Genetic Cholestasis), FILIOE, ERS RARE LIVER, Necker-Enfants Malades Hospital, University of Paris, Paris, France, France; 20Royal Children's Hospital, Department of Gastroenterology and Clinical Nutrition, Melbourne, Australia, Australia; 21Mazumdar Shaw Medical Center, Narayana Health, Bangalore, India, India; 22Gastroenterology and Hepatology Division, Department of Pediatrics, University of Washington, Seattle Children's Hospital, Seattle, Washington, United States, United States; 23Section of Gastroenterology, Hepatology and Nutrition, Department of Pediatrics and the Digestive Health Institute, Children's Hospital of Colorado and University of Colorado School of Medicine, Aurora, United States, United States; 24Division of Gastroenterology, Department of Pediatrics, Stanford University School of Medicine, Palo Alto, California, United States, United States; 25Department of Pediatrics (Cardiology), Stanford University School of Medicine, Lucile Packard Children's Hospital, Palo Alto, California, United States, United States; 26Schneider Children's Medical Center of Israel, Institute of Gastroenterology, Nutrition and Liver Diseases, Petah Tikva, Israel, Israel; 27Oregon Health and Science University, Division of Pediatric Gastroenterology, Department of Pediatrics, Portland, United States, United States; 28Swiss Pediatric Liver Center, Division of Pediatric Specialities, Department of Pediatrics, Gynecology and Obstetrics, University Hospitals Geneva and University of Geneva, Geneva, Switzerland, Switzerland; 29University Medical Center Groningen, Department of Pediatrics, Center for Liver, Digestive, and Metabolic Diseases, Groningen, Netherlands, Netherlands; 30University of Utah, Division of Pediatric Gastroenterology, Hepatology and Nutrition, Primary Children's Hospital, Salt Lake City, UT, USA, United States; 31Department of Pediatrics, University of Ulsan College of Medicine, Asan Medical Center Children's Hospital, Seoul, Korea, Republic of Korea, Rep. of South Korea; 32University Medical Center Ljubljana, Pediatric Gastroenterology, Hepatology and Nutrition, and Department of Pediatrics, Faculty of Medicine, Ljubljana, Slovenia, Slovenia; 33Institute of Liver and Biliary Sciences, Department of Pediatric Hepatology, New Delhi, India, India; 34Department Neurofarba, University of Florence and Meyer Children's University Hospital, Paediatric and Liver Unit, Florence, Italy, Italy; 35Yale University School of Medicine, Department of Pediatrics, New Haven, United States, United States; 36Boston Children's Hospital and Harvard Medical School, Division of Gastroenterology, Hepatology, and Nutrition, Boston, United States, United States; 37Pediatric Gastroenterology Unit, Regina Margherita Children's Hospital, Azienda Ospedaliera-Universitaria Città della Salute e della Scienza, Turin, Italy, Italy; 38Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Servizio di Epatologia Pediatrica, Milan, Italy, Italy; 39Koc University School of Medicine, Department of Pediatric Gastroenterology and Organ Transplant, Istanbul, Turkey, Turkey; 40University of Minnesota, Division of Pediatric Gastroenterology, Hepatology, and Nutrition, Minneapolis, United States, United States; 41Children's Hospital, London Health Sciences Centre, Division of Paediatric Gastroenterology and Hepatology, Western University, London, Ontario, Canada, Canada; 42Department of Hepatology and Gastroenterology, Aarhus University Hospital, Aarhus, Denmark, Denmark; 43Department of Paediatric Gastroenterology, Al Jallla Children's Specialty Hospital, Mohammed Bin Rashid University Of Medicine and Health Sciences, Dubai, United Arab Emirates, United Arab Emirates; 44Department of Pediatrics, Faculty of Medicine, Cairo University, Cairo, Egypt, Egypt; 45Department of Clinical and Chemical Pathology, Faculty of Medicine, Cairo University, Cairo, Egypt, Egypt; 46Solid Organ Transplant Department, Children's Health-Children's Medical Center, Dallas, United States, United States; 47Johns Hopkins University School of Medicine, Department of Pediatrics, Baltimore, United States, United States; 48Leeds Teaching Hospitals NHS Trust, Leeds Children's Hospital, Leeds, United Kingdom, United Kingdom; 49Phoenix Children's Hospital, Division of Pediatric Gastroenterology and Hepatology, Phoenix, United States, United States; 50University of Rochester Medical Center, Department of Pediatrics, Div of Pediatric Gastroenterology, Hepatology, and Nutrition, Rochester, New York, United States, United States; 51Department of Pediatric Gastroenterology, University Medical Center Utrecht, Utrecht, The Netherlands, Netherlands; 52Starship Child Health, Department of Paediatric Gastroenterology, Auckland, New Zealand, New Zealand; 53Hospital Italiano Buenos Aires, Pediatric Gastroenterology and Hepatology Division, Buenos Aires, Argentina, Argentina; 54Liver Unit, Birmingham Women's and Children's Hospital NHS Trust and University of Birmingham, Birmingham, United Kingdom, United Kingdom; 55Faculty of Medicine, Department of Paediatrics, University of Malaya, Kuala Lumpur, Malaysia, Malaysia; 56Division of Paediatric Gastroenterology, Chris Hani Baragwanath Academic Hospital, Department of Paediatrics and Child Health, University of the Witwatersrand, Johannesburg, South Africa, South Africa; 57Ramathibodi Hospital Mahidol University, Division of Gastroenterology, Department of Pediatrics, Bangkok, Thailand, Thailand; 58Children's Mercy Kansas City, Department of Gastroenterology, Section of Hepatology, Kansas City, United States, United States; 59Hospital Universitari Vall d'Hebron, Pediatric Hepatology and Liver Transplant Department, Barcelona, Spain, Spain; 60Department of Liver and Gastrointestinal Diseases, Biodonostia Health Research Institute-Donostia University Hospital - University of the Basque Country (UPV/EHU), San Sebastian, Spain, 20014, Spain;
Background and aims: Alagille syndrome (ALGS) is a rare, autosomal dominant multisystem disorder characterized by cholestasis and extrahepatic manifestations. Given the current era of ileal bile acid transporter (IBAT) inhibitor therapies that reduce serum bile acid concentration to AUC or Cmax ratio. For exploratory analyses, we used linear regression to assess whether the time interval between antibiotic administration and cyst drainage (minutes), cyst location linear regression to assess whether the time interval between antibiotic administration and cyst drainage (minutes), cyst location

Therapeutic success of antibiotics therapy for liver (cyst) infection depends on adequate exposure of the drug at the site of infection. Available pharmacokinetic (PK) data of antibiotics in liver cyst fluid is limited, but such knowledge is critical to manage patients with cyst infections. This study aims to analyse deep tissue exposure of antibiotics using an in vivo human liver cyst model and explore influencing factors. Method: We performed an explorative, randomized, single-dose, PK study. Patients (≥18 years, intact liver and renal function) eligible for percutaneous drainage of liver cysts were, after providing written informed consent, randomized between receiving intravenous (iv) ciprofloxacin and piperacillin/tazobactam (group 1), or trimethoprim/sulfamethoxazole (group 2). Antibiotics were administered as a single iv dose prior to the cyst drainage procedure. Blood samples were drawn at three time-points within 12 hours following administration of antibiotics. The cyst fluid sample was collected during liver cyst drainage. Antibiotic concentrations were measured with liquid chromatography-tandem mass spectrometry using a validated assay for plasma and liver cyst fluid. Primary outcome was deep tissue exposure, expressed as liver cyst to plasma concentration ratio (%). Individual plasma exposure was described by area under the concentration-time curve (AUC). AUC and maximum plasma concentration (Cmax) were calculated by post hoc estimation based on existing population PK models using non-linear mixed effect modelling. Deep tissue exposure estimates were calculated as cyst concentration to AUC or Cmax ratio. For exploratory analyses, we used linear regression to assess whether the time interval between antibiotic administration and cyst drainage (minutes), cyst location (left or right liver lobe) or cyst volume (ml) were correlated with deep tissue exposure.

Results: 565 patients from GALA were included, of whom 349 (61.8%) were male with a median year of birth of 2012 (IQR 2007–2016). Rates of NLS at 1, 5 and 18 years were 93.5%, 63.5%, and 50.3%, respectively. The SBA threshold of 102 mmol/L was a significant predictor of outcome (HR = 3.40, 95% CI 2.28–5.06, p < 0.001) and there was no significant difference in the impact of SBA between the first year of life and thereafter (p = 0.90). SBA remained a significant factor for NLS while adjusting for TB clearance at 1 year (HR = 1.87, 95% CI 1.04–3.33, p = 0.03), where clearance is defined as TB -2 mg/dL. There was no significant interaction between the SBA threshold and clearance of TB.

Conclusion: SBA is an independent predictive factor for NLS in children with ALGS and neonatal cholestasis. Of note, SBA is associated with NLS in children with ALGS who clear their bilirubin i.e. those with anicteric cholestasis. This is relevant in the context of IBAT inhibitors that promote a reduction in SBA and are currently indicated for pruritus but may impact additional important clinical outcomes.

THU-292
Deep tissue exposure of antibiotics at the target site of infection in patients with cystic liver disease: a randomized pharmacokinetic trial
Lucas H.P. Bernts1,2, Roger Brüggemann3, Anouk M.E. Jansen3, Nynke Jager1, Heiman Wertheim3, Joost P.H. Drenth1, Marten A. Lantinga1,4, Radboud University Medical Center, Department of Gastroenterology and Hepatology, Netherlands; Radboud University Medical Center, Department of Medical Microbiology, Netherlands; Radboud University Medical Center, Department of Pharmacy, Netherlands; University Medical Centers Amsterdam, Department of Gastroenterology and Hepatology, Amsterdam Gastroenterology and Metabolism, Netherlands
Email: martenlantinga@gmail.com

Background and aims: Successful antibiotic therapy for liver (cyst) infection depends on adequate exposure of the drug at the site of infection. Available pharmacokinetic (PK) data of antibiotics in liver cyst fluid is limited, but such knowledge is critical to manage patients with cyst infections. This study aims to analyse deep tissue exposure of antibiotics using an in vivo human liver cyst model and explore influencing factors.

Method: We performed an explorative, randomized, single-dose, PK study. Patients (≥18 years, intact liver and renal function) eligible for percutaneous drainage of liver cysts were, after providing written informed consent, randomized between receiving intravenous (iv) ciprofloxacin and piperacillin/tazobactam (group 1), or trimethoprim/sulfamethoxazole (group 2). Antibiotics were administered as a single iv dose prior to the cyst drainage procedure. Blood samples were drawn at three time-points within 12 hours following administration of antibiotics. The cyst fluid sample was collected during liver cyst drainage. Antibiotic concentrations were measured with liquid chromatography-tandem mass spectrometry using a validated assay for plasma and liver cyst fluid. Primary outcome was deep tissue exposure, expressed as liver cyst to plasma concentration ratio (%). Individual plasma exposure was described by area under the concentration-time curve (AUC). AUC and maximum plasma concentration (Cmax) were calculated by post hoc estimation based on existing population PK models using non-linear mixed effect modelling. Deep tissue exposure estimates were calculated as cyst concentration to AUC or Cmax ratio. For exploratory analyses, we used linear regression to assess whether the time interval between antibiotic administration and cyst drainage (minutes), cyst location (left or right liver lobe) or cyst volume (ml) were correlated with deep tissue exposure.

Results: We included 20 patients (90% female, median age 61 years, median eGFR 88 ml/min/1.73 m2, median BMI 23.7 kg/m2). Twenty-one liver cysts were drained (group 1: n = 11 cysts, left lobe: n = 5, right lobe: n = 6 and group 2: n = 10 cysts, left lobe: n = 3, right lobe:
n = 7). Median drained volume was 700 ml [IQR 375–1200 ml]. Deep tissue exposure for ciprofloxacin was 4.2% [IQR 1.6–8.9%], piperacillin 0.3% [IQR 0.1–1.3%], tazobactam 0.2% [IQR 0.0–1.3%], trimethoprim 12.2% [IQR 6.3–16.1%] and sulfamethoxazole 0.4% [IQR 0.2–3.8%], respectively (Figure 1). Cyst concentration to AUC and Cmax ratios showed comparable distributions. Time between iv administration and cyst drainage increased deep tissue exposure for trimethoprim (R-square 0.63, p < 0.01). Deep tissue exposure was numerically higher in left lobe located cysts, except for sulfamethoxazole (Figure 1). Individual cyst volume did not correlate with deep tissue exposure.

**Conclusion:** Deep tissue exposure of antibiotics in liver cysts was overall low after a single iv dose. Highest exposure in both liver lobes was seen for trimethoprim. Due to low sulfamethoxazole penetration, the synergistic combination with trimethoprim (co-trimoxazole) might be less effective. Exploratory analyses show that complex time-dependent pharmacokinetics and hepatic lobar differences could influence antibiotic exposure at the target site of infection.

**Background and aims:** Porto-sinusoidal vascular disease (PSVD) has recently been described as the prominent pathology in liver explants of patients with cystic fibrosis (CF), but data outside the transplant setting are lacking. We aimed to investigate the prevalence of portal hypertension in cystic fibrosis-associated liver disease (CFLD) and develop a non-invasive algorithm to classify liver involvement in CF patients.

**Method:** This is a cross-sectional study of consecutive CF patients followed at our tertiary center between 2018 and 2019, who underwent ultrasound examination, liver (LSM), and spleen stiffness (SSM) measurement by transient elastography (TE). CFLD was defined according to abnormal physical examination, liver tests, and ultrasound findings. PSVD was likely if there were portal hypertension (PH) signs in the absence of advanced chronic liver disease (CF-ACLD, LSM <10 kPa).

**Results:** CFLD was found in 50 (27.5%) of the 182 included patients. At least one sign of PH was found in 47 (26%) patients, but the majority (38/47, 81%) had low LSM (<10 kPa) and were likely to have PSVD, whereas only 9 (5%) had CF-ACLD. PSVD and "mild" CFLD (LSM <10 kPa) co-existed in most (23/36) cases. SSM/LSM ratio could accurately distinguish between likely PSVD and CF-ACLD patients (AUROC = 0.863). In a historical cohort of 599 patients (pre-TE era), survival progressively decreased among patients with no PH, patients with likely PSVD, and patients with CFLD + PH signs (log-rank <0.0001).

**Conclusion:** PSVD seems to be the prevailing cause of portal hypertension in patients with CF. We developed a new diagnostic
algorithm based on ultrasound, clinical criteria, and TE to classify liver involvement in patients with CF.

THU-294
Monitoring, dosing and clinical outcomes of CFTR modulator triple combination therapy in children with CF post liver transplantation
Dana Cerminara1, Daniel Leung2, Texas Children’s Hospital, Pharmacy, United States; 2Baylor College of Medicine, Pediatrics, Houston, United States
Email: dhleung@texaschildrens.org

**Background and aims:** Triple combination therapy with elexacaftor/tezacaftor/ivacaftor (E/T/I) has revolutionized the lives of people with CF by restoring CF transmembrane regulator (CFTR) function in pulmonary, pancreatic and intestinal tissue, leading to drastically improved lung and nutritional health. There is a known risk of hepatotoxicity and drug interactions with transplant immunosuppressive agents.

**Method:** This was a retrospective review of 8 patients with CF who were candidates for E/T/I. We describe the protocolized dosing, monitoring, and clinical outcomes of E/T/I use in 8 children with CF post liver transplantation (LT) transplanted between 2014 and 2022. Data was analyzed using descriptive statistics.

**Results:** From January 2014-December 2022, a total of 14 children with CF received LT at Texas Children’s Hospital (TCH) for the indication of portal hypertension. Of these, 8 (25% female) were alive and initiated E/T/I 17.5 months (median) post LT with a mean follow-up of 26 months. Tacrolimus trough (TAC) and liver labs were collected at baseline, 7 days, 14 days, and 28 days post-initiation. Five out of 8 (63%) patients required a TAC dose decrease within the first 2 months; 0 patients required a TAC dose increase. 1–2 TAC dose adjustments were needed in 63% to achieve goal levels and a 20–30% reduction in TAC while on E/T/I was most common. Adverse effects while on E/T/I included mild elevations (>1.5x baseline) in AST (43%), ALT (43%), GGT (29%), and subjective abdominal pain (29%). No elevations in bilirubin or INR. Only 14% discontinued E/T/I due to intolerance (abdominal pain and diarrhea) and was not liver related. Lung function measured by median FEV1% improved from 85% to 93% over 13 months (expected 3% decline/year) while on E/T/I. Median BMI pre-E/T/I was 16.6 and increased to 19 post-E/T/I over 12 months but no change in BMI z-score (−0.99, −1.02, p > 0.05).

**Conclusion:** While our single center experience appears small, it represents 20% of the US CF pediatric population that received LT during this time period. Treatment with E/T/I post-LT in children with CF appears safe and requires protocolized lab monitoring. 1–2 dose adjustments of tacrolimus (primarily reductions) was most common. E/T/I associated hepatitis was mild with no cholestasis or liver dysfunction. E/T/I was associated with clinically meaningful improvement in lung function and BMI post-LT.

THU-295
Recent splanchnic vein thrombosis occurring during Sars-Cov-2 infection: The VALDIG study
Pierre Deltenre1, Payance Audrey2, Laure Elkkrief3, Vincenzo La Mura4, Artru Florent5, Anna Baiges6, Jean Paul Cervoni7, Louise Chine8, Isabelle Colle9, Elise Lemaître9, Bogdan Procopet11, Dietmar Schiller12, Christophe Buret13, Odile Goria14, Isabelle Ollivier-Hourmand15, Alexandre Nuzzo16, Pierre-Emmanuel Rautou2, Aurélie Plessier17, 1CUB Hôpital Erasme, Belgium; 2Université de Paris, AP-HP, Hôpital Beaujon, Clichy, France; 3CHU Tours, France; 4Ospedale Maggiore Policlinico, Italy; 5CHUV, Switzerland; 6Hospital Clinic, Barcelona; 7CHU, Besançon, France; 8Royal Free Hospital, United Kingdom; 9ASZ Aalst, Belgium; 10CHU Lille, France; 11Cluj-Napoca, Romania; 12Ondensklinikum Linz Barmherzige Schwestern, Linz, Austria; 13Hôpital Universitaire Rangueil, Toulouse, France; 14Hôpital Universitaire Charles Nicolle, Rouen, France; 15Hôpital Universitaire Côte de la Nacre, Caen, France; 16Gastroenterology intensive care unit hospital beaujon, Clichy, France; 17DHU Unity, Pôle des Maladies de l’Appareil Digestif, Service d’Hépatologie, Centre de Référence des Maladies Vasculaires du Foie, Hôpital Beaujon, AP-HP, Clichy, France
Email: pierre.deltenre01@gmail.com

**Background and aims:** While Sars-Cov-2 infection is a well-known prothrombotic disorder, whether it is a risk factor for splanchnic vein thrombosis (SVT) is unknown. We aimed to assess the impact of Sars-Cov-2 infection on the presentation and prognosis of recent SVT and to assess if the disease profile of these patients differs from patients with recent SVT without Sars-Cov-2 infection.

**Method:** Retrospective study collecting health-related data of 27 patients presenting with recent SVT in the context of Sars-Cov-2 infection in 12 hospital centers belonging to VALDIG network and comparison to 494 patients with recent SVT prospectively included in a database before the Sars-Cov-2 pandemics.
**Results:** Among the 27 patients with recent SVT and Sars-Cov-2 infection (18 males, median age 51 years), 21 had portal vein thrombosis with or without thrombosis of another splanchnic vein, 2 had isolated superior mesenteric vein thrombosis, 1 isolated splenic vein thrombosis and 3 isolated hepatic veins thrombosis. Diagnosis of SVT was made 10 days (95% CI: 0–24) after the diagnosis of Sars-Cov-2 infection. Extension of SVT did not differ between patients with and without Sars-Cov-2 infection. No difference was observed in terms of

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Patients with Sars-Cov-2 Infection (n = 27)</th>
<th>Patients without Sars-Cov-2 Infection (n = 494)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td>51 (36-53)</td>
<td>47 (45-49)</td>
<td>0.9</td>
</tr>
<tr>
<td>Male sex, n (%)</td>
<td>18 (67%)</td>
<td>298 (61%)</td>
<td>0.7</td>
</tr>
<tr>
<td>BMI</td>
<td>26.7 (24.3-29.3)</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Fever, n (%)</td>
<td>14 (52%)</td>
<td>74 (15%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Respiratory symptoms, n (%)</td>
<td>12 (44%)</td>
<td>0 (0%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Dyspnea, n (%)</td>
<td>8 (30%)</td>
<td>0 (0%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Anosmia, n (%)</td>
<td>6 (25%)</td>
<td>0 (0%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Ageusia, n (%)</td>
<td>6 (25)</td>
<td>0 (0%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Abdominal pain, n (%)</td>
<td>24 (89%)</td>
<td>404 (82%)</td>
<td>0.6</td>
</tr>
<tr>
<td>Ascites, n (%)</td>
<td>7 (26%)</td>
<td>105 (22%)</td>
<td>0.4</td>
</tr>
<tr>
<td>CRP, mg/dL</td>
<td>42 (14-106)</td>
<td>35 (21-45)</td>
<td>0.5</td>
</tr>
<tr>
<td>D-dimers, ng/mL</td>
<td>3298 (850-10000)</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>White blood cells (10^3/mm^3)</td>
<td>6.1 (4.0-10.0)</td>
<td>7.0 (6.6-7.2)</td>
<td>0.5</td>
</tr>
<tr>
<td>Polymorphonuclear neutrophils (10^3/mm^3)</td>
<td>3.8 (2.7-6.2)</td>
<td>4.1 (3.9-4.4)</td>
<td>0.8</td>
</tr>
<tr>
<td>Lymphocytes (10^3/mm^3)</td>
<td>1.1 (0.9-1.5)</td>
<td>1.6 (1.5-1.7)</td>
<td>0.04</td>
</tr>
<tr>
<td>Eosinophils (10^3/mm^3)</td>
<td>0.03 (0-0.10)</td>
<td>0.10 (0.10-0.10)</td>
<td>0.002</td>
</tr>
<tr>
<td>Platelets (10^3/mm^3)</td>
<td>220 (178-301)</td>
<td>257 (240-273)</td>
<td>0.6</td>
</tr>
<tr>
<td>ASAT, IU/mL</td>
<td>38 (24-43)</td>
<td>32 (30-34)</td>
<td>0.3</td>
</tr>
<tr>
<td>ALAT, IU/mL</td>
<td>41 (25-52)</td>
<td>40 (37-43)</td>
<td>0.7</td>
</tr>
<tr>
<td>Alkaline Phosphatase, IU/mL</td>
<td>90 (75-134)</td>
<td>83 (79-88)</td>
<td>0.4</td>
</tr>
<tr>
<td>Bilirubin, mg/dL</td>
<td>0.9 (0.6-1.1)</td>
<td>0.6 (0.6-0.7)</td>
<td>0.03</td>
</tr>
<tr>
<td>INR</td>
<td>1.2 (1.1-1.3)</td>
<td>1.1 (1.0-1.1)</td>
<td>0.01</td>
</tr>
<tr>
<td>Creatinine (mg/dL)</td>
<td>0.9 (0.7-1.0)</td>
<td>0.8 (0.8-0.8)</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Abbreviations: ALAT, alanine amino-transferase; ASAT, aspartate amino-transferase; BMI, body mass index; CRP, C-reactive protein; INR: international normalized ratio; NA, not available; SVT, splanchnic vein thrombosis

Continuous variables are presented as median (interquartile range)
age, sex ratio and liver blood tests between patients with and without Sars-Cov-2 infection. Seventeen of Sars-Cov-2 patients (59%) had fever and/or respiratory symptoms (dyspnea, ageusia and/or anosmia). Fever (52% vs. 15%, p < 0.001) and respiratory symptoms (44% vs. 0%, p < 0.001) were more frequent, and the median count of lymphocytes was lower (1.1 x 10^3/mm^3 [95% CI: 0.9–1.5] vs. 1.6 x 10^3/mm^3 [95% CI: 1.5–1.7], p = 0.043) in patients with than in those without Sars-Cov-2 infection. A prothrombotic condition was identified in 44% of Sars-Cov-2 patients and in 52% of non-Sars-Cov-2 patients (p = 0.5). No difference was observed regarding associated prothrombotic conditions. Four Sars-Cov-2 patients required ventilation support. All Sars-Cov-2 patients were treated with anticoagulation, including 25 in whom anticoagulation was initiated on the day of SVT diagnosis. During a median follow-up of 250 days (95% CI: 83–394 days), no patient suffered from gastrointestinal bleeding or from another liver-related event and no patient died. Three patients (11%) required intestinal resection for infarction 1 to 3 months after the diagnosis of SVT, which was significantly more frequent than in the control group (n = 13 [2.6%], p = 0.044). At the end of the follow-up period, partial or complete recanalization of the thrombosed splanchnic vein was observed in 33% of Sars-Cov-2 patients.

**Conclusion:** Sars-Cov-2 infection can be associated with recent SVT. SVT occurring during Sars-Cov-2 infection is characterized by a higher frequency of respiratory symptoms and a lower lymphocytes count. Intestinal ischemia leading to delayed intestinal resection seems more frequent in Sars-Cov-2 patients. In this cohort study in which all Sars-Cov-2 patients received anticoagulation therapy early on after the diagnosis of SVT, partial or complete recanalization was observed in one third of patients.

**THU-296**

Liver-related clinical events among adult patients with alpha-1 antitrypsin deficiency-associated liver disease: a longitudinal retrospective study using linked insurance claims data and electronic medical records in the United States

May Hagiwara1, Victoria Divino2, Swarna Munnangi2, Mark Delegge2, Suna Park1, Ed G. Marins1, Kaili Ren1, Charlton Strange3, Takeda Development Center Americas, Inc., Cambridge, MA, USA, United States; IQVIA Inc., Falls Church, VA, USA, United States; Medical University of South Carolina, Charleston, SC, USA, United States

Email: ed.marins@takeda.com

**Figure:** (abstract: THU-296).
Background and aims: Alpha-1 antitrypsin deficiency (AATD) is a rare genetic disorder occurring in ~1 per 3000–5000 people in the USA. It is characterized by low levels of serum alpha-1 antitrypsin (AAT) and accumulation of misfolded AAT in hepatocytes, which can lead to liver and/or lung disease. Patients with AATD and the protease inhibitor (Pi) ZZ genotype are at increased risk of both diseases. The burden of liver-related clinical events among adult patients with AATD was investigated using large US claims and Ambulatory Electronic Medical Records (AEMR) databases.

Method: This was a retrospective analysis of administrative claims data from the IQVIA PharMetrics® Plus database linked to the IQVIA AEMR database (selection period: January 2012 to October 2021). PharMetrics Plus comprised 142 million enrollees with medical and pharmacy benefits and ≥1-month enrolment during the selection period. Inclusion criteria were: (1) at least one inpatient or at least two outpatient medical claims ≥90 days apart with a diagnosis of AATD in PharMetrics Plus, or (2) with a PiZZ/PiMZ genotype in AEMR and with linkage to PharMetrics Plus; (3) a liver disease diagnosis. A person-time approach was used to maximize the use of data. Follow-up time was assigned to the AATD-liver disease group (for time with liver disease only) and the AATD-liver+lung disease group (for time with both liver and lung disease). Liver-related clinical events of interest (identified by International Classification of Diseases-Ninth/Tenth Revision codes) included liver transplantation, ascites, gastrointestinal bleeds, spontaneous bacterial peritonitis, hepatocellular carcinoma, and hepatic encephalopathy. These were evaluated separately and as a composite (defined as the occurrence of ≥1 of the six clinical events).

Results: In total, 771 and 541 adults aged ≥18 years contributed their time to the AATD-liver disease and AATD-liver+lung disease groups, respectively (combined 1147 patients). The median age was 49 and 55 years, 58% and 51% were male, and the median duration of observation was 22 and 21 months, respectively. Liver-related clinical event rates per person-year among all patients and median time to event for those with liver-related clinical events are shown in Figure 1.

Conclusion: Among adult patients with AATD and liver disease, ascites was the most frequently observed and earliest encountered of the liver-related clinical events studied, followed by gastrointestinal bleeds and hepatic encephalopathy. These rates were higher when patients had both liver and lung disease involvement than liver disease only, possibly related to the higher median age of patients with both diseases. The number of patients with a confirmed PiZZ/ PiMZ genotype was very low (AATD-liver disease: n = 11; AATD-liver+lung disease: n = 5), restricting further analysis.

Acknowledgments: Writing assistance was provided by Elena Sugrue, PhD, of Oxford PharmaGenesis, Oxford, UK and funded by Takeda Development Center Americas, Inc.

Funding: This study was funded by Takeda Development Center Americas, Inc.

THU-297 Hepatobiliary malignancies in Wilson Disease: data from an Italian national reference centre

Lorenzo Canova1, Pier Maria Battezzati1, Greta Trevisi2, Elisabetta Bogà1, Emanuela Bertolini1, Paola Zermiani1, Sara Monico1, Massimo Giovanni Zuin1. 1Azienda Ospedaliero Universitaria Ospedale Maggiore Policlinico, Università degli Studi di Milano, Milano, Italy; 2Department of Internal Medicine, University of Padova, Padova, Italy

Background and aims: Wilson disease (WD) is a rare genetic disorder of copper transport leading to its accumulation mainly in the liver and the brain. Clinical course is frequently complicated by development of liver cirrhosis, a recognized risk factor for liver cancer (LC). Data on the risk of LC in WD is limited and controversial. Hepatocellular carcinoma (HCC) and cholangiocarcinoma (CC) have been regarded as a rare complication of WD. In the largest available study (130 patients), a 1.2% prevalence (incidence rate, 0.28 cases per 1,000 person years) has been estimated (van Meer S., 2015). Conversely, HCC estimates in Saudi Arabia (71 patients) were 7.0% and 9.1 cases per 1,000 person years, respectively (Al Fadda M., 2012). We investigated LC risk in a cohort of WD from a single tertiary referral center for liver diseases.

Method: We enrolled all the patients who were consecutively diagnosed WD (Leipzig score >3) between 1975 and 2022. First line therapy was Penicillamine, while intolerant patients received trientine or zinc salts. Patients underwent liver US examinations yearly. Cirrhosis was diagnosed on the basis of histology (if available), clinical, laboratory and US criteria. At time of first evidence of cirrhosis, LC surveillance was started (6-month US scan, alphafetoprotein testing). End of follow-up was date of LC diagnosis, liver transplantation (OLT), death, or last visit. 24 h urinary copper excretion was used to monitor treatment adequacy. Cox modeling was used to analyze survival.

Results: Overall, 189 WD patients (52% males) were included. Median age was 17 yr (2–74) on diagnosis and 40 yr (11–74) at time of enrollment. Median follow-up was 11.1 yr (0–47). 158 patients (83%) had hepatic or neurologic symptoms at presentation and 32 (17%) were diagnosed by family screening. On diagnosis, cirrhosis was present in 85 (45%) patients, of whom 11 (13%) had decompensated cirrhosis. At the end of follow-up, 95/189 patients had cirrhosis (3 compensated, 1 waiting OLT for end-stage liver disease). LC was detected in 8 patients (7.5%; age at LC diagnosis, 49–60 yr): 5 had HCC (4 transplanted and alive, 1 died), 2 CC (1 transplanted and alive, 1 died); 1 patient with HCC underwent tumor resection and subsequently developed CC (transplanted and alive). Of the 8 patients diagnosed WD when aged ≥30 yr, 6 developed LC (4 HCC, 1 CC, 1 HCC +CC). In 2 patients HCC was diagnosed at time of WD recognition (57, 58 yr). In the remaining 6 patients, 24 h urinary copper excretion was in the therapeutic target. No relationship with mode of presentation or treatment emerged during the treatment period. The incidence of LC was 2.8 cases per 1,000 person years since birth (3 cases per 1,000 person years since time of WD diagnosis) with a prevalence of 4.2%.

Conclusion: The incidence of LC in WD is higher than formerly estimated, but still lower than other chronic liver diseases. CC represents a substantial part of LC.

THU-298 Beneficial effect of cystic fibrosis transmembrane conductance regulator modulators on adults with cystic fibrosis liver disease

Sofia Manioudaki1, Larisa Vasiliou2, Iliaana Mani3, Filia Diamantea4, Theodoros Alexopoulos5, Sophia Pourki6, Zoe Athanassa7, Alkaterini Sakagianni8, Eleni Geladari9, Ioannis Elefsiniotis9, Emilia Hadziyannis10, Alexandra Alexopoulou10. 1Sismanoglio General Hospital of Athens, Greece; 2Alexandra General Hospital, Gastroenterology, Athens, Greece; 32nd Department of Internal Medicine and Research Laboratory, National and Kapodistrian University of Athens, Medical School, Hippokration General Hospital, Athens, Greece; 4Adult Cystic Fibrosis Unit, Sismanoglio General Hospital of Athens, Greece; 5Laiko General Hospital, Gastroenterology Department, Athens, Greece; 6Intensive Care Unit, Sotiria General Hospital of Athens, Greece; 7Intensive Care Unit, Sismanoglio General Hospital, Athens, Greece; 8Evangelismos General Hospital; 3rd Department of Internal Medicine and Liver Outpatient Clinic, Athens, Greece; 9Academic Department of Internal Medicine, General Oncology Hospital of Kifissia “Agioi Anargyroi”, National and Kapodistrian University of Athens, Greece; 102nd Department of Internal Medicine and Research Laboratory, Medical School, National and Kapodistrian University of Athens, Hippokration Hospital, Athens, Greece

Email: alexandra61@med.uoa.gr

Background and aims: In cystic fibrosis (CF), liver disease (CFLD) is the third leading cause of mortality. A combination of modalities including physical examination, biochemical and imaging were utilized in the conventional Debray criteria. New drugs have been approved for the treatment of CF patients who have at least one copy
of the F508del mutation in the CF transmembrane conductance regulator (CFTR) gene. These modulators were reported to improve lung function and symptoms as well as decrease CF exacerbations. However, the drug efficacy and tolerability on CFLD need further investigation.

Method: Longitudinal data were collected from a cohort of genetically confirmed CF adult patients. CFLD was diagnosed by Debray criteria.

Results: Thirty patients with CF [66.7% male, median age at diagnosis 6 (interquartile range 1.83–36) months, median age 27.5 (23–33) years] were included. Nine (30%) met the Debray criteria at first assessment. Seventeen patients (treatment group) treated for ≥12 months were compared with 13 treated for <12 months or untreated (non-treatment group). The median period of drug administration was 45 (21–69) months. Seven patients were receiving from the beginning elixacaftor/tezacaftor/ivacaftor (ELX/TEZ/IVA) while 10 initiated TEZ/IVA or lumacaftor/IVA and continued with ELX/TEZ/IVA. Mild fluctuations in LFTs occurred in 58.8% but did not lead to therapy discontinuation. Only one patient with CFLD received the drug in reduced dose. At the reassessment, 60.5 (57–65.25) months following first assessment, 11 (36.7%) of total patients met the Debray criteria. Two (15.4%) of the non-treatment group were classified as CFLD at first assessment and 6 (46.2%) in the reassessment. Seven (41.2%) in treatment group were classified as CFLD at first assessment and were reduced in 5 (29.4%) at the reassessment. Liver stiffness decreased in the treatment group from 6.8 kPa (5.05–11.95) to 5 kPa (4.15–6.35), (p = 0.001). The median time elapsing between two liver stiffness determinations were 87 (57–95) months. Liver stiffness values did not demonstrate a significant alteration in the non-treatment group between the two assessment points (p = 0.972).

Conclusion: In a case series of adult patients with CF, some patients from the non-treatment group developed CFLD during investigation period while others treated with CFTR modulators were de-classified from CFLD and re-classified in non-CFLD group. Liver stiffness was also improved in treated patients. However, more patients and longer follow-up are needed for solid conclusions to be drawn.

THU-299
Genetic findings and magnetic resonance imaging of multiple biliary hamartomas
Juliana Goediker1, Philipp Schindler2, Judit Horvath3, Julius Heidenreich4, Jonel Treblicka5, Carsten Bergmann6, Bernhard Schlewig7, 1University Hospital Muenster, Internal Medicine B, Germany; 2University Hospital Muenster, Department of Radiology, Germany; 3University Hospital Muenster, Department of Human Genetics, Germany; 4University Hospital of Würzburg, Department of Diagnostic and Interventional Radiology, Germany; 5Medical Center-University of Freiburg, Department of Medicine IV, Germany
Email: juliana.goediker@ukmuenster.de

Background and aims: Biliary hamartomas (BH), which are also known as “von Meyenburg complexes,” are benign and asymptomatic malformations of dilated bile ducts embedded in fibrous stroma, usually smaller than 10 mm. BH are usually incidental findings in liver imaging and there is a risk of misdiagnosis as malignomas. BH are part of a wider spectrum of ductal plate malformations, which are generally presumed to have a genetic basis. However, the specific genetic cause of BH is unknown. This study aims to provide a structured genetic and magnetic resonance imaging (MRI) analysis of BH.

Method: 6 patients with multiple biliary hamartomas (MBH) were identified in a large cohort of a tertiary center. Customized next-generation sequencing was used to identify the underlying genetic cause of MBH. This panel contained more than 650 genes with a known association with ciliopathies. High-resolution contrast-enhanced hepatobiliary MRI was performed in all subjects to provide a structurally report of the imaging features of MBH. Quantitative analysis of cystic liver volume was performed with an artificial-intelligence augmented approach at baseline and follow-up MRI.

Results: In all patients, a heterozygous missense change, truncating or frameshift mutation was found in PKHD1, which encodes for multidomain integral membrane protein fibrocystin. Biallelic mutations are causative for autosomal recessive polycystic kidney disease (ARPKD). Laboratory and clinical abnormalities were missing and acoustic radiation force elastography (ARFI) displayed no signs of liver fibrosis in these patients. MRI showed innumerable small liver cysts without communication with the biliary tree, which allowed diagnosis of MBH. Longitudinal MRI studies revealed that total hepatic cystic volume remained stable over time (mean volume: 104.8 ml; mean proportion of total liver volume: 8.1%, mean follow-up: 3.8 years).

Figure: 3D magnetic resonance cholangiopancreatography (MRCP) showing multiple cystic lesions within the liver, but without communication of the lesions with the biliary ducts.

Conclusion: This case series delivers evidence that MBH and PKHD1-associated polycystic liver disease may belong to the same disease entity, caused by monoallelic mutations in PKHD1. Clinically they share a similar phenotype with innumerable liver cysts within the range of a few millimeters, which remain stable over time.

THU-300
Performance of blood based non-invasive tests for liver fibrosis prediction by transient elastography in Alpha-1 antitrypsin deficiency
Hassaan Youssuf1,2, Tobias Maharaj1,2, Daniel Fraughen1,2, Tomas Carroll1,2, Noel G. McElvaney1,2, John Ryan1,2, 1Beaumont Hospital, Dublin, Ireland; 2Royal College of Surgeons in Ireland, Ireland
Email: HassaanYousuf@hotmail.com

Background and aims: Alpha-1 Antitrypsin Deficiency (AATD) is an inherited disorder characterised by lung and/or liver injury. The most severe form is seen in individuals with the homozygous PiZZ variant, while heterozygous (PiMZ; PiSZ) variants are associated with milder disease. Progressive liver fibrosis may lead to cirrhosis in some cases. In chronic liver disease, liver biopsy is used less often as a staging tool; instead blood-based fibrosis scores such as the NAFLD fibrosis score (NFS), AST to platelet ratio index (APRI) or the Fibrosis-4 (Fib-4) score, or Transient Elastography (TE) by liver stiffness measurement (LSM) may be used to determine fibrosis stage.

Method: Clinical data, blood tests and TE measurements were taken on adult patients presenting to a dedicated AATD clinic over a 18-month period. LSM cutoffs used were >7.1kPa for significant
fibrosis, and >10kPa for advanced fibrosis/cirrhosis. Statistics were performed using Stata software.

**Results:** 155 patients were assessed. Of them, 55% were female, mean age was 52.6 (± 16). Regarding AATD phenotype, 69 (44.5%) were PiZZ, and 62 PiMZ and 15 PiSZ. Of the overall cohort, 40 (25.8%) had significant fibrosis based on TE measurement, while 17 (11%) had advanced fibrosis. Of patients with the PiZZ phenotype, 20 (28.9%) had significant fibrosis, while 10 (14.4%) had advanced fibrosis. Of patients with the PiMZ phenotype, 12 (19% of PiMZ) had significant fibrosis, while 4 (6.4%) had advanced fibrosis. NAFLD fibrosis score (NFS), AST to platelet ratio index (APRI) and the Fibrosis-4 (Fib-4) score were compared with liver fibrosis stage as determined by TE. The AUROC curves from significant and advanced fibrosis are outlined in Fig 1. For both stages of fibrosis, these scores showed a modest ability to predict fibrosis, while 4 (6.4%) had advance fibrosis. Reliable disease-specific tools are needed to accurately stage liver disease in AATD.

**Conclusion:** In patients with AATD, existing blood-based, non-invasive markers of liver fibrosis have a modest ability to predict fibrosis. Reliable disease-specific tools are needed to accurately stage liver disease in AATD.

**THU-301**

**Main clinical characteristics and evolutionary events among patients suffering Wilson disease in Spain: first results from the Spanish Wilson registry**

Zoe Mariño, Luis García-Villarreal, Antonio Oliveira Martin, Javier Ampuero, Marina Berenguer, Diego Burgos Santamaria, José Ramón Fernández, José María Moreno Planas, María Lázaro Ríos, Helena Masnou, María Luisa Gonzalez Dieguez, Jose Ramón Fernández, José María Moreno Planas, María Lázaro Ríos, Helena Masnou, María Luisa Gonzalez Dieguez, Jose Ramón Fernández, José María Moreno Planas, María Lázaro Ríos, Helena Masnou, Maria Luisa Gonzalez Dieguez, Jose Ramon Fernandez, Jose Maria Moreno Planas.

**Background and aims:** Wilson disease (WD) is characterized by a high clinical heterogenicity. In Spain, a National Wilson Registry (supported by the Spanish Association for the Study of the Liver, AEEH) was created in Nov/2021, with the aim of updating clinical information and promote consciousness and interest on the disease. In this first analysis of the global database, we aimed at describing the main baseline characteristics, therapy and long-term clinical events of WD patients.

**Method:** Multicentric national study including patients from the Spanish Wilson AEEH-Registry up to November 2022. Ethical approval from the participant centers and a signed informed consent was required for all cases.

**Results:** During the first year, 352 patients were registered and 320 had enough data to be analyzed (final cohort): 315 (95.3%) were
adults at inclusion (mean age 42, IQR25–75 29–53), 228 (71.3%) were index cases, 167 were male (52.2%), age at WD diagnosis: 16 years (10–27.8). Leipzig score at diagnosis: 7 (5–9) points (93.4% had score ≥3), baseline ceruloplasmin <0.2 g/l in 265 (83%), urinary copper >100 µg/24 hours in 148 (46.3%), intrahepatic copper >250 µg/g in 152 (47.5%). Genetics were performed in 242 patients (75%); among them, 85% were compound heterozygote. One third (32.2%) reported a positive family history. Most of the patients (78%) were diagnosed after being studied from a liver disease. Predominant phenotype at diagnosis was chronic liver disease (n = 158, 49%), followed by presymptomatic cases (n = 66, 20.6%), neurological presentations (n = 32, 10.1%), mixed phenotypes (n = 29, 9.1%) and acute liver disease (n = 29, 9.1%). This last group included 7 cases who required an early liver transplantation (in the first month after diagnosis). Cirrhosis was present in 62 patients (19.4%) at diagnosis. The main initial therapy was based on chelators (n = 213, 67%), mainly with D-penicillamine (91.3%). Up to 30% suffered early adverse events (AE). In patients with AE, the therapeutical decision (available in 222) was to remain unchanged in 62%, changed in 32.4% and dose-adjusted in 5.9%. WD treatment is currently different to the initial one in 56% of the cohort. Mean follow-up from diagnosis is 18 years (9–26). Elastography was performed at least once in 203 (64%) cases [mean 6.1KPa (5–8.7)]. Evolutionary events were available from 170 patients (53%): 42 (24.7%) developed de novo cirrhosis, 7 (16%) presented hepatic decompensation (mainly ascites), 1 (0.6%) had liver cancer, 5 (2.9%) required liver transplantation within time and 16 (9.4%) patients died (15 deaths were WD-related).

Conclusion: During the first year of the Wilson AEEH-Registry we have recorded data from 320 patients. The hepatic phenotype was predominant in this cohort, as it has been promoted from the Hepatology scientific community. Up to 25% of the patients in Spain still lack from a confirmatory genetic analysis.

**THU-302**

**Endoscopic ultrasound direct portal pressure measurement in patients with porto-sinusoidal vascular disorder and clinically significant portal hypertension: a comparison with hepatic venous pressure gradient measurement**

Lucia Giuli1, Francesco Santopaolo1, Francesca Ponziani1, Brigida Eleonora Annicchiarico1, Antonio Gasbarrini1. Giulia Venturini1, Andrea Contegiacomo1, Bethania Mazzoni1, Giorgio Russo2, Fabio Diez1, Giuseppe Frustaci1

**Background and aims:** Hepatic venous pressure gradient (HVPG) represents the gold standard for the evaluation of portal hypertension (PH). HVPG >10 mmHg defines clinically significant portal hypertension (CSPH), a condition that is independently associated with the occurrence of decompensation events. Portal pressure measurement is of fundamental importance for prognostic stratification and assessment of response to therapies. Indeed, a decrement of HVPG by 20% and/or <10 mmHg reduces the decompensation risk. HVPG, however, indirectly measures PH and it may underestimate portal pressure gradient (PPG) in patients with pre-sinusoidal forms of PH, as in porto-sinusoidal vascular disorder (PSVD). Endoscopic ultrasound (EUS)-guided PPG measurement has recently become available. This technique allows measurement of portal pressure directly in the portal vein system and theoretically overcomes HVPG limitations. We investigated the safety and accuracy of EUS measurements as compared to HVPG in evaluating PPG in a cohort of patients with PSVD and CSPH. In patients naïve to non-selective beta-blockers (NSBBs) hemodynamic response to therapy was also evaluated.

**Method:** Consecutive outpatients with PSVD diagnosed according to Valdig criteria and who presented specific sign(s) of CSPH (gastrooesophageal varices and/or portosystemic collaterals) underwent HVPG and EUS-guided PPG measurements. In patients naïve to NSBBs, treatment was started and after its titration EUS-PPG measurement was repeated. Definition and severity of adverse events (AEs) were based on classification of Cotton et al.

**Results:** Between March 2022 and December 2022, ten patients (mean age 59 ± 16; 67% males) were enrolled. Mean platelet count was 64.000 U/microliter with 30% of patients having platelet count <50,000 U/microliter. A total of 13 EUS-guided PPG and 10 HVPG measurements were performed. EUS-PPG was technically successful in all cases, without any AEs and requirement for platelet transfusion. EUS-PPG mean value was 19.3 ± 3.2 mmHg versus 8.3 ± 1.3 mmHg of HVPG (p < 0.0001) (Figure 1). In three patients naïve to NSBBs we repeated a new EUS-PPG measurement after drug titration. The average PPG value in these patients before and after NSBBs titration was respectively 19.3 (± 3.8) and 16.3 (± 2.9) mmHg, with one patient out of three who achieved a decrement of PPG >20%.

![Figure 1](image)

**Conclusion:** Direct EUS-guided PPG measurement is safe and significantly more reliable than HVPG in the evaluation of PH in patients with PSVD and CSPH. This technique could be also used to assess hemodynamic response to therapy in pre-sinusoidal forms of PH.

**THU-303**

**Alpha-1 antitrypsin deficiency is underdiagnosed in cirrhotic liver transplant patients: a retrospective multicenter study**

Manon Evain1, Ilias Kounis2, Isaac Ruiz2, Guillaume Lassailly3, Olivier Roux4, Alessandre Mazzola5, Pauline Houssel-Debry6, Laure Elkrief7, Rodolphe Anty8, Mylène Sebagh1, Teresa Antonini9, Didier Samuel1, Audrey Coilly1, 1Hôpital Paul-Brousse AP-HP, Villejuif, France; 2CHUM, Montréal, Canada; 3Hospital Claude Huriez, Lille, France; 4Hospital Beaujon AP-HP, Clichy, France; 5University Hospitals Pitié Salpêtrière-Charles Foix, Paris, France; 6CHU Rennes-Pontchaillou Hospital, Rennes, France; 7Chu Hospitals Of Tours, Tours, France; 8Hospital L’archet, Nice, France; 9Hôpital de la Croix-Rousse-HCL, Lyon, France.

Email: manon.evain@hotmail.fr

**Background and aims:** Alpha-1 antitrypsin deficiency (AATD) is one of the most common genetic diseases in Europe. It mainly causes pulmonary emphysema. Although it is also responsible for liver fibrosis, AATD is not always diagnosed, even in the most severe patients who are candidates for liver transplantation (LT). The aims of this study was to determine when the diagnosis was made for patients transplanted for AATD, to describe their clinical characteristics and the outcome on the transplant waiting list.
Method: We performed a multicenter retrospective study between May 2019 and June 2021 in 9 French and Canadian centers by including all liver transplant patients for AATD. The selection of patients was made or confirmed on the explant analysis with PAS+, diastase-resistant inclusions within hepatocytes. A control group (n = 305) to study the evolution on the transplant waiting list was selected from an existing monocentric cohort of liver transplant patients for decompensated cirrhosis.

Results: We included 58 liver transplant patients with AATD between 1996 and 2020, with a mean age of 55.6 ± 9.9 years at LT, mostly men (78%). Indication of LT was AATD in only 31% of cases whereas excessive alcohol consumption, NASH, cryptogenic cirrhosis represented 43%, 14% and 12% of patients respectively. The diagnosis of AATD was made before LT in only 40% of cases, after LT in 15% of cases. For 45% of patients, the diagnosis was never confirmed before the retrospective analysis. Among them, 62% was diagnosed with cirrhosis due to excessive alcohol consumption. Only 46% of patients in the cohort had confirmation of AATD by phenotyping or genotyping before or after LT. Only 60% of patients had a pre-LT serum AAT assay, which was significantly lower in homozygous versus heterozygous patients (0.36 vs. 0.82 mg/ml, p < 0.01). Moreover, 25% of the patients had non-specific pulmonary symptoms, 8% had pulmonary emphysema and 7% had an obstructive syndrome. Compared to the control group, patients transplanted for AATD had a higher MELD score at listing for transplant (21.9 vs 14.2, p < 0.001) and a shorter waiting time on the transplant waiting list (4.7 months vs 8.3 months, p < 0.001). They were also significantly more often hospitalized in intensive care before transplantation (22 vs. 4.3%, p < 0.001), and had more pre-LT sepsis (29 vs. 5.1%, p < 0.001).

Conclusion: Our study demonstrates that although patients with AATD are more severe, AATD is largely under-diagnosed in the context of LT. AAT dosage is not sufficient to screen the disease on the waiting list patient. Regarding recent advances and development of curative treatments, systematic phenotype/genotype screening of patients on waiting list could be suggested as well as raising awareness of transplant physician to achieve better management of the patients and their relatives.

THU-304
The impact of a complete biochemical response on health-related quality of life in patients with autoimmune hepatitis: a multicentre prospective cross-sectional study
Romée Snijders1,2, Katheryn Olsen2,10,11, Alejandra Campos-Murguia2,15, Richard Taubert2,15, Ozgur Koc2,16, Matthijs Kramer16, Jose Willemsen2,17, Bernd Löwe1,18, Ansar W. Lobser2,19, Joost P.H. Drenth2,1, Christoph Schramm2,4,19, Piotr Milkiewicz2,3,20, Tom Gevers2,16,21, 1Department of Gastroenterology and Hepatology, Radboud University Medical Center, Nijmegen, The Netherlands, Netherlands; 2European Reference Network on Hepatological Diseases (ERN RARE-LIVER), Germany; 3Department of Hepatology, Transplantology and Internal Medicine, Medical University of Warsaw, Warsaw, Poland, Poland; 4Division of Gastroenterology and Center for Autoimmune Liver Diseases, Department of Medicine and Surgery, University of Milano-Bicocca, Monza, Italy; 5Division of Gastroenterology, Department of Internal Medicine, Faculty of Medicine, University of Debrecen, Hungary; 6Division of Autoimmune Liver Diseases, Department of Medicine and Surgery, University Medical Centre Hamburg-Eppendorf, Hamburg, Germany, Germany; 7Kálmán Laki Doctoral School, Faculty of Medicine, University of Debrecen, Hungary, Hungary; 8Division of Gastroenterology and Hepatology, Hvidovre University Hospital and Rigshospitalet, Copenhagen, Denmark, Denmark; 9Liver Transplant and Hepato-biliary Unit, Queen Elizabeth Hospital, University Hospital of Birmingham NHS Foundation Trust, United Kingdom; 10Centre for Liver and Gastro Research, NIHR Biomedical Research Centre, Institute of Immunology and Immunotherapy, University of Birmingham, Birmingham, United Kingdom, United Kingdom; 11Department of Gastroenterology and Hepatology, Erasmus University Medical Center, Rotterdam, The Netherlands, Netherlands; 12Liver Disease Unit, Internal Medicine Department, Centro Hospitalar e Universitário de Coimbra, Coimbra, Portugal, Portugal; 13Liver Transplant Unit, Centro Hospitalar e Universitário de Coimbra, Coimbra, Portugal; 14Department of Gastroenterology, Hepatology and Endocrinology, Hannover Medical School, Hannover, Germany, Germany; 15Department of Gastroenterology and Hepatology, MUMC+, Maastricht, The Netherlands, Netherlands; 16Departments of Medical Research, NIHR Biomedical Research Centre, Institute of Immunology and Immunotherapy, University of Birmingham, Birmingham, United Kingdom, United Kingdom; 17Dutch Liver Patients Association, Hoogland, The Netherlands, Netherlands; 18Department of Psychosomatic Medicine and Psychotherapy, University Medical Center Hamburg-Eppendorf, Hamburg, Germany, Germany; 19Department of Medicine, University Medical Center Hamburg-Eppendorf, Hamburg, Germany, Germany; 20Translational Medicine Group, Pomeraniám Medical University, Szczecin, Poland, Poland; 21Nutrim School for Nutrition and Translational Research in Metabolism, Maastricht University, Maastricht, The Netherlands, Netherlands
Email: Romee.Snijders@radboudumc.nl

Background and aims: Autoimmune hepatitis (AIH) is a rare, chronic liver disease. A complete biochemical response (CBR) is a desired end point in the treatment of AIH. Data suggest that CBR improves the prognosis, but the impact on health-related quality of life (HRQoL) in AIH patients is unclear. The aim of this study is to characterize the relationship between CBR and HRQoL in an international multicentre cohort.

Method: A cross-sectional cohort study was performed in adult patients with AIH who were recruited between July 2020 and December 2022 from 12 European tertiary centres. Patients with a history of liver transplantation or hepatocellular carcinoma were excluded. HRQoL was evaluated using the EQ-5D visual analogue scale (VAS), ranging from 0 (worst imaginable health) to 100 (best imaginable health). The cohort was divided into two groups according to their CBR, which was defined as normal alanine aminotransferase, aspartate aminotransferase, and immunoglobulin G levels. Clinical data were obtained from patient records at the time of HRQoL evaluation. A linear mixed regression analysis was used to explore the relationship between CBR and EQ-5D VAS score.

Results: A total of 748 patients with AIH (mean age: 49.7 years (standard deviation (SD) 17.2); 73.8% female) were evaluated. A total of 25.6% had compensated cirrhosis. The median disease duration was six years (interquartile range (IQR) 2–11). In this cohort, 44.8% had a CBR at the time of HRQoL evaluation. The median EQ-5D VAS score was 80 (IQR 65-90) in the patients with a CBR and 70 (IQR 50–85) in the patients without a CBR. Patients with a CBR used fewer corticosteroids (48.0% vs. 65.4%, p < 0.001) and were older (mean (SD) 51.9 (17.1) vs. 48.0 (17.1), p = 0.002), while sex and the prevalence of cirrhosis were similar. After controlling for age, sex and corticosteroid use, patients with a CBR reported significantly higher median EQ-5D VAS scores than those without a CBR (β = 6.71; 95% CI 2.23, 11.20). We did not observe any association between corticosteroid use and EQ-5D VAS score.

Conclusion: Achieving a CBR in patients with AIH is an important factor associated with improved HRQoL, independent of corticosteroid use, age and sex.
Impact of extrahepatic portal vein obstruction on fertility and pregnancy outcomes—a tertiary center experience

Ankita Singhe, Sidharth Harindranathf, Karan Muzumdar2, Aditya Kaje, Akash Shukla1, 1King Edward Memorial Hospital, Gastroenterology, Mumbai, India; 2King Edward Memorial Hospital, Mumbai, India

Email: drakashshukla@yahoo.com

Background and aims: Pregnancy in patients with portal hypertension (PHT) presents a major challenge in terms of management due to plasma volume expansion and increased cardiac output which increases portal pressure and risk of variceal bleeding. PHT is associated with poor pregnancy outcomes in mother and foetus. We aim to study the outcomes of pregnancy (maternal and neonatal) in patients with EHPVO.

Method: This was a single center retrospective analysis of pregnancy outcomes in patients with EHPVO who were registered in the department of Gastroenterology at KEM Hospital between January 2006 to December 2022. All patients underwent endoscopy with prophylactic EVL (for high-risk varices) during second trimester and beta blockers were continued during pregnancy. Second stage of labour was shortened as per obstetric indications. Control group consisted of healthy females without comorbidities and with low-risk pregnancies.

Results: Complete data was available for 100 pregnancies in 45 patients, of which 98 were spontaneous and 2 assisted. There was no maternal mortality. 82 (82%) pregnancies had successful fetal outcomes. Of the 18 unsuccessful pregnancies, 13 (72.2%) were spontaneous abortions, 2 (11.1%) were intrauterine fetal deaths, and 3 (16.7%) were neonatal deaths. 3 (6.7%) patients presented with acute variceal bleed (AVB) for the first-time during pregnancy. Only one of the 17 patients with history of UGIB prior to pregnancy, had repeat haematemia during pregnancy. During pregnancy, 24 (53.3%) patients were treated with combination (endoscopic with non-selective beta blockers) therapy, 10 (22.3%) with NSBB alone and 11 (24.4%) did not receive any treatment. Anemia was observed in 37 (82.2%) patients; 73% patients had mild, 21.6% moderate and 5.4% severe anemia. 10 (22.2%) patients had thrombocytopenia (platelet count <11). Infertility was diagnosed in 10 (13.3%) patients, 3 (50%) of them underwent treatment for same and 1 patient had conceived. Of the pregnancies with successful outcomes, 4 (4.9%) were delivered preterm and 19 (23.1%) required Caesarean section; Low birth weight was seen in 23 (28%) and small for gestational age in 9 (10.9%) pregnancies. 105 pregnancies in 45 healthy females formed the control group. 86 (81.9%) successful outcomes, 4 (4.9%) were delivered preterm and 19 (23.1%) required Caesarean section; Low birth weight was seen in 23 (28%) and small for gestational age in 9 (10.9%) pregnancies. No. No AHF No AHF No AHF No AHF

<table>
<thead>
<tr>
<th>(n)</th>
<th>No arthritis</th>
<th>No arthritis</th>
<th>Arthritis (21)</th>
<th>Arthritis (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIC (umol/g)</td>
<td>110 (34-399)</td>
<td>188 (41-361)</td>
<td>384 (295-510)*</td>
<td>228 (57-675)*</td>
</tr>
<tr>
<td>HII (HIC/age)</td>
<td>3.7 (10-17.4)</td>
<td>4.4 (13-10.8)</td>
<td>6.1 (6.0-12.4)</td>
<td>4.9 (1.3-19.3)</td>
</tr>
<tr>
<td>Fe (g)</td>
<td>4.8 (12-20.0)</td>
<td>7.5 (2.5-19.5)</td>
<td>11.0 (10.0-22.5)</td>
<td>14.0</td>
</tr>
<tr>
<td>Fe/HIC (g/umol/g)</td>
<td>0.041 (0.016-0.088)</td>
<td>0.042 (0.023-0.133)</td>
<td>0.029 (0.022-0.034)</td>
<td>0.062 (0.026-0.171)*</td>
</tr>
</tbody>
</table>

All values—Median (range); *p < 0.05; **p < 0.01 vs no AHF/no arthritis group; p < 0.05 vs AHF/no arthritis group.

Conclusion: Pregnancy in patients with EHPVO has good maternal and neonatal outcomes irrespective of history of variceal bleed before or during pregnancy.
THU-307
Longitudinal assessment of plasma immune and bacterial translocation markers in biliary atresia
Vandana Jain¹, Emma Alexander¹, Charlotte Burford¹, Mark Davenport¹, Jessica Nulty¹, Muhammed Yuksel¹, Anil Dhawan¹.
¹King’s College Hospital, United Kingdom
Email: vjain@nhs.net

Background and aims: Bacterial translocation (BT), and Pathogen Associated Molecular Patterns (PAMPS), propagate a pro-inflammatory response in chronic liver diseases. However, the role of BT, the immune system, and their interaction, is as-yet incompletely characterised in Biliary Atresia (BA). We aimed to characterise the association of immune markers in BA, before and after Kasai portoenterostomy (KPE), with fibrosis and BT, and clinical outcomes.

Method: Plasma samples were prospectively collected from BA infants (n = 55) pre-KPE, 6weeks-, 3months-, and 6months-post-KPE. Th1- (IL-2, IFNy), Th2- (IL-4, IL-10), TH17- (IL-17, IL-23), macrophage-associated (IL-6, IL-8, TNFα, IL-1β) cytokines, and cellular adhesion molecules (ICAM-1, VCAM-1), BT biomarkers (LBP and D-lactate) were measured. Clinical outcomes: 6month-JC (jaundice clearance), 1year-LT (liver transplantation), cholangitis by 6month-post-KPE, fibrosis biomarkers [Aspartate Aminotransferase-to-platelet ratio index (APRi); Liver Stiffness Measurement (LSM)].

Results: Pre-KPE, immune markers were similar between clinical outcome groups. By 6weeks-post-KPE, increased IL-4, IL-8, IL-1β and ICAM-1 were associated with 1year-LT. ICAM-1 was associated with poor 6month-JC and with fibrosis biomarkers [APRi;rs = 0.6, p < 0.001:LSM;rs = 0.6, p < 0.001]. By 3months-post-KPE, further increases in macrophage-associated cytokines in non-favourable outcome groups (1year-LT and poor 6month-JC), were evident. VCAM-1/ICAM-1, IL-8 and IL-1β positively correlated with APRi and LSM. We found an increased rise of IL-17 [1.14 ng/L/month], IFN-γ [4.04 ng/L/month] over the 6month-period, in 1yr-LT group. IL-17, 6weeks-post-KPE, associated with cholangitis [p = 0.03]. At early-post-KPE time-points, macrophage markers (IL-6, IL-8, TNFα) and ICAM-1/VCAM-1 positively correlated with LBP levels; macrophage markers/TH2/Th17 and adhesion molecules, positively correlated with D-lactate.

Conclusion: Divergence of innate (macrophage) and adaptive (Th1/Th2/Th17) immune pathways early post-KPE, strongly discriminates BA infants with non-favourable clinical outcomes. This novel data provides convincing evidence for BT in macrophage activation, upregulation of adhesion molecules, and fibrosis. Consequently, targeted microbiota-modulatory therapy, early-post-KPE, could dampen PAMP-associated damage in BA.

THU-308
Chronic hepatitis B infection and porto-sinusoidal vascular disorder, a non-negligible coexistence
Pol Olivas Alberch¹,2,3, Sabela Lens¹,4, Genís Campreciós³,5, Carla Montiromi³, Marta Mazag³,4, Valeria Perez³,7, Lara Orts³,8, Anna Baiges³,4, Fanny Turon³,4, Juan Carlos, Garcia Pagan³,5, Virginia Hernandez-Geya³,2,10.¹Liver Unit, Hospital Clinic de Barcelona, Universitat Barcelona, IDIBAPS, Spain; ²Hemodynamic Lab, Hospital Clinic de Barcelona, ERN-rare-Liver, Spain; ³Centro de investigación biomedica en red enfermedades hepáticas y digestivas (CIBEREHD), Spain; ⁴Liver Unit, Hospital Clinic de Barcelona, Universitat de Barcelona, IDIBAPS, Spain; ⁵Liver Unit, Hospital Clinic de Barcelona, Universitat de Barcelona, IDIBAPS, Spain; ⁶Department of Pathology, Hospital Clinic de Barcelona, Universitat de Barcelona, IDIBAPS, Spain; ⁷Liver Unit, Hospital Clinic de Barcelona, Universitat de Barcelona, IDIBAPS, Spain; ⁸Hemodynamic Lab, Hospital Clinic de Barcelona, IDIBAPS, Spain; ⁹Liver Unit, Hospital Clinic de Barcelona, Universitat de Barcelona, IDIBAPS, Spain; ¹₀Liver Unit, Hospital Clinic de Barcelona, Universitat de Barcelona, IDIBAPS, Spain
Email: olivas.alberch@gmail.com

Background and aims: Porto-sinusoidal vascular disorder (PSVD) diagnostic criteria have recently been redefined (Baveno VII). An important novelty is that the presence of other liver disease etiology does not exclude PSVD diagnosis in absence of cirrhosis. Coexistence of HBV chronic infection (HBVci) and PSVD-like vascular alterations have anecdotally been reported. Our aim is to evaluate the prevalence of this coexistence and its clinical impact.

Method: Retrospective unicentric study. Inclusion of patients meeting Baveno VII PSVD criteria. Detailed characterization of HBV biology. Collection of clinical data at diagnosis and follow-up (11 ± 9 months). Results: Out of 95 patients meeting Baveno VII criteria, 26 (27%) had HBVci. Patients with HBVci were more likely to be male (p = 0.03), have advanced liver disease (Child-Pugh C: 0.01), and have a higher Ishak fibrosis score (0.04). The presence of HBVci was associated with a lower MELD score (0.02), and a lower MELD-Na (0.001). Furthermore, patients with HBVci had a lower platelet count (0.03) and a higher AST/ALT ratio (0.001). Conclusion: HBVci is a common and clinically relevant coexistence in patients meeting Baveno VII PSVD criteria. This novel data has important implications for the management of patients with PSVD.
Background and aims: Patients with Wilson Disease (WD) experience pathologic hepatic copper accumulation due to reduced biliary copper excretion. Bis-choline tetrathiomolybdate (TTM) is a high affinity copper chelator with therapeutic potential in WD. Reports in rodents that TTM stimulates hepatic copper excretion into the bile have not been confirmed in humans. In this study, to better understand its mechanism of action, we used $^{64}$Cu PET imaging to examine the effects of TTM on copper distribution and hepatic excretion in patients with WD.

Method: Copper distribution and biliary excretion after an intravenous $^{64}$Cu dose was investigated in four WD patients on stable chelation therapy using $^{64}$Cu PET/MRI. Samples of venous blood were also taken for radiocopper measurement. Patients were scanned 20 minutes post $^{64}$Cu dose and 7 more times until 68 h post dose. We compared PET/MRI recordings without treatment (baseline) and after TTM treatment, with each patient serving as their own control.

Results: TTM significantly increased $^{64}$Cu levels by 5–70% in venous blood samples and in aorta (measured by PET) during the first 6 h after the $^{64}$Cu administration. Hepatic levels of $^{64}$Cu were significantly decreased from baseline by TTM by 59%–27% (20 min–68 h post dose, respectively). These observations suggested immediate strong binding of $^{64}$Cu in blood by TTM with retention of $^{64}$Cu in plasma, leading to reduced uptake in organs. Gallbladder $^{64}$Cu levels were below or near detection limit at all time points and did not increase on TTM treatment during the 68 h timeframe, suggesting no induction of biliary radiocopper excretion (Figure). Radiocopper in the kidneys followed a different pattern. Initially, TTM inhibited renal $^{64}$Cu accumulation, but from 20 h onwards renal $^{64}$Cu was higher after TTM (p < 0.03). However, this was not followed by increased $^{64}$Cu levels in the bladder.

Conclusion: PET/MRI is a useful tool for examining copper metabolism and mechanism of action of copper chelation therapy. TTM did not enhance biliary excretion of $^{64}$Cu after TTM administration to patients with WD, in contrast to earlier reports in rodents, suggesting an alternative mechanism of action for this drug. TTM initially acted to reduce exposure of the liver and other organs to Cu by retaining $^{64}$Cu in the plasma, but with time the copper may be redistributed. Further study is needed to delineate the multimodal effect of TTM on copper metabolism.
Background and aims: Primary sclerosing cholangitis (PSC) is a rare, chronic cholestatic liver disease characterized by progressive inflammation, fibrosis, and destruction of the intrahepatic and extra-hepatic bile ducts. Animal models of PSC have shown that cytokines and chemokines may be important pathogenetic mediators of liver inflammation and fibrosis. CCL24 (eotaxin-2) is a chemokine that promotes cell trafficking and regulates inflammatory and fibrotic activities through the CCR3 receptor. Blockade of CCL24 with CM101, a humanized anti-CCL24 monoclonal antibody, has been shown in pre-clinical models to significantly reduce migration and activation of immune cells and fibroblasts, including hepatic stellate cells. In four PSC relevant mouse models (MDR2 knockout, chronic ANIT-induced cholestasis, bile duct ligation, and thioacetamide-induced liver fibrosis), CM101 consistently demonstrated both anti-inflammatory and antifibrotic effects. CM101 was found to reduce alkaline phosphatase (ALP), bile acid and liver fibrosis in the MDR2 knock out mouse model. CM101 was also observed to be safe and well tolerated in healthy subjects and in subjects with non-alcoholic fatty liver disease and patients with non-alcoholic steatohepatitis. Based on the pre-clinical evidence, the safety and tolerability profile of CM101 in phase 1 studies, and the high unmet medical need for patients with PSC, further evaluation of CM101 safety and efficacy is warranted.

Method: A phase 2a biomarker and clinical study was designed to understand the role of CCL24 in the pathogenesis of PSC and the effects of blockade of CCL24 with CM101 in patients with PSC.

Results: This is a Phase 2a, randomized, double-blind, placebo-controlled, multiple-dose, international study evaluating the safety and efficacy of CM101 in patients with PSC (NCT04595825). The overall study design is shown in Figure 1. Up to 93 patients with large duct PSC disease of >24 weeks duration, ALP >1.5 upper limit of normal, and any patients with concurrent stable inflammatory bowel disease will be randomized. The primary end point of the study is safety and tolerability. The pharmacodynamic effects of CM101 will be assessed by changes in CCL24 serum levels, serum inflammatory markers, and immune cell sub-populations. The clinical activity of CM101 will be assessed by changes in ALP, enhanced liver fibrosis (ELF) score, liver enzymes, liver elastography and liver fibrosis markers (e.g. PRO-C3, and PRO-C5). Patient reported outcomes will also be assessed. An independent Data Monitoring Committee has reviewed all safety data and had no safety concerns. They endorsed the plan for the next dose escalation per protocol.

Conclusion: Results from this study will provide early evidence of the role of CCL24 in inflammatory and fibrotic disease pathology and the clinical impact of neutralizing CCL24 with CM101, which will guide future development of CM101 in PSC.

Figure: (abstract: THU-310).

THU-311
Intrahepatic cholestasis of pregnancy: genetic testing and genotype-phenotype relations in a cohort from a Danish tertiary liver center
Henning Grønbæk1, Ida Paulsen1, Jens Fuglsang2, Ida Vogel3, Naja Becher4, 1Aarhus University Hospital, Department of Hepatology and Gastroenterology, Aarhus University Hospital, Aarhus, Denmark, 2Aarhus University Hospital, Department of Obstetrics and Gynaecology, Aarhus N, Denmark; 3Aarhus University Hospital, Department of Obstetrics and Gynaecology, Aarhus N, Denmark; 4Aarhus University Hospital, Department of Clinical Genetics, Aarhus N, Denmark
Email: henning.gronbaek@dadlnet.dk

Background and aims: Intrahepatic cholestasis of pregnancy (ICP) affects 0.5–1% of all pregnancies in Denmark. In pregnancy, women present with symptoms of pruritus, elevated liver enzymes and bile acids, and hepatic dysfunction. In severe cases, ICP increases the risk of preterm birth and stillbirth. We aimed to investigate genetic variants related to the development of ICP and describe the genotype-phenotype associations.

Method: We included 34 women (median age 28 years) with ICP and genetic testing of disease causing variants. Thirteen (38%) had a history of cholestatic disease prior to their pregnancy. Patients were screened for disease-causing variants in ABCB11, ABCB4, ABCG5, ABCG8, ATP8B1, JAG1, NOTCH2, TJP2 and UGT1A1 using a gene panel approach.

Results: Symptoms of cholestatic pruritus occurred in 5 (15%) patients in the 1st trimester, 13 (38%) in the 2nd trimester and in 16 (47%) patients in the 3rd trimester. At first visit the majority presented with elevated ALT (94%), bilirubin (91%), GGT (44%), and bile acids (53%). Thirty-three patients (97%) received treatment; 21 (62%) received monotherapy with Ursodeoxycholic acid, while 12 (35%) patients also received Rifampicin and/or Cholestyramine. In 20 of 34 (59%) patients we identified disease-causing variants, with highest prevalence in ABCB11 and ABCB4. A genotype/phenotype correlation was detected in 21 (62%) women. A total of 13 (38%) women gave birth prematurely (<37 weeks); 7 patients with planned induced labor, and 6 gave birth spontaneously. Four women had an intrauterine foetal demise. Fourteen (41%) had recurrence of ICP in their subsequent pregnancy with one foetal demise.
increased alpha-diversity \( p = 0.01 \), correlated with propionate \( rs = 0.5; p = 0.01 \). Early-post-KPE, \( 0.004 \], was associated with 1year-LT. Increased propionate was reduced acetate \( p < 0.001 \), was shown in BA vs HC. Pre-KPE, \( \Delta \) incorporation, between BA vs HC \( p < 0.03 \), not CC \( p = 0.5 \) (Fig1). BA was associated with poor 6month-JC \( p = 0.01 \) and 1year-LT \( p = 0.001 \). 6months-post-KPE, \( \uparrow \) Blautia \( [p = 0.03] \), were associated with poor 6month-JC. APRi positively and negatively correlated with Streptococcus \( rs = 0.4; p = 0.03 \) and Bifidobacterium \( rs = -0.5; p = 0.01 \). Bifidobacterium, 6weeks-post-KPE, was associated with cholangitis development \( p = 0.03 \). Butyrate, 6weeks-post-KPE, inversely correlated with total bilirubin \( rs = -0.3; p = 0.02 \). Increased Claudin-3, early-post-KPE, was associated with poor 6month-JC \( p = 0.01 \) and 1year-LT \( p = 0.001 \). 6months-post-KPE, \( \uparrow \) Blautia \( [p = 0.01] \), SCFAs \( p = 0.04 \), \( \uparrow \) SC \( [p = 0.05] \), were associated with 1year-LT; \( Bifidobacterium \) inversely correlated with LSM \( rs = -0.5; p = 0.02 \).

**Conclusion:** We detected a genotype/phenotype correlation in 21 (62%) women with ICP. This illustrates the importance of the combination of genetic testing and clinical work-up among women with ICP and may guide handling and treatment of future pregnancies in these women.

**THU-312**

Longitudinal assessment of gut microbiota, metabolome and intestinal barrier dysfunction in biliary atresia

Vandana Jain1, Charlotte Burford1, Emma Alexander1, Konstantinos Gerasimidis2, Anita Verma1, Mark Davenport1, Matthew Dalby1, Lindsay Hall1, Anil Dhawan1, 1King’s College Hospital, United Kingdom; 2University of Glasgow, United Kingdom; 3Quadrum Institute, United Kingdom

Email: vjain@nhs.net

**Background and aims:** Adjuvant therapy post-Kasai Portoenterostomy (KPE), has not reduced liver transplantation (LT) in Biliary Atresia (BA). Increasingly, a gut microbiota (GM)-host interplay, in chronic liver disease, is being described. We aimed to characterise GM, stool short chain fatty acids (SCFAs) and intestinal barrier (IB) markers, in BA, and association with clinical outcomes.

**Method:** Stool, plasma, were prospectively collected, in BA infants \( n = 55 \) pre-KPE, and 6weeks-, 3months-, 6months-post-KPE. Age-matched healthy \( (HC; n = 19) \) and cholestatic control \( (CC; n = 21) \) stool was collected. Stool 16S rRNA sequencing (GM) and gas chromatography (SCFAs), were performed. IB markers included plasma Claudin-3 and stool calprotectin (SC). Clinical outcomes: 6month-JC (jaundice clearance), 1year-LT, cholangitis by 6month-post-KPE, fibrosis biomarkers \([\text{Aspartate Aminotransferase-to-platelet ratio index (APRi)}\), Liver Stiffness Measurement (LSM)]

**Results:** Pre-KPE, beta-diversity revealed differences in genus-level-clustering, between BA vs HC \( p < 0.03 \), not CC \( p = 0.5 \) (Fig1). BA incorporated \( \uparrow \) Bifidobacterium \( [p = 0.01] \), \( \uparrow \) Enterococcus \( [p = 0.01] \), \( \uparrow \) Clostridium \( [p = 0.04] \), compared to HC. 6weeks-post-KPE, increased alpha-diversity \( [p < 0.001] \), increased genus-level-clustering variation \([\text{Bifidobacterium, } p < 0.001]\), \( \uparrow \) Enterococcus \( [p = 0.03] \), and reduced acetate \( p < 0.001 \), was shown in BA vs HC. Pre-KPE, increased alpha-diversity \( [p = 0.04] \), and reduced acetate \( p = 0.004 \), was associated with 1year-LT. Increased propionate was associated with poor 6month-JC \( p = 0.02 \). Clostridium positively correlated with propionate \( rs = 0.5; p = 0.01 \). Early-post-KPE, increased alpha-diversity \( p = 0.01 \), \( \uparrow \) Streptococcus \( [p < 0.001] \),

**Conclusion:** Dysbiosis, characterised by pathobiont enrichment and "probiotic" \( \uparrow \) Blautia, Bifidobacterium deficiency, and subsequent SCFA dysregulation, in pre- and early-post-KPE BA, are associated with non-favourable clinical outcomes. Increased intestinal permeability early-post-KPE, is a likely a key factor in GM-BA-pathogenesis. Early microbiota-modulatory therapy may reduce LT in BA.

**THU-313**

Odevixibat therapy following liver transplantation in patients with FIC1-deficient progressive familial intrahepatic cholestasis: a retrospective case series

Georg-Friedrich Vogel1,2, Simone Kathemann3, Andrea Pietrobattista4, Giuseppe Maggiore4, Denise Aldrian1, Marco Scivieres5, Henkjan J. Verkade6, Peter Rauschkolb7, Christof Maucksch7, Velichka Valcheva7, Christine Clemson7, Elke Lainka1, 1Department of Paediatrics 1, Medical University of Innsbruck, Austria; 2Institute of Cell Biology, Medical University of Innsbruck, Austria; 3Department of Paediatric Gastroenterology, Hepatology, and Liver Transplantation, University Children’s Hospital, Germany; 4Hepatology, Gastroenterology, Nutrition, Digestive Endoscopy, and Liver Transplantation Unit, Bambino Gesù Children’s Hospital IRCCS, Italy; 5Paediatric Hepatology and Liver Transplantation, IRCCS ISMETT, Italy; 6Department of Paediatrics, University of Groningen, Beatrix Children’s Hospital/University Medical Centre Groningen, Netherlands; 7Alibero Pharma Inc., Boston, United States

Email: georg.vogel@i-med.ac.at

**Background and aims:** \( \text{ATP8B1} \), encoding FIC1, is expressed in multiple organs such as the liver and small intestine. Mutations in this gene can result in progressive familial intrahepatic cholestasis type 1 (PFIC1), which is characterized by hepatic and extrahepatic manifestations that can ultimately necessitate liver transplantation (LT). Following LT, patients with PFIC1 may develop complications that include graft injury (hepatic steatosis), liver fibrosis, and/or exacerbated diarrhoea, which may impair patients’ ability to perform daily activities and reduce their quality of life (QoL). These complications are thought to result from the interplay between physiologic bile acid secretion from the transplanted liver and the native, FIC1-deficient bowel. In this case series, we present clinical
**Clinical Features, Quality of Life, and Liver Pathology Before and Following Odevixibat Initiation in Patients With PFIC1 And Liver Transplantation**

<table>
<thead>
<tr>
<th>Before LT</th>
<th>Patient 1</th>
<th>Patient 2</th>
<th>Patient 3</th>
<th>Patient 4</th>
<th>Patient 5</th>
<th>Patient 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms leading to LT</td>
<td>Refractory pruritus</td>
<td>Electrolyte imbalance</td>
<td>Intractable pruritus</td>
<td>1st LT: Cholestasis</td>
<td>1st LT: Relapsing jaundice</td>
<td>Refractory pruritus and cholestasis</td>
</tr>
<tr>
<td></td>
<td>Cholestasis</td>
<td>Dystrophy</td>
<td>Decreasing liver function</td>
<td>Failure to thrive</td>
<td>Failure to thrive</td>
<td>Jaundice</td>
</tr>
<tr>
<td></td>
<td>Feeding disorder</td>
<td>Phytotherapy</td>
<td>Hepatic artery thrombosis</td>
<td>Severe pruritus</td>
<td>Severe pruritus</td>
<td>Fatigue</td>
</tr>
<tr>
<td></td>
<td>Infections with hospitalization</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>After LT But Before Odevixibat Initiation</th>
<th>Patient 1</th>
<th>Patient 2</th>
<th>Patient 3</th>
<th>Patient 4</th>
<th>Patient 5</th>
<th>Patient 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of impact on QoL</td>
<td>Diapers needed during day and/or night</td>
<td>Diapers needed during day and/or night</td>
<td>Wearing diapers unacceptable to patient, so diarrhoea impacted school and family's ability to travel</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Biopsy findings</td>
<td>10% macrovesicular and 5% microvesicular fatty degeneration</td>
<td>Liver fibrosis, stage 3</td>
<td>Stas[hthepatits and ductular proliferation</td>
<td>N/A</td>
<td>15% microvesicular and 5% macrovesicular fatty degeneration</td>
<td>N/A</td>
</tr>
<tr>
<td>Current daily odevixibat dose (treatment duration)</td>
<td>~30 µg/kg (11 months)</td>
<td>~100 µg/kg (17 months)</td>
<td>~80 µg/kg (13 months)</td>
<td>40 µg/kg (5 months)</td>
<td>40 µg/kg (8 months)</td>
<td>120 µg/kg (16 months³)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>With Odevixibat</th>
<th>Patient 1</th>
<th>Patient 2</th>
<th>Patient 3</th>
<th>Patient 4</th>
<th>Patient 5</th>
<th>Patient 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of impact on QoL</td>
<td>No diarrhoea</td>
<td>No diarrhoea and no nocturnal stools</td>
<td>Better able to participate in school and leisure activities</td>
<td>N/A</td>
<td>Reduced frequency of diarrhoea</td>
<td>N/A</td>
</tr>
<tr>
<td>Biopsy findings</td>
<td>No diarrhoea and no nocturnal stools</td>
<td>Reduced fatigue and better concentration at school</td>
<td>N/A</td>
<td>N/A</td>
<td>25% to 30% microvesicular fatty degeneration</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Portal inflammation</td>
<td>Slight ductular proliferation</td>
<td>Liver fibrosis, stage 1–2</td>
<td>Liver fibrosis, stage 1–2</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

*Patient underwent a complete bilioenteric diversion at the same time as the second LT; nLast available data before initiating odevixibat; *Patient developed steatosis and hepatic inflammation shortly after LT. The patient received surgical biliary diversion approximately 4 years after LT, which resolved the steatosis and liver inflammation. It was previously treated with odevixibat for approximately 15 months before undergoing LT on 18 November 2022. Odevixibat was restarted approximately 4 days after LT. Available data are limited due to recent surgery.* Data from last available assessment. LT, liver transplantation; N/A, not available; PFIC, progressive familial intrahepatic cholestasis; QoL, quality of life.
Jean Philippe Combal1, Claire Leboucher2.

This case series comprises 6 male patients. Common indications for LT included intractable pruritus, cholestasis, and/or growth issues or dystrophy; a second LT was performed in patients 4 and 5 (Table). After LT, 5 patients had fatty degeneration, steatohepatitis, or hepatic steatosis, and patients 1, 2, 4, and 5 had hepatic fibrosis (stage 1–3; Table). Following LT, all patients had diarhoea (up to 7 stools/day). As a result, QoL and/or school functioning were negatively impacted for these patients and/or their families (Table). Five of 6 physicians cited steatosis and/or unresolved diarrhoea as a reason for initiating odevixibat; in patient 6, who had prolonged episodic cholestasis prior to LT, the drug was prophylactically re-initiated. In patient 5, odevixibat was withdrawn after 8 months due to unchanged steatosis and progression of liver disease despite mild improvement in stool frequency (4–7 to 2–4 stools/day). In other patients with available data who received odevixibat post LT, diarrhoea resolved and/or patients had less frequent bowel movements (approximately 2 stools/day) or improved stool consistency (eg, Bristol Stool Chart type 7 to type 4–5). These patients had improvements in QoL (Table). Changes in liver pathology before and following odevixibat initiation are shown in the Table.

Conclusion: In patients with PFIC1, diarrhoea and hepatic steatosis after LT are frequent and severe, impacting QoL. The real-world data presented here indicate that odevixibat can improve diarrhoea and QoL after LT in patients with PFIC1. In addition, 2 of 4 patients where biopsy was performed following odevixibat initiation had improved steatosis (odevixibat duration: 11 and 17 months, respectively, at last data collection). More studies are needed to determine the role of IBATi treatment in long-term graft survival.

THU-314
A longitudinal study of epidemiology and treatment management of Wilson disease in France based on the French national claims database SNDS

Bernard Benichou1, Thomas Daniel Robin1, Jean Philippe Combald, Claire Leboucher2, Vivet Therapeutics, France; Putnam Inizio Advisory, France

Background and aims: The aim of this study was to evaluate longitudinal trends in the epidemiology and management of patients with WD (Wilson disease) identified in the French national health insurance database (SNDS).

Method: The study included all patients with at least one medical claim for hospitalisation with the ICD-10 diagnostic code for WD (E83.0*: copper metabolism disorder) or eligible for ALD status for WD between 1st January 2009 to 31st December 2019. For each patient, data were extracted on age, gender, hospitalisations, liver transplantation, mortality, WD-specific treatments (D-penicillamine, trientine and zinc), disability status and sick leave.

Results: 1,928 patients with WD were identified, of whom 1,520 (78.8%) were analysed. Prevalence of WD in 2019 was estimated as 2.2 cases per 100,000. The median age of the total cohort at inclusion was 39 years and 48% of patients were women. At inclusion, 67% of patients were symptomatic, with a spectrum of hepatic, neurological or psychiatric symptoms. In the first year, 995 patients (65.6%) were hospitalised at least once for a mean duration of 4.4 ± 10.9 days. In the following year, the proportion declined to 41.7% and remained around 40% for the remainder of the follow-up period. 152 patients (10.0%) underwent liver transplantation and 205 died (13.5%). The mean age at death was 57.9 ± 23.1 years. 665 patients (43.8%) received a WD-specific treatment at least once. 167 patients (17.1%) received a government disability pension and 624 (41.1%) benefited from long-term illness status due to WD.

Conclusion: Unexpectedly, less than half of French patients with WD ICD-10 diagnostic code received continuous treatment as recommended in practice guidelines, which with reduce compliance may contribute to a high disease burden in terms of hospitalizations, disability and reduced life expectancy. Interestingly similar results from other countries have been observed (Choe et al. Nature Scientific Reports 2020; Czlonkowska et al. Eur J Neurol 2022) either from national healthcare databases or from large cohort of WD patients followed in reference center. Raising awareness around the limitations of current disease management, patients awareness and improving treatment rates with new transformative treatment alternatives could help reduce the burden of patients living with WD.

THU-315
Impact of suffering Wilson disease in Spain: an observational cross-sectional multicenter study

Zoe Mariló1,2, Marina Berengué1,4, Luis Peña5, Antonio Oliveira Martin6, Anna Miralpeix1, Clara Pérez1, Anna Anguera8, Hospital Clinic de Barcelona, Liver Unit, Barcelona, Spain; CIBERhde, IDIBAPS, ERN-RARE Liver, University of Barcelona, Barcelona, Spain; Hospital Universitari i politècnic La Fe, Department of Gastroenterology and Hepatology, Valencia, Spain; CIBERhde and IISLaFe, Valencia, Spain; Complejo Hospitalario Universitario Insular Materno Infantil, Pediatric Gastroenterology, Gastroenterology and Nutrition Unit, Las Palmas de Gran Canaria, Spain; Hospital La Paz, Department of Gastroenterology, Madrid, Spain; Outcomes10, Castellón de la plana, Spain; Alexion AstraZeneca, Rare Disease Unit, Medical Department, Spain

Background and aims: Wilson disease (WD) can negatively impact health-related quality of life (HRQoL) as well as emotional/social health, two aspects, which have been little explored to date. We aimed to assess the impact of WD on HRQoL, treatment adherence, use of healthcare resources utilization (HRU), and its associated costs. Method: An observational cross-sectional multicenter study was conducted. Patients with WD aged ≥12 years; at least 1 year of previous follow-up and signed informed consent were included. Sociodemographic, clinical and treatment data were collected. The following questionnaires were administered: 1) EQ-5D-5L: HRQoL questionnaire, 2) ad-hoc questionnaire on social/emotional impact of WD, and 3) SMAQ: medication adherence questionnaire. Also, HRU in the last year and productivity were collected, and the costs per patient/month (€) were estimated. A descriptive analysis was performed on 2 subgroups of patients: 1) isolated liver involvement (group H, n = 83, 81.4%) and 2) hepatic and extrahepatic involvement (group EH, n = 19, 18.6%). Data analysis was performed with STATA v.14. Variables were expressed as % or median (IQR25–75%).

Results: We included 102 patients: median age of 35 (22–47) years, 57.8% were male, median time since diagnosis 16.2 (10.6–29.4) years, 17% with cirrhosis (93.3% Child-Pugh A; 33.3% with esophageal varices), mainly treated with zinc salts (48%) or D-Penicillamine (32.4%). 46.1% received concomitant treatment, especially neuro-psychiatric drugs (46.8%). Group H showed better median EQVAS score (88 [75–92]) than EH group (76 [50–85]); with higher scores in mobility, self-care, activities of daily living or pain items. However, up to 42% of patients had some degree of anxiety/depression in both groups. Group EH reported greater impairment in daily activities and executive function. EH group had more difficulty in making friends (42.2% EH vs 16.9% H) or dating (57.9% EH vs 13.2% H). Although emotional affection was greater in the EH group (47%), up to 30% of the H group reported sadness, anxiety, frustration, or anger related to WD. According to the SMAQ, only 18.1% of the H group showed total medication adherence. In the last year, patients had a median of 4 outpatient visits to specialists (3 to hepatology). EH group used more extra NHS health resources than the H group (31.6% physiotherapist, 21.1% speech therapist). Overall,
THU-316
Role of transient elastography to identify Fontan-associated liver disease (FALD) and novel risk-score to predict failing Fontan
Luisa Cavalletto1, Roberta Biffanti2, Giovanni Di Salvo2, Massimo Fadafano1, Chiara Giraudo1, Liliana Chemello1.
1) University of Padova, Department of Medicine-DIMED, Padova, Italy; 2) University of Padova, Department of woman and child's health, Padova, Italy.
Background and aims: The single ventricle (SV) heart is a rare congenital heart disease (CHD) (7/1000 cases, born alive, with major heart defects) corrected with the palliative Fontan intervention (cavo-pulmonary shunt) that restores the survival of most child and young patients up to adulthood. Unlikely, these patients develop a series of complications, among all, the Fontan associated liver disease (FALD), which is particularly due to chronic systemic venous hypertension, that causes the occurrence of liver cirrhosis and other severe complications, that negatively impacts the life expectancy in the majority of cases. Our primary aim was to characterize these patients by liver fibrosis and portal hypertension scores (Forns, LSPS and SSPPS) and by liver (LS) and spleen (SS) stiffness measurement in relation to time since Fontan, secondarily to define the risk profile of major complications tailored to the individual patient by selective criteria.
Method: One-hundred and twenty outpatients (68 m/52 f, mean age 24.8 ± 11.6 years) born with SV defects and corrected with Fontan circuit have been recruited prospectively from 2019 to 2022 (mean FU 18.5 ± 13.1 months). Each patient underwent a complete anamnesis, physical examination and specific lab-test profile, and an instrumental evaluation with abdominal US-Doppler or CT/MRI and the LS and SS by transient elastography (VCTE, Fibroscan, Echosens, Paris).
Results: Based on the time elapsed since Fontan surgery 3 groups, each of 40 cases (group A <15; B 15–25 and C >25 yrs), were formed to compare the clinical, biochemical and imaging features. ROC curves were built to select the scores cut-off proved to be the most accurate to diagnose FALD (Fig.1). The worsening of the hepatic, renal and cardiac function in relation to time since Fontan surgery appeared in 58/120 cases (group A; B and C in 17.5%, 47% and 80% of cases, respectively; p < 0.01). Ten patients (8.3%) died, need OHT or had HCC occurrence. Moreover by identification of advanced liver disease and of portal hypertension selective criteria, we applied a novel risk-score of failing-Fontan, that has predicted a low-moderate risk profile (HR 0.30; CI 0.18–0.52) in 66 patients (55%) and a high risk profile (HR 3.29, CI 1.93–5.60) in 54 (45%).

Table: Score-cut-off, Sens., Spec. ( ROC AUC ± SE CI 95\% p-value).

<table>
<thead>
<tr>
<th>Score</th>
<th>Cut-off</th>
<th>Sens. (%)</th>
<th>Spec. (%)</th>
<th>AUC ± SE</th>
<th>CI 95%</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>FORNS</td>
<td>≥ 1.1</td>
<td>92/68/62</td>
<td>0.93/0.62</td>
<td>0.97/0.87</td>
<td>&lt; 0.001</td>
<td></td>
</tr>
<tr>
<td>LSPS</td>
<td>≥ 1.4</td>
<td>92/68/62</td>
<td>0.93/0.62</td>
<td>0.97/0.87</td>
<td>&lt; 0.001</td>
<td></td>
</tr>
<tr>
<td>SSPPS</td>
<td>≥ 2.3</td>
<td>92/68/62</td>
<td>0.93/0.62</td>
<td>0.97/0.87</td>
<td>&lt; 0.001</td>
<td></td>
</tr>
<tr>
<td>LS</td>
<td>≥ 20.2</td>
<td>84/65/79</td>
<td>0.93/0.62</td>
<td>0.97/0.87</td>
<td>&lt; 0.001</td>
<td></td>
</tr>
<tr>
<td>SS</td>
<td>≥ 0.7</td>
<td>84/65/79</td>
<td>0.93/0.62</td>
<td>0.97/0.87</td>
<td>&lt; 0.001</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1:

Conclusion: All the scores (Fig.1) showed the capability to improve the FALD diagnosis and the hepatologic management of these young and adult subjects with SV and Fontan circuit. This novel risk score proposed may help to predict the development of major complication and targeting individual surveillance in Fontan patients, to better guide some decision-making process (i.e., the need of surgical interventions or OHT).

THU-317
Real-world experience of Odevixibat in adults with genetic disorders of cholestasis
Palak Trivedi1,2, Alberto Borghi3, Cornelius Engelmann4, Vinod Hegade5, Simon Hohenester6, Deepak Joshi7, Jan F. Monkelbaan8, Anna Morgando9, Praneeta Nagraj10, Velichka Valcheva10, National Institute for Health Research Birmingham Biomedical Research Centre, University of Birmingham, Birmingham, United Kingdom; 2) Liver Unit, University Hospitals Birmingham, Birmingham, United Kingdom; 3) Internal Medicine Unit, Faenza Hospital, Italy; 4) Medizinische Klinik m. S. Hepatologie und Gastroenterologie, Charité Universitätsmedizin Berlin, Berlin, Germany; 5) Leeds Liver Unit, Leeds, United Kingdom; 6) Department of Medicine II, University Hospital, LMU Munich, Munich, Germany; 7) Institute of Liver Studies, King’s College Hospital, London, United Kingdom; 8) Department of Gastroenterology and Hepatology, University Medical Center, Utrecht, Netherlands; 9) Cà Gastroenterologia U, Città della Salute e della Scienziu di Turin, Turin, Italy; 10) Albireo Pharma, Inc, Boston, MA, United States.
Background and aims: Genetic disorders of cholestasis, including progressive familial intrahepatic cholestasis (PFIC), typically present in infancy or early childhood. The ileal bile acid transporter inhibitor odevixibat is approved for the treatment of PFIC in patients aged 6 months or older in the European Union and for treatment of pruritus in patients aged 3 months and older with PFIC in the United States. The overarching goal of this study was to seek experience with odevixibat in adult patients with genetic disorders of cholestasis with regard to safety, tolerability, and efficacy.
Method: Data were collected from adults harbouring suspected or confirmed genetic variants associated with cholestasis who initiated odevixibat therapy at age >16 years. Details regarding symptoms and on-treatment biochemical changes are presented.
Results: We accrued data from 10 patients across 8 treatment centres (50% men; age range at diagnosis: 6 months–35 years; current age range, 22–48 years); 6 patients were diagnosed in adulthood (Table). Prior to odevixibat initiation, median serum bile acid (sBA), total bilirubin, and alanine aminotransferase (ALT) values were 138 µmol/l, 18 µmol/L, and 56 U/l, respectively. In most patients, presenting features included pruritus and jaundice, alongside impaired sleep and attention and overall diminished quality of life. Nine patients experienced improvement in pruritus with odevixibat over a median of 3.4 months follow-up (range: 0.9–25.5 months), with 8 patients reporting complete absence of pruritus at the last available assessment. Median (quartile 1, quartile 3) reduction in sBA values was −73 (−174, −38) µmol/L (p = 0.012 [Wilcoxon signed-rank test]). Median changes in total bilirubin and ALT values were minimal (p ≥ 0.16). Two patients experienced gastrointestinal adverse events (increased defecation frequency that resolved with dosage adjustment in 1 patient; mild diarrhoea modifiable with dietary changes in another patient) during treatment with odevixibat; no new safety signals were reported.
Conclusion: In adults with genetic disorders of cholestasis, odevixibat treatment appears to be safe, well tolerated, and associated with a reduction in pruritus intensity.
### Table. Outcomes in Adult Patients With Genetic Disorders of Cholestasis Treated With Odefovixibat

<table>
<thead>
<tr>
<th>Patients 1–6: Diagnosed in Adulthood</th>
<th>Age at Diagnosis</th>
<th>Current Age</th>
<th>Sex</th>
<th>Affected Gene(s)</th>
<th>Presenting Features</th>
<th>Dosage (Treatment Duration)</th>
<th>Outcomes With Odefovixibat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient 1</td>
<td>35 years</td>
<td>38 years</td>
<td>F</td>
<td>ABCB4*</td>
<td>Cholangitis and fibrosis; Impaired QoL; No pruritus; sBAs: 10 µmol/L</td>
<td>2400 µg/day (1.7 months)</td>
<td>No change in pruritus, sleep; ALT or TB; Mild diarrhea modified with dietary changes; sBAs: 5 µmol/L at month 1</td>
</tr>
<tr>
<td>Patient 2</td>
<td>34 years*</td>
<td>48 years</td>
<td>M</td>
<td>ABCB11*</td>
<td>Pruritus and recurrent jaundice; Elevated GGT; sBAs: 69 µmol/L</td>
<td>2400 µg/day (1.3 months)</td>
<td>Improved pruritus (no itch within 1 month); Decreased TB; sBAs: 75 µmol/L at month 1</td>
</tr>
<tr>
<td>Patient 3</td>
<td>32 years</td>
<td>32 years</td>
<td>M</td>
<td>ND*</td>
<td>Pruritus; Jaundice; Abdominal pain; sBAs: 96 µmol/L</td>
<td>3600 µg/day (4.6 months)</td>
<td>Improved pruritus (VAS=0 by month 2); Decreased ALT, TB; Improved sleep, increased energy; sBAs: 4 µmol/L at month 2</td>
</tr>
<tr>
<td>Patient 4</td>
<td>26 years</td>
<td>41 years</td>
<td>F</td>
<td>ABCB11*</td>
<td>Pruritus and recurrent jaundice; Elevated GGT; sBAs: 54 µmol/L</td>
<td>2400 µg/day (0.9 months)</td>
<td>Improved pruritus (no itch within 1 month); sBAs: 22 µmol/L at month 1</td>
</tr>
<tr>
<td>Patient 5</td>
<td>18 years</td>
<td>29 years</td>
<td>F</td>
<td>ABCB11*</td>
<td>Pruritus; sBAs: 48 µmol/L</td>
<td>2400 µg/day (4.8 months)</td>
<td>Improved pruritus (no itch by month 2); sBAs: 10 µmol/L at month 3; Able to care for child</td>
</tr>
<tr>
<td>Patient 6</td>
<td>18 years</td>
<td>23 years</td>
<td>M</td>
<td>ABCB11*</td>
<td>Pruritus; Jaundice; sBAs: 214 µmol/L</td>
<td>2400 µg/day (3.5 months)</td>
<td>Improved pruritus (absent within 3 months); No waking up at night; sBAs: 141 µmol/L at month 3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Patients 7–10: Diagnosed in Childhood</th>
<th>Age at Diagnosis</th>
<th>Current Age</th>
<th>Sex</th>
<th>Affected Gene(s)</th>
<th>Presenting Features</th>
<th>Dosage (Treatment Duration)</th>
<th>Outcomes With Odefovixibat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient 7</td>
<td>11 years</td>
<td>33 years</td>
<td>M</td>
<td>ATP8B1, ABCB11, ABCB4#</td>
<td>Recurrent pruritus, jaundice, liver dysfunction; Impaired QoL; psychological distress; sBAs: 280 µmol/L</td>
<td>2400 µg/day (1.8 months)</td>
<td>Improved pruritus (absent by month 2) and jaundice; Decreased ALT, TB; Positive psychological impact; sBAs: 6 µmol/L at month 2</td>
</tr>
<tr>
<td>Patient 8</td>
<td>9 years</td>
<td>32 years</td>
<td>F</td>
<td>ABCB11*</td>
<td>Pruritus; sBAs: 284 µmol/L</td>
<td>2400 µg/day (4.3 months)</td>
<td>Improved pruritus (no itch by month 3); Decreased ALT, TB; sBAs: 110 µmol/L at month 3; Better mood</td>
</tr>
<tr>
<td>Patient 9</td>
<td>4 years</td>
<td>22 years</td>
<td>F</td>
<td>ND*</td>
<td>Pruritus, dry skin; Fatigue; Short stature; Poor QoL and attention; sBAs: &gt;180 µmol/L</td>
<td>1600 µg/day (3.4 months)</td>
<td>Pruritus ~20% reduced; Decreased TB; Eyes are less yellow; More engaged in activities of daily living; sBAs: ND</td>
</tr>
<tr>
<td>Patient 10</td>
<td>6 months</td>
<td>25 years</td>
<td>M</td>
<td>ND*</td>
<td>Persistent pruritus; Intermittent cholestasis; Sleep and attention disorders; sBAs: 386 µmol/L</td>
<td>2400 µg/day and 1200 µg/day alternating (25.5 months)</td>
<td>Improved pruritus (no itch by month 3); Conflated sleep for first time in life; sBAs: 27 µmol/L at month 6; Increased defecation frequency</td>
</tr>
</tbody>
</table>

*Heterozygous c.1445T>C variant; *Patient was symptomatic for many years prior to diagnosis; *Common variant in ABCB11 (c.1331T>C); Clinical presentation compatible with PFIC; *Homozygous c.1331T>C, heterozygous c.1497T>C, and heterozygous c.1568C>G variants; *Homozygous c.1457T>C, heterozygous c.3148C>T, and heterozygous c.1599C>T variant s; *Homozygous ATP8B1 variant (p.R90SQ); heterozygous ABCB11 variants (p.A44VV and c.3084A>G), and heterozygous ABCB4 variant (c.767A>T); *Treatment was stopped due to significant improvement of symptoms, as well as normalized blood values and liver function; Heterozygous c.1723T and heterozygous c.1139delT variants; Diagnosis of PFIC type 1; *Demonstrated similar haplotype to known patients with recurrent episodic cholestasis. ALT, alanine aminotransferase; F, female; GGT, gamma-glutamyl transferase; M, male; ND, not determined; PFIC, progressive familial intrahepatic cholestasis; QoL, quality of life; sBAs, serum bile acids; TB, total bilirubin; VAS, visual analogue scale.
THU-318
High diagnostic uptake of a targeted panel sequencing in adult patients with chronic hereditary liver disorders
Luisa Ronzoni1, Ilaria Marini1, Serena Pelusi1, Federica Golletto1, Angela Lombardi1, Jessica Rondena1, Giulia Passignani1, Roberta D’Ambrosio2, Daniele Prati3, Luca Valent1,1, Fondazione IRCCS Ca’ Granda Ospedale Maggiore Policlinico Milano, 1 Precision Medicine-Biological Resource Centre-Department of Transfusion Medicine, Italy; 2Fondazione IRCCS Ca’ Granda Ospedale Maggiore Policlinico Milano, Division of Gastroenterology and Hepatology, Italy; 3Fondazione IRCCS Ca’ Granda Ospedale Maggiore Policlinico Milano, Department of Transfusion Medicine, Italy; 4Università degli Studi di Milano, Department of Pathophysiology and Transplantation, Italy
Email: luisa.ronzoni@policlinico.mi.it

Background and aims: The pathogenesis of chronic liver diseases (CLD) remains often unexplained despite extended clinical and instrumental evaluations. Next-generation sequencing (Whole Exome [WES] or Targeted Panel Sequencing [TS]) and polygenic risk scores (PRS) determination may improve the diagnostic rate of rare genetic disorders also in adults, but they are not yet widely clinically available. The aim was to evaluate the clinical utility of a TS approach, combined with PRS stratification, in diagnosis CLD in adult patients.

Method: A customized TS including 82 selected liver-diseases genes was performed in 57 unrelated adult patients with CLD of suspected hereditary etiology. For each patient, the genetic predisposition to progressive fatty liver disease was evaluated (PRS based on PNPLA3 rs738409, TM6SF2 rs58542926, MBOAT7 rs641738, GCKR rs1260326 and HSD17B13 rs72613567 variants combination).

Results: Patients’ phenotypes were divided into four categories: iron overload, dyslipidemia, cholestatic diseases and fatty liver diseases. Overall, TS allowed to reach a definitive genetic diagnosis in 16 patients (diagnostic yield: 28%). Heterozygous likely pathogenic variants or rare variants of unknown significance (VUS), but with a high likelihood of altering protein function, were identified in 26 patients, providing a diagnostic rate of 46% for genetic contribution to the phenotype. A total of 15 cases (26%) remained undiagnosed. Stratifying according to the clinical phenotypes, the higher diagnostic yield was obtained in patients with dyslipidemia (36%) and iron overload (35%). Overall, PRS values were over the positive threshold (fixed at 0.495) in 13 patients, 7 of whom (54%) had fatty liver diseases (Figure 1).

Conclusion: TS proved to be a useful first-tier genetic test for the diagnosis of selected adult patients with CLD, mainly if the clinical phenotype is well defined, as in dyslipidemia or iron overload cases. Moreover, TS allowed to identify genetic variants possibly contributing to disease phenotype in a high number of patients, expanding disease pathogenesis understanding. PRS stratification was a useful analysis, mainly in patients with fatty liver diseases, contributing to the diagnosis and allowing to set up a personalized follow-up.

THU-319
Phytoestrogens as a possible hidden driver of cysts proliferation in polycystic liver disease in men and women after menopause
Miki Scaravaglio1, Antonio Ciaccio2,3, Martina Mann2, Giacomo Mullinacci1, Pietro Invernizzi1,2,3, 1University of Milano-Bicocca, Department of Medicine and Surgery, Italy; 2Fondazione IRCCS San Gerardo dei Tintori, Gastroenterology Unit, Italy; 3European Reference Network on Hepatological Diseases (ERN RARE-LIVER), Italy
Email: antonio.ciaccio@unimib.it

Background and aims: Polycystic liver disease (PLD) is characterized by the presence of multiple liver cysts with a potential for progressive liver enlargement and cysts growth that may result in visceral compression and poor quality of life, requiring surgery or liver...

Figure 1. Diagnostic rate of a customized targeted panel for the analysis of 57 unrelated adult patients with CLD, divided in four disease categories

<table>
<thead>
<tr>
<th>Clinical Phenotype (number of cases)</th>
<th>Genetic diagnosis</th>
<th>Likely genetic diagnosis</th>
<th>Undiagnosed cases</th>
<th>High PRS (≥0.495)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron Overload (20)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n. cases (%)</td>
<td>Pathogenic variants</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7/20 (35%)</td>
<td>HFE rs1800562</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HFE 1799945</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FTL rs88603762</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HAMP1 rs10348486</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SLC3A1 rs77038909</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TF rs1799899</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dyslipidemia (14)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n. cases (%)</td>
<td>Pathogenic variants</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5/14 (36%)</td>
<td>APOB p.S2429*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>APOC1 S58962T</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LDLR rs28941717G</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LDLR rs74594352G</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LIPA rs11369022852</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cholestatic disease (4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n. cases (%)</td>
<td>Pathogenic variants</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 (0)</td>
<td>TERT rs14408741</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>JAK2 rs6187116</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ALOC1 rs1800546</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PHKB rs11718785</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PHKB rs50275827</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fatty Liver Disease (19)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n. cases (%)</td>
<td>Pathogenic variants</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4/19 (22%)</td>
<td>RTETL1 rs74875360</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SERPIN1A rs28931570</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SERPIN1A rs2892947</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>APOB rs11960292</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>APOB rs18629224</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MAN2B1 rs45576356</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MAN2B1 rs740556560</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DUG2 rs179403273</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DREL rs79518868</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total cases (57)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16/57 (28%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26/57 (46%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15/57 (26%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12/57 (22%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: VUS, variant of unknown significance; CLD, Chronic Liver disease.
transplantation in some cases. Female sex hormones have been identified as major drivers of liver cysts growth and among them estrogens have been recently pointed as a promising target for new treatment strategies. Phytoestrogens (PEs) are plant-derived non-steroidal compounds mimicking the effects of estrogens by binding estrogen receptors. They are found in plant foods, mainly soy and red clover, and in many dietary supplements prescribed for postmenopausal symptoms and prostate conditions. Nonetheless, possible concerns related to PEs exposure in patients with PLD have been overlooked so far. We aimed to investigate whether PEs-containing supplements might have a role in the progression of liver cysts growth in PLD patients.

**Method:** We retrospectively assessed the exposure to PEs in all consecutive men and postmenopausal women with a diagnosis of PLD evaluated at the Gastroenterology Unit of Fondazione IRCCS San Gerardo, Monza. Patients with a follow-up less than 12 months were excluded from the analysis.

**Results:** Of 68 patients diagnosed with PLD, 45 satisfied the study criteria and were included in the analysis, with a median follow-up of 64 months (interquartile range [IQR], 39 to 101 months). Most patients were female after menopause (73.3%) and had a diagnosis of autosomal dominant polycystic kidney disease (51.1%). During the study period, a growth of liver cysts of any grade was reported in 10 out of 45 patients (23.8%), while 7 patients (16.7%) had a significant growth of liver cysts, as defined by an increase of at least 25% per year of the diameter of any cyst and/or the development of signs or symptoms of liver enlargement. Cyst complications, including cyst hemorrhage, cyst infection and cyst rupture, occurred in 8 patients (17.8%). Nobody required liver transplantation. Only one patient died during the study period, for causes unrelated to liver disease. A documented exposure to over-the-counter PEs supplements was identified in 6 out of 41 patients (14.6%). PEs exposure was associated with a higher risk of significant growth of liver cysts (OR 8.3, CI 2.1–42.8, p = 0.005). No associations were found when assessing sex, type of PLD, exposure to estrogen-containing drugs before menopause, metabolic comorbidities.

**Conclusion:** PEs exposure is associated with a significant risk of liver cysts growth in PLD resulting in a higher burden of symptoms. Pending confirmatory results in larger prospective studies, this pilot study supports the key role of estrogens signaling in the progression of PLD and highlights the need to establish a proper dietary counselling to minimize the risk of exposure to PEs and improve PLD patients care.

**THU-320**
Patient experience with acute hepatic porphyria before and after long-term givosiran treatment: a qualitative interview study
Stephen Lombardelli1, Michelle Brown2, Stephen Meninger3, Hetanshi Naik4.

1Alnylam Pharmaceuticals, Maidenhead, United Kingdom; 2RTI Health Solutions, Research Triangle, United States; 3Alnylam Pharmaceuticals, United States; 4Icahn School of Medicine at Mount Sinai, United States

Email: slombardelli@alnylam.com

**Background and aims:** Acute hepatic porphyria (AHP) is a family of genetic disorders associated with disruption of heme biosynthesis, accumulation of neurotoxic heme intermediates, and acute neurovisceral attacks; chronic manifestations may be present. In Phase 1/2 (NCT02949830) and Phase 3 (ENVISION; NCT03338816) studies, givosiran treatment led to sustained improvement in annualized attack rate and other measures. To explore long-term treatment outcomes, qualitative interviews were conducted with study participants.

**Method:** Patients with AHP (US, Spain, UK) continuing givosiran treatment after completing open-label extension periods of the Phase 1/2 or ENVISION studies participated in 1-hour semistructured telephone interviews. Thematic analysis was conducted.

**Results:** There were 21 interviewees (86% female; mean [range] age at interview, 39.3 [25–61] years; mean [standard deviation] duration

**Table:** (abstract: THU-320).

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Participant Description of Symptom</th>
<th>Posttreatmenta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal pain</td>
<td>It would usually start with severe stomach pain, intractable vomiting, it would expand to a full body, horrible, searing, and indescribable level of pain.</td>
<td>The stabbing pain that I used to get in the upper right quadrant is completely gone. Now if it hurts, it’s more of an ache. I never have that searing knife-like, sharp pain anymore.</td>
</tr>
<tr>
<td>Other pain</td>
<td>I had this spine pain, which was at the base of my neck; it would hurt so bad. I would be at work like faying on tennis balls to relieve the pressure and I knew that I’d be hospitalized.</td>
<td>My pain is completely gone. I don’t have it on a day-to-day basis anymore. I don’t get attacks of pain or nausea at all. On the very odd occasion I do have some discomfort, [but] it’s not anywhere near going towards an attack.</td>
</tr>
<tr>
<td>Limb pain</td>
<td>If I woke up the next morning, I would have pain in my legs and I would have had pain for the rest of the day.</td>
<td>I don’t really vomit anymore though, that has been a big change.</td>
</tr>
<tr>
<td>Back pain</td>
<td>There had been a period where I had pain in my back, it was constant pain, it was a muscle pain, it was a nerve pain.</td>
<td>The depression has significantly improved. I kind of feel like I’m getting back to my old self.</td>
</tr>
<tr>
<td>Headache</td>
<td>[I] noticed the pain was not quite as bad as it used to be, but it was still there, it was still there for a while.</td>
<td></td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>[I] noticed the pain was not quite as bad as it used to be, but it was still there, it was still there for a while.</td>
<td></td>
</tr>
<tr>
<td>Nausea</td>
<td>The depression has significantly improved. I kind of feel like I’m getting back to my old self.</td>
<td>I don’t really vomit anymore though, that has been a big change.</td>
</tr>
<tr>
<td>Vomiting</td>
<td>Then having thrown up for 3 days and then I had to go to the hospital.</td>
<td></td>
</tr>
<tr>
<td>Constipation</td>
<td>I don’t really vomit anymore though, that has been a big change.</td>
<td></td>
</tr>
<tr>
<td>Faeces</td>
<td>The depression has significantly improved. I kind of feel like I’m getting back to my old self.</td>
<td></td>
</tr>
<tr>
<td>Mood and emotions</td>
<td>The depression has significantly improved. I kind of feel like I’m getting back to my old self.</td>
<td></td>
</tr>
<tr>
<td>Anxiety, fear, and worry</td>
<td>The depression has significantly improved. I kind of feel like I’m getting back to my old self.</td>
<td></td>
</tr>
<tr>
<td>Depression and sadness</td>
<td>The depression has significantly improved. I kind of feel like I’m getting back to my old self.</td>
<td></td>
</tr>
<tr>
<td>Anger, agitation, and aggression</td>
<td>The depression has significantly improved. I kind of feel like I’m getting back to my old self.</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>The depression has significantly improved. I kind of feel like I’m getting back to my old self.</td>
<td></td>
</tr>
<tr>
<td>Fatigue</td>
<td>The depression has significantly improved. I kind of feel like I’m getting back to my old self.</td>
<td></td>
</tr>
<tr>
<td>Sleep (excessive or limited)</td>
<td>The depression has significantly improved. I kind of feel like I’m getting back to my old self.</td>
<td></td>
</tr>
<tr>
<td>Cognition (eg, concentration, confusion)</td>
<td>The depression has significantly improved. I kind of feel like I’m getting back to my old self.</td>
<td></td>
</tr>
<tr>
<td>Muscle weakness and paralysis</td>
<td>The depression has significantly improved. I kind of feel like I’m getting back to my old self.</td>
<td></td>
</tr>
</tbody>
</table>

**AHP, acute hepatic porphyria.**

*a* Prior to Phase 1/2 study or ENVISION.

*b* Symptom descriptions are not necessarily from the same interviewee.

*Neuropathic pain/paresthesia was coded for any mention of neuropathy, burning, or tingling.

Journal of Hepatology 2023 vol. 78(S1) | S100–S1212

S993
of givosiran treatment, 51.8 [7.9] months). When describing their pre-study (ie, prior to Phase 1/2 or ENVISION studies) experience (Table), interviewees reported AHP symptoms in multiple domains, particularly abdominal pain and fatigue (95% for both). The impacts of AHP symptoms were wide-ranging, affecting work/school (100%), family and intimate relationships (95%), and other domains. Most interviewees (19/21; 90%) had used opioids pre-study; relief of acute and/or chronic pain was described as somewhat effective (84%), not effective or mildly effective (26%), and/or effective only in the hospital (intrahepatic: 21%). Posttreatment, interviewees reported improvement in both symptoms (including abdominal and other types of pain [100%]) and impacts (particularly family and intimate relationships [95%] and work/school [91%]). Most described their attacks as gone (62%) or less frequent/severe (33%). Among 17 interviewees who took opioids, 10 (59%) stopped opioids and 4 (24%) used a lower dose. Pain alleviation was mentioned most frequently as the most important posttreatment improvement (43%). Symptoms that were still present (but less severe) included muscle weakness and paralysis (4/5 interviewees; 80%), fatigue (14/18; 78%), and neuropathic pain and paresthesia (6/9; 67%). All interviewees (100%) were “very satisfied” with givosiran treatment. Conclusion: Results of these qualitative interviews improve the understanding of the burden of AHP. Interviewees reported meaningful improvements with continuing givosiran treatment.

THU-322
Surveillance of cystic echinococcosis in France: report of the first 103 cases from the French observational OFREKYS
Solange Bresson-Hadni1,2, Coralie Barrera1,2, Louis Bohard1,3, Noémie Tissot1,3, Paul Calame1,4, Alexandre Dousset1,1, Celia Turco1,5, Eleonore Brumpt1,4, Demonmerot Florent1, Jenny Knapp1,2, Catherine Chirouze1,3, Laurence Millon1,2, CNR-EchinoCoccoses, laboratoire de Parasitologie-Mycologie, CHRU Besançon, Besançon, France; 2UMR6249 CNRS Chrono-Environnement, Université de Franche-Comté, Besançon, France; 3Service des Maladies Infectieuses, CHRU Besançon, Besançon, France; 4Service de radiologie viscérale CHRU Besançon, Besançon, France; 5Service de chirurgie vésicale et carcinologique, transplantation hépatique, CHRU Besançon, Besançon, France
Email: dr.bresson.hadni@wanadoo.fr

Background and aims: Cystic echinococcosis (CE) is a zoonosis due to the larval stage development of Echinococcus granulosus. The liver is the organ most often concerned. In France, the available data on CE is limited. In 2016, the French Observatory of CE was launched by the National Reference Center for Echinococcosis (NRC-E) at the request of the Agence Santé Publique France. It aims to study the population through a computerized reporting system (Clean WEB®). From January 2016 to January 2023, 103 patients were included, (53M/50F), median age 42 yrs (range: 5–89). Most of the reports came from infectious diseases specialists (40% of the cases) and hepato-gastroenterologists (25% of the cases). Eighty five patients (83%) were from foreign countries, Maghreb in 52 cases (50%), Turkey in 10 cases (10%), Eastern Europe in 10 cases (10%). This was a primary diagnosis in 60 patients (59%). A past-history of CE was reported in 42 patients, 16 of them having had an incomplete surgery for CE in their native country. Ten patients seem to have been infected in France. CE discovery was incidental in 41% of the cases. Abdominal pain was the most common revealing symptom (56% of the cases). An acute inaugural complication (cyst fissuration or rupture, abscess, compression) involved 24% of the cases and resulted in death in 2 patients. There was a single cyst in 45 patients (44%). The liver was the organ most often affected in 84 patients (82%), either alone (n = 61) or in combination with other sites (n = 23). In 18 cases (17%), it was a primary extra-hepatic CE. Cyst characterization according to the WHO classification had only been assessed in 61 cases (59%). Therapeutic data (available on 90 patients) indicated that surgical treatment concerned 72% of the cases and was associated to albendazole (ABZ) in 79%. Instrumental treatments (per-cutaneous and/or biliary interventional endoscopy) concerned 6 cases. Long-term ABZ alone involved 10 patients (11%). In 13% of the cases, CE was considered as inactive and the “Watch and Wait” option was proposed.

Conclusion: This first report of CE case collection in France indicates that most cases are imported and concerns migrant population. The level of knowledge of French practitioners on CE appears insufficient, both at the diagnostic and therapeutic stages. Percutaneous treatments are not developed in this country. Concerning autochthonous cases, prevention actions and animal investigations in the field will be soon set up in the concerned areas. The continuation of this surveillance should help to optimize the management of CE in France.

THU-323
Role of gut-derived endotoxins in porto-sinusoidal vascular disease
Stefania Gioia1, Roberto Carnevale2, Daniele Tavano1, Diletta Overi1, Lorenzo Ridda1, Silvia Nardelli1, Manuela Merli1, Giulia d’Amati1, Adriano Pellicelli1, Vincenzo Cardinale1, Valerio Giannelli1, Andrea Baiocchini1, Guido Carpino2, Oliviero Riggi1, Eugenio Gaudio1, Sapienza, University of Rome, Department of Translational and Precision Medicine, Italy; 2Sapienza, University of Rome, Department of Medico-Surgical Sciences and Biotechnologies, Latina, Italy; 3Sapienza, University of Rome, Department of Anatomical, Histological, Forensic Medicine and Orthopedics Sciences, Italy; 4Sapienza, University of Rome, Department of Radiological, Oncological, and Pathological Sciences, Italy; 5Azienda Ospedaliera San Camillo, Department of Transplantation and General Surgery, Italy; 6Azienda Ospedaliera San Camillo, Department of Pathology, Italy; 7University of Rome “Foro Italico”, Department of Movement, Human and Health Sciences, Division of Health Sciences, Italy
Email: stensgioia@hotmail.com

Background and aims: Porto-sinusoidal vascular disease (PSVD) is characterized by histological lesions involving portal veins and sinusoids in absence of cirrhosis. The pathophysiology of PSVD is unclear. However, its association with immunodeficiency, celiac disease, intestinal bowel disorders and abdominal bacterial infections supports the role of altered intestinal permeability and of gut-derived endotoxins. The study aimed at assessing the association between serological markers of increased intestinal permeability, pro-aggregating/pro-coagulant state and liver injury in patients with PSVD.

Method: 33 patients with biopsy-proven PSVD and clinical signs of portal hypertension and 33 healthy subjects, similar for age and sex, were submitted to a peripheral venous blood sampling for the measurement of zonulin and lipopolysaccharides (LPS) as markers of intestinal permeability, of s-Glycoprotein VI, s-Selectin, ADAMTS13 and von Willebrand factor as markers of platelet aggregation, thrombogenesis and microvascular inflammation, factor VIII and F1+2 as markers of hypercoagulability. Liver biopsy specimens from a subgroup of PSVD patients (n = 18) were available for histomorphological and immunohistochemical study.
**Results:** Compared to controls, PSVD patients had higher serum levels of LPS (55.4 ± 15.4 vs 19.1 ± 5.3 pg/ml, p < 0.0001), zonulin (4.3 ± 1.4 vs 1.9 ± 0.8 ng/ml, p < 0.0001), von Willebrand Factor (vWF) (303 ± 88 vs 158 ± 65 U/dl, p < 0.0001), factor VIII (185 ± 77 vs 103 ± 33 U/dl, p < 0.0001), sP-selectin (37.9 ± 11.9 vs 17.7 ± 5.5 ng/ml, p < 0.0001), and F1+2 (158 ± 40 vs 136 ± 27 pmol/l, p = 0.01). ADAMTS13 (259 ± 95 vs 497 ± 110 ng/ml, p < 0.0001) was reduced. Serum LPS correlated with zonulin (r = 0.80, p < 0.0001), sP-selectin (r = 0.85, p < 0.0001), FVIII (r = 0.42, p = 0.02), and vWF (r = 0.53, p = 0.02). Histological analysis showed specific signs of PSVD in all patients; particularly, obliterative portal venopathy (OPV) was associated with clinical features, portal inflammation and fibrosis. Compared to samples from healthy subjects (liver donors), PSVD specimens were characterized by increased Toll-like Receptor-4 (TLR4)-positive macrophages and platelet number, located both in portal and perisinusoidal position. TLR4+ macrophage number was correlated with portal inflammation and fibrosis. Sinusoid dilation, perisinusoidal fibrosis, and sinusoidal capillarization were observed. Bile duct alterations and ductular reaction were also observed in PSVD, and their extent correlated with liver fibrosis.

**Conclusion:** PSVD patients display an altered intestinal permeability with a concomitant endotoxemia correlated to a pro-aggregating and pro-coagulant state; at histologic level, PSVD was associated with increased TLR4+ cell involvement and platelet aggregation within sinusoids. Our study suggests that LPS-TLR4 pathway could play a role in the pathophysiological basis of OPV (figure).

**THU-324 Evaluating pruritus and fatigue in patients with treatment-refractory primary biliary cholangitis**

Jörn Schattenberg1, Betsy Williams2, France Sowell2, Peter Serafint3, Asad Khan4, Marwan Sleiman5, Julie Dietrich6, Carol Addy6, Dawn Vargas6, Gail Wright7, Kris Kowdle8, 1University Medical Centre Hamburg-Eppendorf, Hamburg, Germany; 2Iovia, New York, United States; 3Ipsen, Cambridge, United States; 4Ipsen, Slough, United Kingdom; 5Ipsen, Boulogne, France; 6GENFIT Corp, Cambridge, United States; 7Canadian PBC Society, Toronto, Canada; 8Liver Institute Northwest, Seattle, United States

**Email:** marwan.sleiman@ipsen.com

**Background and aims:** Pruritus and fatigue are common symptoms that negatively impact patients with primary biliary cholangitis (PBC). The PBC Worst Itch Numeric Rating Scale (PBC WI NRS) and PROMIS Fatigue Short Form 7a (PSF 7a) are being used to assess symptoms in a phase III clinical trial of an investigational therapy for PBC.

**Method:** Semi-structured qualitative interviews were conducted with adult patients diagnosed with PBC using Institutional Review Board-approved materials. PBC WI NRS asks patients to rate their worst itch over the past 24 hours on a scale ranging from 0 (No itch) to 10 (Worst itch imaginable). The PSF 7a consists of 7 items that measure both the experience of fatigue and interference of fatigue on daily activities over the past 7 days using a Likert response scale. Patients were asked to evaluate the PBC WI NRS and PSF 7a on ease of understanding of instructions and items, ease of use of scale/ response options, and appropriateness of recall period to capture the patient experience. Interviews were conducted by experienced qualitative researchers, and audio recordings were transcribed and analyzed with coding software.

**Results:** 20 patients (aged 28–68 years; 19 females) diagnosed with PBC (mean 10.7 years since diagnosis) experiencing pruritus (mild [30%], moderate [45%] or severe [25%]) were interviewed. For the PBC WI NRS, patients reported that instructions (20/20), item wording (20/20), and response options (19/20) were clear (Figure). Most patients (10/18) reported that a 3-point change on the PBC WI NRS scale would constitute a meaningful improvement, which would be pruritus that is “manageable,” and would occur occasionally, for shorter periods of time. This change would lead to less scratching, providing periods of “peace of mind” and less interference with sleep. For the PSF 7a, all patients asked stated that instructions (18/18), items (18/18), and response options (19/19) were easy to understand. Most patients (12/18) stated a 1-point change on the PSF 7a would represent a meaningful change in fatigue; this improvement corresponded to changes in alertness and well-being that would be easily noticeable compared to the consistency in their day-to-day experience with fatigue. The energy remaining would also be less fleeting allowing them to accomplish more throughout the day.

**Table:**

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Instructions clear</th>
<th>Response options easy to use</th>
<th>Recall period appropriate</th>
</tr>
</thead>
<tbody>
<tr>
<td>PBC WI NRS</td>
<td>20/20</td>
<td>19/20</td>
<td>15/19*</td>
</tr>
<tr>
<td>PSF 7a</td>
<td>18/18*</td>
<td>19/19*</td>
<td>16/20</td>
</tr>
</tbody>
</table>

*One patient was not asked the question
**Two patients were not asked the question

**Conclusion:** Most patients found the PBC WI NRS and PSF 7a instruments easy to understand and use for reporting their experience with pruritus and fatigue. These interview results support the content validity of the PBC WI NRS and PSF 7a instruments in the context of PBC clinical trials; these instruments were selected to measure treatment benefit.

**THU-325 Ultrasonographic liver characteristics among patients with Wilson disease**

Zoe Mariloño1, Clàudia García2, Cristina Collazos2, Anna Miralpeix2, Xavier Forns1, Ernest Belmonte1, 1Liver Unit, Hospital Clinic Barcelona, IDIBAPS, CIBERehd, ERN-RARE Liver, Universitat de Barcelona, Barcelona, Spain; 2Liver Unit, Hospital Clinic Barcelona, Barcelona, Spain; 3Abdominal section, Radiology Department, Hospital Clinic Barcelona, Barcelona, Spain

**Email:** zmarino@clinic.cat

**Background and aims:** Wilson disease (WD) may mimic other prevalent liver diseases. A previous work by Akhan O et al (Eur J Radiol 2009) suggested that WD may exert some differential ultrasonographic characteristics, such as the presence of hypoechoic nodules or increased periportal thickness (pPT) (more than 2 mm), that could be used for arising WD suspicion. The aim of this work was to analyze the main characteristics of abdominal ultrasounds (aUS) in a cohort of WD patients and correlate them with clinical and elastographic data.

**Method:** WD patients followed in our institution with aUS performed between 2018 and 2022 were included. An experienced radiologist blinded to clinical data performed the aUS retrospective analysis. We recorded the closest clinical, elastographic and analytical data for each patient. Statistical analysis was performed with SPSS v.27; variables were expressed as n (%) or mean (IQR25–75).
Results: We included 55 WD patients with aUS: 28 (51%) male, current age 38 (27–47), WD diagnosis done 17 years (11–27) ago, 30 (55%) hepatic phenotype, 14 (25.5%) with cirrhosis (10 at diagnosis, 4 at follow-up), 28 (52.8%) with abnormal ASAT and/or ALT at US evaluation, elastographic value 5.2 Kpa (4.6–7.4) and CAP 255 dB/m (209–295), available in 47 cases. Transient elastography (TE) was higher in cirrhosis vs non-cirrhosis (9.1Kpa vs. 4.9KPa, p < 0.001). At the aUS, most of the WD patients showed normal hepatic size and morphology (87.3% and 100% respectively). Hepatic contours were normal in 37 (67%). Hepatic parenchyma was heterogeneous in 18 (32.7%), and echogenicity was increased in 31 (56.3%) patients: mild 24 (77.4%), moderate 5 (16.2%), severe 2 (6.4%). The presence of moderate/severe steatosis in aUS (n = 7) was significantly associated with a CAP value >261 dB/m, corresponding to S2-S3 at TE (p = 0.02). Eleven patients (20%) presented any solid hepatic lesion (SHL): the majority were hypoechoic nodules (isolated in 2, multiple in 4) or hemangiomias (n = 3). Five out of the 6 cases with hypoechoic nodules had cirrhosis; 1 case was hepatocellular carcinoma. pPT was explored in 40 patients (72.7%) and was increased in 14 cases (40%); abnormal pPT was not associated with the presence of cirrhosis, increased transaminasines, or SHL. Up to 19 patients (34.5%) had splenomegaly [spleen diameter: 13 cm (12.7–15.5)]; 52.6% of them had cirrhosis (n = 10) whereas 47.4% (n = 9) had no signs of advanced liver disease (p < 0.001). Splenomegaly could only be associated with a reduced platelet count (136 vs 224, p < 0.001).

Conclusion: Steatosis showed to be very prevalent in US and correlated with the TE-CAP value among patients with WD. Splenomegaly was observed in one third of the cohort, even in the absence of cirrhosis. The presence of an increased perportal thickness and/or hypoechoic nodules at the aUS could be helpful for WD diagnosis and should be explored prospectively.

THU-326
Exploring pregnancy, breastfeeding and contraception among women with Wilson disease in Spain: results from the Spanish Wilson registry
Marta Romero-Gutiérrez1, Pablo Alonso Castellano2, Marina Berenguer3, Antonio Olveira Martin4, Toledo, Spain; 2Complejo Hospitalario Universitario Insular Materno Virgen Macarena, Sevilla, Spain; 3Hospital Clínico San Carlos, Madrid, Spain; 4Hospital Virgen de la Luz, Cuenca, Spain; 5Hospital Clinica de Barcelona, Liver Unit, Spain

Background and aims: Recommendations about gestation and breastfeeding in patients with Wilson disease (WD) are heterogeneous. Our aim was to collect data on gestational history, lactation, therapeutic modifications, and contraception in patients with WD in Spain.

Method: Multicenter ambispective study including adult women within the Spanish Wilson Registry. Informed consent was obtained and specific interviews were performed in all cases.

Results: We included 92 women with WD: median age was 43.7 (range: 18–81) years, age at WD diagnosis was 15.7 (3–67) years. Thirty-four women (37%) reported no history of gestation, whereas 58 (63%) referred previous pregnancies [total gestations: 143, median/woman: 2]. WD diagnosis was done during pregnancy in 2 patients (3.4%), before in 41 (70.7%) and after in 15 (25.9%). Up to 35 (33.6%) received no anti-copper therapy while on pregnancy, mostly due to post-gestation diagnosis (91.4%). In those pregnant women with treatment (n = 69), the drugs used were: 52.2% D-Penicillamine (D-P); 5.8% trientine and 42% zinc. The therapeutic attitude during pregnancy was: 62.3% unchanged, 10.1% dose reduction, 7.3% changed D-P to zinc; 7.3% women decided to voluntarily abandon therapy; in 13% it was unknown. Up to 49% of women were followed in high-risk gynecological programs. The age at first delivery was 26.1 (18–40) years. Twenty-three WD patients (39.6%) reported previous history of miscarriage, mainly spontaneous (74%) and most occurring during the first trimester. Data regarding 106 newborns was available: 98 term neonates, 6 pre-term, 2 post-term; pathology was reported in 4 children (3.8%). Breastfeeding data was obtained from 78 pregnancies: 26.9% did natural breastfeeding, 60.3% artificial lactation, mixed in 12.8%. Type of lactation was based on patient’s choice in 37.2%, hepatology recommendation in 17.9%, gynecology recommendation in 30.8%, others in 7.7%, not available in 6.4%. The use of artificial lactation was mainly (68%) based on physician’s recommendations (hepatology/gynecology). After WD diagnosis, 26.1% did not use any contraception, 24.9% used hormonal contraceptives, 21.7% barrier contraceptives, 5.4% IUDs, 10.8% other/combined, and 6.5% unknown. When we asked specifically, WD women were concerned about pregnancy (48.1%), mostly because of the risk of WD and treatment on the fetus (64.5%). However, information received from physicians was considered to be sufficient in more than a half (53.2%).

Conclusion: Gestational history among women with WD in Spain was shown to be heterogeneous. Almost 50% of the patients reported concerns about being pregnant. Artificial breastfeeding was the most frequent method, mainly due to medical recommendations. A clear guide for physicians and WD patients would be desirable.

THU-327
Hepatic alterations in COVID-19: a comparative autopsy study
Sigurd Lax1,2, Kristján Skok3, Peter Zechner4, Hans-Peter Dienes5, Michael Trauner6, Johannes Kepler University, Pathology, Graz, Austria; 5Medical University Vienna, Gastroenterology and Intensive Medicine, Graz, Austria; 6Kepleruniklinikum, Pathology and Molecular Pathology, Linz, Austria

Background and aims: COVID-19 is a systemic disease involving particularly the lungs and, in addition, multiple other organs. Whereas the pulmonary changes have been extensively studied, our knowledge on the impact of SARS-CoV-2 on the liver is limited. The aim of this study was to investigate liver changes of COVID-19 deceased in correlation with the hepatic viral status and to compare
the findings with a control group of non-COVID-19 patients matched for age and underlying medical conditions.

Method: Formalin-fixed, paraffin-embedded liver tissue of 50 COVID-19 and 20 non-COVID deceased was studied histologically, by immunohistochemistry and by PCR for SARS-CoV-2 RNA and correlated with clinical and laboratory information.

Results: Viral RNA was detected in liver tissue of 15/50 (30%) COVID-19 deceased but in none of the controls. Livers of COVID-19 deceased showed significantly more frequently moderate to severe (mostly macrovesicular) steatosis, Kupffer cell proliferation and ductular metaplasia of hepatocytes compared to the control group (p < 0.01). Portal T-cell infiltrates were significantly less frequent in the PCR-positive COVID-19 subgroup compared to PCR-negative COVID-19 patients and controls (p < 0.01). Other findings such as active cholangitis, ductular proliferation, periductular sclerosis, fibrosis, and congestion were present in both COVID-19 patients and controls, without statistically significant differences. Cholestasis and hepatic thrombosis were only found in COVID-19 deceased.

Conclusion: Severe hepatic steatosis, increased Kupffer cell proliferation, ductular proliferation and ductular metaplasia of hepatocytes in COVID-19 may reflect a reaction to the viral infection and/or associated systemic inflammation. However, other histological findings in the liver of elderly COVID-19 deceased, particularly, periductular sclerosis seem to be potentially age-related.

THU-328
The adequacy and safety of liver biopsy performed during cardiac catheterization in patients with Fontan and non-Fontan heart disease
Edward Cytryn1, Peizi Li2, Sara Lewis3, Maria Isabel Fiel2, Barry Love4, Ali Zaidi5, Thomas Schiano6, Lauren Grinspan6.
1Icahn School of Medicine at Mount Sinai, Department of Medicine, New York, United States; 2Icahn School of Medicine at Mount Sinai, Department of Pathology, New York, United States; 3Icahn School of Medicine at Mount Sinai, Department of Radiology, New York, United States; 4Icahn School of Medicine at Mount Sinai, Department of Pediatrics, Division of Cardiology, New York, United States; 5Icahn School of Medicine at Mount Sinai, Department of Medicine (Cardiology), Department of Pediatrics, New York, United States; 6Icahn School of Medicine at Mount Sinai, Division of Liver Diseases, Recanati/Miller Transplantation Institute, New York, United States
Email: edward.cytryn@mountsinai.org

Background and aims: Liver biopsy is the gold standard for diagnosis of hepatic fibrosis and cirrhosis. However, it is an invasive procedure and carries risk of bleeding. The surveillance of Fontan-associated liver disease (FALD), an increasingly recognized complication in the growing number of patients post-Fontan procedure, with biopsy during right heart catheterization (RHC) is a unique approach performed at few centers, in part due to questions of risk of biopsy and sampling error. The role and efficacy of transcutal liver biopsy during RHC warrants further investigation. The aim of this study was to review the indications, outcomes, and adequacy of liver biopsy during RHC, with special attention to patients having FALD.

Method: A multidisciplinary, retrospective review of patients at a single institution who underwent liver biopsy during RHC was performed. 94 liver biopsies taken between December 2011 and October 2022 were analyzed. Patient characteristics, RHC and biopsy indications, hemodynamics, complications, and tissue adequacy were evaluated. Specimens were classified as "adequate" if total biopsy linear length was greater than or equal to 20 mm or the total number of portal tracts was greater than or equal to 10, "limited" if the total length was 10 to 20 mm or total number of tracts was 5 to 10, or "inadequate" if the total length was less than 10 mm and total number of tracts was less than 5.

Results: There were 55 biopsies in non-Fontan patients and 39 in Fontan patients with a median age at RHC of 55.5 years and 30 years, respectively. Indications for RHC were routine hemodynamic assessment (49%), new or progressive heart failure symptoms (47.2%), and arrhythmia (3.6%) in the non-Fontan group and assessment of Fontan circulation (46.6%), heart failure symptoms (10.3%), and arrhythmia (2.6%) in the Fontan group. Indications for liver biopsy in non-Fontan patients was to rule out fibrosis in 92.7% and abnormal LFTs in 7.3%. In Fontan patients, biopsy was indicated to assess FALD in 25.6% with known disease and to rule out fibrosis in 74.4%. Hepatic pressure measurements were obtained in 95.7% of cases (98% non-Fontan, 93.2% Fontan). Average fluoroscopy time was longer in Fontan compared to non-Fontan cases, 12.5 vs 6.4 minutes, with fewer average number of biopsy passes, 2.8 vs 3.6. There were no complications from pain, bleeding, perforation, or infection, and no noted technical difficulties in either group. Average total linear length and number of portal tracts were similar between Fontan and non-Fontan biopsies, 24.3 vs 24.4 mm and 12.7 vs 13.7 portal tracts, respectively. In total, 82/94 (87.2%) were “adequate” and 10/94 (10.6%) were “limited.” 4/94 (4.3%) were inadequate by linear length, while 3/94 (3.2%) were inadequate by number of portal tracts, however, only 2/94 (2.1%) met both criteria and were classified as “inadequate.” Similar adequacy was noted in sub-analysis of Fontan patients with 34/39 (89.7%) “adequate,” 4/39 (10.3%) “limited,” and 1/39 (2.6%) “inadequate.” A definitive diagnosis was reached on pathologic review of 92/94 (97.9%) biopsy cases.

Conclusion: Liver biopsy performed during a clinically warranted RHC can be safely performed with adequate yield and minimal complication risk. It is especially useful and effective in Fontan patients undergoing RHC to assess FALD development and progression. Liver histology is important to analyze during cardiac decompensation and obtaining a liver biopsy concurrently during a RHC should be considered.

THU-329
Deep learning quantification reveals fundamental prognostic role for ductular reaction in biliary atresia
Iiris Nyholm1, Nelli Sjöblom2, Maria Hukkinen1, Marjut Pihlajoki3, Jouko Lohi3, Aino Mutka2, Päivi Heikkilä2, Mark Davenport4, Markku Heikinheim5, Johanna Arola2, Mikko Pakarinen1, University of Helsinki and Helsinki University Hospital, Section of Pediatric Surgery, Pediatric Liver and Gut Research Group, Finland; 2University of Helsinki and Helsinki University Hospital, Department of Pathology, Finland; 3University of Helsinki and Helsinki University Hospital, Pediatric Research Center, Finland; 4King’s College Hospital, Department of Pediatric Surgery, United Kingdom
Email: iiris.nyholm@helsinki.fi

Background and aims: Ductular reaction (DR) is a prominent pathological feature of biliary atresia (BA) associating with unsuccessful Kasai portoenterostomy (KPE) and liver fibrosis in previous small studies using conventional histopathology.

Method: Deep learning model was developed and applied to cytokeratin 7 (CK7) stained native liver biopsies (n = 257) in BA patients (n = 136). The CharBADR model quantified total proportional DR (DR%) composed of CK7 positive portal biliary epithelium (BEL) and parenchymal intermediate hepatocytes (PIH). Results were related to clinical data, Sirius Red quantified liver fibrosis, and serum bile acids.

Results: In total, 116 biopsies were obtained at KPE and 141 during postoperative follow-up. 58% of patients cleared their jaundice (COJ, post-KPE serum bilirubin <20 µmol/l) and overall native liver survival (NLS) was 38%. DR% (8.3 vs 5.9%, p = 0.045) and PIH% (13.4 vs 6.3%, p = 0.004), but not BEL% (6.8 vs 5.1%, p = 0.09), were increased at KPE in patients without COJ. During follow-up, increased DR% (13.6 vs 2.9%, p < 0.001), PIH% (6.4 vs 0.3%, p < 0.001) and BEL% (4.4 vs 2.5%, p < 0.001) persisted in patients subsequently transplanted. In Cox regression, high DR% predicted inferior NLS both at KPE (HR = 134, p = 0.02) and during post-KPE follow-up (HR = 22, p < 0.001). DR% correlated with liver fibrosis at KPE (R = 0.47, p < 0.0001) and follow-up (R = 0.27, p = 0.004). A close association between DR% and serum bile acids.

Journal of Hepatology 2023 vol. 78(S1) | S100-S1212
S997
bile acids was observed at follow-up (R = 0.61, p < 0.001). Fibrosis was not prognostic for NLS at KPE (HR = 1.00, p = 0.96) or follow-up (HR = 1.01, p = 0.29).

Conclusion: DR associated with COJ and, unlike liver fibrosis, predicted need for liver transplantation.

THU-330
Long-term outcomes of patients with Wilson disease: a single center analysis of 361 Korean patients
Hyo Jin Nam1, Jonggi Choi1, Won-Mook Choi1, Danbi Lee1, Ju Hyun Shin1, Kang Mo Kim1, Young-Suk Lim1, Han Chu Lee1. 1Asan Medical Center, Korea, Rep. of South
Email: jkchoi0803@gmail.com

Background and aims: There are few data regarding long-term outcomes and survival of patients with Wilson disease (WD) from large Asian cohorts. We aimed to analyze the clinical long-term data in a large Korean cohort of WD.

Method: Between 2000 and 2022, 361 patients with WD were retrospectively analyzed at Asan Medical Center, Seoul, Republic of Korea. Diagnosis of WD were made on typical symptoms, clinical, biochemical and genetic findings. Primary outcome was liver transplant-free survival. Development of hepatocellular carcinoma (HCC) in the entire patients and progression to liver cirrhosis (LC) in patients without LC at diagnosis were also analyzed. Patients who met the following criteria were excluded: 1) received liver transplantation within 6 months of diagnosis; 2) follow-up period less than 6 months; 3) co-infection with hepatitis B virus; 4) combined transplantation within 6 months of diagnosis; 2) follow-up period less than 6 months; 3) co-infection with hepatitis B virus; 4) combined transplantation within 6 months of diagnosis.

Results: The mean age was 17.2 years, and 206 (57.1%) of the patients were male. At diagnosis, 146 (40.4%) patients had LC, of which 48 (13.3%) patients showed decompensation. Transplant-free survival rates at 5-, 10-, 15-, and 20-years were 100.0%, 89.4%, 97.9%, and 97.9%, respectively. Cumulative probabilities of HCC development at 5-, 10-, 15-, and 20-years were 0.0%, 0.4%, 1.9%, and 6.1%, respectively. Of the 215 patients without LC at diagnosis, 15 (7.0%) patients showed progression to LC with cumulative risks of 0.0%, 3.0%, 6.1% and 14.1% at 5, 10, 15, and 20 years, respectively. No patients without LC at diagnosis died or developed HCC during the follow-up period. Older age and LC at diagnosis were significantly associated with a worse survival rate (p < 0.05 for all).

Conclusion: Korean patients with WD had a favorable long-term prognosis. However, older age and LC at the time of diagnosis increase the risk of death and HCC development.

THU-331
Lessons from population genomics for Wilson disease: Prevalence, penetrance of mutations, clinical implications and design of regional screening programmes
Pablo Alonso Castellano1, Zoe Mariño2, Antonio Olivea Martín3, Javier Ampuero4, Marina Berenguer5, Maria Pilar Huarte Muniesa6, Diego Burgos Santamaría7, José Ramón Fernández8, Jose Maria Moreno Planas9, María Lázaro Ríos10, Helena Masnou11, Maria Luisa Gonzalez Dieguez12, Jose Pinazo Banderà12, Esther Molina13, Manuel Hernández Guerra13,15, Marta Romero-Gutiérrez16, Patricia Cordero Ruiz17, Carolina Muñoz Codoceo18, Sara Lorente19, Alba Cacherio20, Manuel Delgado21, Victor Manuel Vargas Blasco22, Judith Gómez-Camarena23, Julia Morillas24, Francisca Cuenca Alarcon25, Luis Iñáez Samaniego26, Miguel Fernandez-Bermejo27, Beatriz Álvarez-Suárez28, Paula Iruzubieta29, Ana Arencibia Almeida30, Anna Miralpeix31, Pilar Castillo3, Luis García-Villarreal1, 1Servicio Digestivo, Complejo Hospitalario Universitario Insular Materno Infantil (CHUIMI), Las Palmas de Gran Canaria, Spain; 2Liver Unit, Hospital Clinic, CIBEREhd, IDIBAPS, ERN-RARE Liver, Universitat de Barcelona, Barcelona, Spain; 3Hospital Universitario La Paz, Madrid, Spain; 4Hospital Universitario Virgen del Rocio, Sevilla, Spain; 5Hospital Universitari i Politècnic La Fe, Valencia, Spain; 6Complejo hospitalario Navarra, Pamplona, Spain; 7Hospital Ramón y Cajal, Madrid, Spain; 8Hospital Universitario de Cruces, Barakaldo, Spain; 9Servicio de Aparato Digestivo, Complejo Hospitalario Universitario de Albacete, Facultad de Medicina, Universidad de Castilla La Mancha, Spain; 10Hospital Universitario Miguel Servet, Zaragoza, Spain; 11Hospital Universitari Germans Trias i Pujol, Badalona, Spain; 12Hospital Universitario Central de Asturias, Oviedo, Spain; 13Unidad de Hepatología, Unidad de Gestión Clínica de Aparato Digestivo, Hospital Universitario Virgen del Vicariasico, Instituto de Investigación Biomédica de Málaga-Plataforma Bionand, Málaga, Spain; 14Hospital Clínico de Santiago, Santiago de Compostela, Spain; 15Hospital Universitario de Canarias, Santa Cruz Tenerife, Spain; 16Hospital Universitario de Toledo, Toledo, Spain; 17Hospital Universitario Virgen Macarena, Sevilla, Spain; 18Hospital Universitario 12 of October, Madrid, Spain; 19Unidad de Hepatología y Trasplante Hepático, Hospital Clínico Lozano Blesa de Zaragoza, IESS Aragón, Spain; 20Hospital Universitario Bellvitge, Hospital de Llobregat, Spain; 21Hospital Universitario A Coruña, A Coruña, Spain; 22Servicio de Hepatología, Hospital Vald d’Hebron, Universitat Autònoma Barcelona, CIBEREhd, Barcelona, Spain; 23Hospital Universitari de Burgos, Burgos, Spain; 24Hospital Universitario Virgen de la Luz, Cuenca, Spain; 25Unidad de Hígado, Servicio de Aparato Digestivo, Hospital Clínico San Carlos, Madrid, Spain; 26Hospital General Universitario Gregorio Marañón, Madrid, Spain; 27Hospital Universitario de Cáceres, Cáceres, Spain; 28Hospital Universitario Lucus Augusti (CHUL), Lugo, Spain; 29Hospital Universitario Marqués de Valdecilla, Santander, Spain; 30Hospital Universitario Nuestra Señora de la Candelaria, Santa Cruz de Tenerife, Spain; 31Liver Unit, Hospital Clinic, CIBEREhd, IDIBAPS, ERN-RARE Liver, Universitat de Barcelona, Barcelona, Spain
Email: lgarciaivillarreal@gmail.com

Background and aims: During the last years several studies have discussed about the prevalence and penetration of Wilson Disease (WD) mutations with conflicting conclusions. So we decided to compare the estimated data for WD in Spain from genome databases-Lorente et al j Pediatr Gastroenterol Nutr. 2022 Feb 1;74 (2):192–199-with clinical and genetic data obtained from the Spanish Wilson Registry (SWR) by AEEH

Method: We calculated the number of homozygotes of the most frequent mutations in Spain as predicted from the number of carriers found at the Collaborative Spanish Variant Server (assuming that the
Hardy-Weinberg equilibrium is met), and compared those estimated values with records from the Spanish Wilson Registry (adding late communication from a center not included yet) covering approximately 85% of the Spanish population, and represented mainly by adult cases recruited at digestive services.

**Results:** The estimated vs real number of homozygotes were as follows: p.Met645Arg (194 vs 6), p.His1069Gln (20 vs 8), p.Leu708Pro (63 vs 24; only Gran Canaria) and p.Gly869Arg (147 vs 0). Studying homozygous cases from the SWR, the p.Met645Arg homozygous cases compared with those for p.Leu708Pro and p.His1069Gln presented 0% with cirrhosis at diagnosis (vs 40% and 20%, respectively), 20% with extrahepatic disease (vs 46% and 50%, respectively), 20% asymptomatic cases (vs 8% and 0%, respectively), 0% with Kayser-Fleischer (KF) ring (vs 40%, 75% p < 0.05 with p. His1069Gln)), and 60% diagnosed after 40 y.o. (vs 0% and 0%, p < 0.001). When comparing p.Met645Arg homozygotes vs p.Met645Arg compound heterozygotes, we found that 60% vs 17%, respectively, were diagnosed after 40 yo (p < 0.05). Finally we studied these 4 mutations in compound heterozygotes with any other mutation, excluding compounds between the frequent mutations (Table):

**Conclusion:** Considering the limited recruitment time (only one adult cases recruited at digestive services).

**Method:** Stool and plasma samples, were prospectively collected, in BA infants (n = 55) pre-Kasai Portocenterostomy (KPE), 6weeks-, 3months-, and 6months-post-KPE. Plasma ethanol, BT [Lipopolysaccharide-Binding Protein (LBP)], D-lactate and IP [Claudin-3] biomarkers, were measured. Stool 16S-rRNA sequencing was performed for GM genus abundance. Outcomes: 6month jaundice clearance vs 6month jaundice [BA-JC vs BA-J], 1year-liver transplant (LT) status [BA-native liver survivor (NLS) vs BA-LT], Paediatric End Stage Liver Disease (PELD) score, fibrosis [Liver Stiffness Measurement (LSM)].

**Results:** Plasma ethanol concentration pre-KPE, 6weeks-post-KPE, were not associated with 6month-JC or 1year-LT outcome groups. At 3months-post-KPE, increased ethanol was associated with 1year-LT [BA-NLS, 2.4 mg/L (0, 12.3) vs BA-LT 7 mg/L (1, 140, p = 0.02) and predicted the need for LT at 1year-post-KPE, with AUROC of 0.74. At 6months-post-KPE, ethanol was not associated with clinical outcomes. At 3months-post-KPE, ethanol positively correlated with disease severity [PELD, rs = 0.4, p = 0.02] and fibrosis [LSM, rs = 0.5, p = 0.01]. Regarding BT, ethanol positively correlated with D-lactate at 6weeks-post-KPE [rs = 0.4, p = 0.02] and 3months-post-KPE [rs = 0.5, p = 0.01], but inversely with LBP [3months-post-KPE, rs = −0.3, p = 0.05; 6months-post-KPE, rs = −0.5, p = 0.01]. No correlation between ethanol and individual genus abundance or IP (Claudin-3), was identified.

**Conclusion:** Ethanol, at 3months-post-KPE, is associated with LT in BA. Ethanol and D-lactate production are linked, suggesting a role for GM-ethanol-BA pathogenesis. The inverse correlation between LBP and ethanol may reflect a protective role for LBP in early endotoxemia. Mechanistic pathways for ethanol-BA pathogenesis, warrant further investigation.

**THU-333**

**Endogenous ethanol production in biliary atresia and its association with clinical outcomes, liver disease severity, fibrosis, bacterial translocation and intestinal permeability**

Emma Makin1, Anita Verma1, Anil Dhawan1, Vandana Jain1. 1King’s College Hospital, United Kingdom

**Background and aims:** Altered gut microbiota (GM; dysbiosis), have been implicated in the pathogenesis of chronic liver diseases, including Biliary Atresia (BA), and are a major source of endogenous ethanol production. Plasma ethanol concentration was increased in NASH vs obese/healthy controls, and we have previously described an increase in potential ethanol-producing GM in BA. Aim: To characterise ethanol production in BA, and its association with clinical outcomes, liver disease severity, fibrosis, bacterial translocation (BT) and intestinal permeability (IP).

**Method:** Stool and plasma samples, were prospectively collected, in BA infants (n = 55) pre-Kasai Portoenterostomy (KPE), 6weeks-, 3months-, and 6months-post-KPE. Plasma ethanol, BT [Lipopolysaccharide-Binding Protein (LBP)], D-lactate and IP [Claudin-3] biomarkers, were measured. Stool 16S-rRNA sequencing was performed for GM genus abundance. Outcomes: 6month jaundice clearance vs 6month jaundice [BA-JC vs BA-J], 1year-liver transplant (LT) status [BA-native liver survivor (NLS) vs BA-LT], Paediatric End Stage Liver Disease (PELD) score, fibrosis [Liver Stiffness Measurement (LSM)].

**Results:** Plasma ethanol concentration pre-KPE, 6weeks-post-KPE, were not associated with 6month-JC or 1year-LT outcome groups. At 3months-post-KPE, increased ethanol was associated with 1year-LT [BA-NLS, 2.4 mg/L (0, 12.3) vs BA-LT 7 mg/L (1, 140, p = 0.02) and predicted the need for LT at 1year-post-KPE, with AUROC of 0.74. At 6months-post-KPE, ethanol was not associated with clinical outcomes. At 3months-post-KPE, ethanol positively correlated with disease severity [PELD, rs = 0.4, p = 0.02] and fibrosis [LSM, rs = 0.5, p = 0.01]. Regarding BT, ethanol positively correlated with D-lactate at 6weeks-post-KPE [rs = 0.4, p = 0.02] and 3months-post-KPE [rs = 0.5, p = 0.01], but inversely with LBP [3months-post-KPE, rs = −0.3, p = 0.05; 6months-post-KPE, rs = −0.5, p = 0.01]. No correlation between ethanol and individual genus abundance or IP (Claudin-3), was identified.

**Conclusion:** Ethanol, at 3months-post-KPE, is associated with LT in BA. Ethanol and D-lactate production are linked, suggesting a role for GM-ethanol-BA pathogenesis. The inverse correlation between LBP and ethanol may reflect a protective role for LBP in early endotoxemia. Mechanistic pathways for ethanol-BA pathogenesis, warrant further investigation.

**THU-333**

**Digital pathology using stain-free imaging indices as a tool for fibrosis quantification in patients with congestive hepatopathy**

Matthew Yeh1, Hong-Wen Tsai2, Che-Wei Hsu2, Cheng-Yi Chen2, Yayun Ren3, Kutbuddin Akbary3, Elaine Chng3, Dean Tai3. 1University of Washington, Department of Pathology, United States; 2National Cheng Kung University Hospital, Taiwan; 3HistoIndex Pte Ltd, Singapore

**Email:** yehmliver@gmail.com

**Background and aims:** Congestive hepatopathy (CH) is the result of right heart failure from myriads of heart diseases. It causes centriflobular fibrosis and can progress to portal and bridging fibrosis and even cirrhosis. While histological scoring system for fibrosis in congestive hepatopathy exists, the scores are categorical but not continuous. There are also intra- and inter-observer variation among pathologists. Second harmonic generation/two-photon excitation fluorescence (SHG/TPEF) microscopy has been demonstrated to provide accurate and reproducible fibrosis quantification in preclinical and clinical liver specimens, including biopsies from patients with viral hepatitis and NAFLD. We aim to test the feasibility using SHG/TPEF microscopy in assessing liver fibrosis in congestive hepatopathy.

**Method:** Unstained sections from 10 congestive hepatopathy cases with Dai scheme stages 0, 1, 2 and 3 were imaged using SHG/TPEF microscopy. Changes in overall liver fibrosis and in five zonal regions of liver lobules were quantitatively assessed by qFibrosis-a cumulative index based on measuring 184 collagen features on a continuous scale. There are also intra- and inter-observer variation among pathologists. Second harmonic generation/two-photon excitation fluorescence (SHG/TPEF) microscopy has been demonstrated to provide accurate and reproducible fibrosis quantification in preclinical and clinical liver specimens, including biopsies from patients with viral hepatitis and NAFLD. We aim to test the feasibility using SHG/TPEF microscopy in assessing liver fibrosis in congestive hepatopathy.

**Results:** 3 parameters chosen for CH fibrosis quantification in patients with congestive hepatopathy:

**Table:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>BA-JC</th>
<th>BA-J</th>
<th>1year-LT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neurological manifestations</td>
<td>8, 0.00%</td>
<td>19, 0.00%</td>
<td>27, 0.00%</td>
</tr>
<tr>
<td>Hepatic manifestations</td>
<td>72, 0.00%</td>
<td>81, 0.00%</td>
<td>31, 0.00%</td>
</tr>
<tr>
<td>Screening cases</td>
<td>23, 0.00%</td>
<td>23, 0.00%</td>
<td>18, 0.00%</td>
</tr>
<tr>
<td>KF ring</td>
<td>6, 0.00%</td>
<td>25, 0.00%</td>
<td>39, 0.00%</td>
</tr>
<tr>
<td>Cirrhosis at diagnosis</td>
<td>14, 0.00%</td>
<td>25, 0.00%</td>
<td>9, 0.00%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>BA-JC</th>
<th>BA-J</th>
<th>1year-LT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neurological manifestations</td>
<td>8, 0.00%</td>
<td>19, 0.00%</td>
<td>27, 0.00%</td>
</tr>
<tr>
<td>Hepatic manifestations</td>
<td>72, 0.00%</td>
<td>81, 0.00%</td>
<td>31, 0.00%</td>
</tr>
<tr>
<td>Screening cases</td>
<td>23, 0.00%</td>
<td>23, 0.00%</td>
<td>18, 0.00%</td>
</tr>
<tr>
<td>KF ring</td>
<td>6, 0.00%</td>
<td>25, 0.00%</td>
<td>39, 0.00%</td>
</tr>
<tr>
<td>Cirrhosis at diagnosis</td>
<td>14, 0.00%</td>
<td>25, 0.00%</td>
<td>9, 0.00%</td>
</tr>
</tbody>
</table>

**Figure:** (abstract: THU-331).
progression patterns is quantitatively different in portal tract and central vein regions. This difference can be better visualized in the figures, where SHG/TPEF images shows more fibrosis in NASH comparing to CH. Note that the staging systems used are NASH-CRN and Dai for NASH and CH patients respectively.

**Conclusion:** This is the first series liver fibrosis in congestive hepatopathy is shown to be assessed using SHG/TPEF microscopy. These data will be expanded and validated in an additional larger number of congestive hepatopathy cohort correlating with clinical and outcome data, and compared with other liver diseases (e.g., NASH and viral hepatitis), which may provide insight evaluating disease severity that aid clinical management plan algorithm and decision-making.

**THU-334**
Current transition management of adolescents and young adults with liver diseases: an European reference network rare liver survey
Joao Madaleno1,2,3, Marianne Samyn3,4, Isabel Gonçalves3,5, Zoe Mariño3,6, Ruth de Bruyne3,7, Deirdre Kelly3,8. 1Liver Disease Unit,
Background and aims: There is an increased risk for medical complications and morbidity surrounding transfer from pediatric to adult hepatology and transplant services. Health care transition (HCT) is the process of moving from a child/family-centered model of care to an adult or patient-centered model of health care. On behalf of the European Reference Network (ERN) RARE-Liver, the Transition Working group conducted a survey within Europe exploring current practice.

Method: A questionnaire was developed and circulated electronically via ERN members and other national/international professional bodies using the EU Survey platform.

Results: A total of 90 responses (44% adult) from 67 centers in 27 countries were collected. A liver HCT programme was available in 61% (n = 41) centres, organized by paediatrics in 29%, adults 11% and jointly in 57%. Lack of resources was the main reason (56%) for not having a liver HCT programme. Transfer to adult services is mainly driven by age, with 71% occurring by their 18th/19th birthday but exceptions are allowed in 57%. Transition readiness assessments were only used by 19%, and 70% of health care providers had not received specific training in the care of adolescents and young adults (AYA). The main barriers to adequate HCT were patient/family’s dependence on the pediatric provider and inadequate communication between teams with 76.7% and 68.9% responding strongly agree/agree. No feedback system between pediatric and adult services occurs in 45.5% and no evaluation system is in place in 60%.

Conclusion: HCT is important for AYA with chronic liver diseases, but there are crucial limitations and variations in the current provision of transition services across Europe. Standardization of AYA management and specific training are required. This should improve management and continuity of care during adolescence and into adulthood to achieve the best healthcare outcomes.

THU-335
Quality of life in patients with Wilson disease treated with Trientine dihydrochloride: a prospective study
Karl Heinz Weiss1, Isabelle Mohr2, Larissa Wijnberg3, Carlot Kruse1.
1Salem Medical Centre, Internal Medicine, Germany; 2Heidelberg University Hospital, Gastroenterology, Germany; 3Univar Solutions, Netherlands
Email: larissa.wijnberg@universolutions.com

Background and aims: Wilson disease (WD) is a rare genetic disorder, causing copper accumulation in organs, particularly the liver and brain. Life-long chelation therapy is required to remove excess copper and avoid development or worsening of hepatic and neurological symptoms. Chronic illness is known to impact quality of life. This study aimed to assess the quality of life (QoL) in patients with WD treated with Trientine dihydrochloride (Tehdine®) in a prospective manner.

Method: A total of 90 responses (44% adult) from 67 centers in 27 countries were collected. A liver HCT programme was available in 61% (n = 41) centres, organized by paediatrics in 29%, adults 11% and jointly in 57%. Lack of resources was the main reason (56%) for not having a liver HCT programme. Transfer to adult services is mainly driven by age, with 71% occurring by their 18th/19th birthday but exceptions are allowed in 57%. Transition readiness assessments were only used by 19%, and 70% of health care providers had not received specific training in the care of adolescents and young adults (AYA). The main barriers to adequate HCT were patient/family’s dependence on the pediatric provider and inadequate communication between teams with 76.7% and 68.9% responding strongly agree/agree. No feedback system between pediatric and adult services occurs in 45.5% and no evaluation system is in place in 60%.

Conclusion: HCT is important for AYA with chronic liver diseases, but there are crucial limitations and variations in the current provision of transition services across Europe. Standardization of AYA management and specific training are required. This should improve management and continuity of care during adolescence and into adulthood to achieve the best healthcare outcomes.
life (QoL), with lower QoL and increased risk of depression reported in WD. We report QoL outcomes in a prospective study to assess long-term outcomes in patients with WD treated with Trientine dihydrochloride (TETA-2HCl).

**Method:** Patients with WD who were withdrawn from therapy with D-penicillamine and treated for at least 6 months with 300 mg capsules of TETA-2HCl (equivalent to 200 mg of trientine base) were eligible for this prospective, observational study. Patients were administered their routine dose of TETA-2HCl and completed the EQ-5D-3L questionnaire at Baseline, Month 6, and Month 12.

**Results:** EQ-5D-3L questionnaires were completed by all patients (N = 51). The five dimensions of the EQ-5D-3L (mobility, self-care, usual activities, pain/discomfort, anxiety/depression) were stable and generally similar at Months 6 and 12. Most patients had no difficulty in mobility or performing self-care activities while on treatment with TETA-2HCl, however one (2%) patient was confined to bed and not able to perform self-care (unable to wash or self-dress) throughout the study. Some problems in performing usual activities were reported by 7 (13.7%) patients, 10 (19.6%) patients and 10 (19.6%) patients at Baseline, Month 6, and Month 12, respectively, while two (3.9%) patients were completely unable to perform any usual activities during the study. Moderate anxiety or depression was noted in 15 (29.4%) patients at Baseline, Month 6 and at Month 12 respectively. Extreme anxiety or depression were experienced by 2 (3.9%) patients and 3 (5.9%) patients at Baseline, Month 6 and at Month 12 respectively.

**Conclusion:** Patients with WD receiving long-term TETA-2HCl therapy generally reported good mobility, self-care and ability to carry out their usual activities. However, pain or discomfort were reported by almost half of patients. Anxiety or depression also affected up to half of patients at Baseline, although the proportion reporting moderate anxiety or depression decreased substantially during the 12 months of treatment. As a clinical consequence, assessment of anxiety and depression in patients with WD is warranted, even during maintenance therapy.

**THU-336**

Odevixibat therapy in patients with MYO5B mutations: a retrospective case series

Bertrand Roquelaure1, Marco Sciveres2, Tassos Grammatikopoulos3, Eberhard Lurz4, Folke Freudenberg5, Lionel Thevathasan6, Fatine Elaraki6, Velichka Valcheva6, Emmanuel Gonzales7. 1CHU, Hospital de la Timone, France; 2Paediatric Hepatology and Paediatric Liver Transplantation, ISMETT, University of Pittsburgh Medical Center Italy, Palermo, Italy; 3Institute of Liver Studies, King’s College London, London, United Kingdom; 4Division of Paediatric Gastroenterology and Hepatology, Dr. von Hauner Children’s Hospital, University Hospital Munich, LMU, Munich, Germany; 5Klinikum Dritter Orden, Division of Pediatric Gastroenterology and Hepatology, Munich, Germany; 6Albireo Pharma Inc., Boston, MA, United States; 7Hépatologie et Transplantation Hépatique Pédiatriques, Centre de Référence de l’Atrésie des Voies Biliaires et des Cholestases Génétiques, FSMR FILFOIE, ERN RARE LIVER, Hôpital Biétre, AP-HP Université Paris-Saclay, Hépatinov, Inserm U 1193, Paris, France

**Background and aims:** Progressive familial intrahepatic cholestasis type 6 (PFIC6, recently renamed PFIC10 according to Online Mendelian Inheritance in Man [OMIM; https://www.omim.org/entry/619868]) is a rare liver disease caused by mutations in the MYO5B gene and characterised by elevated serum bile acids (sBAs) and severe pruritus. This case series reports the effects of treatment with the ileal bile acid transporter inhibitor odevixibat in children with PFIC10.

![Figure: (abstract: THU-336).](S1002)
Method: This was a retrospective analysis of 5 children with a diagnosis of MYOSB-related PFIC and pruritus refractory to standard treatment who were treated with odevixibat. Anonymised clinical and laboratory data collected at least quarterly were analysed, including anthropometrics, liver function tests, and treatment history. Pruritus and sleep disturbances were rated on a 4-point Likert scale (absent, mild, moderate, or severe).

Results: Odevixibat treatment (40–120 µg/kg/day) was started between 2 and 10 years of age. In the year before starting odevixibat, all patients presented with moderate to severe pruritus despite treatment with rifampicin and ursodeoxycholic acid. Four patients had sleep disturbances. Patient 4 had a history of microvillus inclusion disease and was enterally fed. In the year prior to initiating odevixibat, sBA levels were >150 µmol/L in all patients; total bilirubin levels were >25 µmol/L in 4 patients and <5 µmol/L in Patient 5. In the 3 months after starting odevixibat, sBA levels decreased dramatically (Figure). By 6 months, all patients achieved sBA levels <10 µmol/L and total bilirubin fell to <15 µmol/L. sBA levels remained mostly <10 µmol/L throughout the treatment period (up to 20 months) in 4 patients (Figure). In Patients 3 and 5, compliance and access to treatment were limited, which may explain the fluctuations in sBA levels observed. Pruritus and sleep disturbances improved in the first 3 months and disappeared completely on treatment in all patients (dose increases to 45 µg/kg/day and 65 µg/kg/day were required in Patient 5). In Patients 1 and 3, odevixibat treatment was discontinued following an episode of gastroenteritis associated with a positive test for adenovirus or enteropathogenic Escherichia coli. Patient 3 subsequently resumed full-dose odevixibat after 6 weeks of suspension or reduced dosing. Digestive tolerability of odevixibat was good; no new or worsening gastrointestinal symptoms were observed in any child.

Conclusion: Odevixibat treatment in patients with PFIC10 led to a rapid and sustained resolution of pruritus and a significant decrease in or normalisation of sBA levels, supporting the effectiveness of odevixibat. Treatment with odevixibat should be further evaluated in patients with PFIC associated with MYOSB gene mutations.

THU-377
Alkaline phosphatase on admission to the intensive care unit as a new early prognostic biomarker for the development of COVID-19-associated secondary sclerosing cholangitis
Lea Aratari1, Lea Krauß1, Vlad Pavel1, Alexander Mehr1, Arne Kandulski1, Karsten Guelow1, Martina Mueller-Schilling1, Stephan Schmid1,2
1University Hospital Regensburg, Department of Internal Medicine I, Gastroenterology, Hepatology, Endocrinology, Infectious Diseases and Rheumatology, Regensburg, Germany
Email: stephan.schmid@ukr.de

Background and aims: In COVID-19, hepatic involvement occurs in up to 53% of patients. Secondary sclerosing cholangitis in critically ill patients (SSC-CIP) is of great importance in the management of critically diseased patients with COVID-19 in the intensive care unit (ICU). In COVID-19 disease cases with SSC-COVID-19-associated SSC-occurrence. Early detection of this disease and endoscopic treatment is crucial. Therefore, the aim of our study was to identify new and early prognostic biomarkers for developing COVID-19-associated SSC.

Method: 258 patients hospitalized in the ICUs of the University Hospital of Regensburg were analyzed retrospectively. Various clinical, laboratory and intensive care parameters were recorded from the electronic documentation systems. For statistical analyses, IBM SPSS Statistics was used. Receiver operating characteristic (ROC) analysis was conducted, and the area under the curve (AUC) was calculated.

Results: 14 of the 258 patients (5.4%) developed COVID-19-associated SSC during hospitalization in the ICU 9 of the 14 patients had a high positive end-expiratory pressure (PEEP >10) and were in prone position. In the 9 patients with COVID-19-associated SSC who received Extracorporeal membrane oxygenation (ECMO) therapy, the average duration of ECMO treatment was 55 days. 3 of the 14 patients had a medical history of preexisting liver disease. 8 of the 14 patients survived the hospitalization at the ICU. In the ROC analysis, there was a significant (p = 0.004) association between a longer duration of ECMO therapy and the development of SSC. Of note, elevated values of the alkaline phosphatase on admission to the ICU correlated significantly (p = 0.004) with the development of COVID-19-associated SSC in the ROC analysis. The area under the curve (AUC) was 0.731.

Conclusion: Elevated alkaline phosphatase on admission was identified as a novel and early prognostic biomarker for the development of COVID-19-associated SSC. Our findings allow optimization of intensive care therapy to reduce the risk of developing COVID-19-associated SSC and early initiation of endoscopic treatment.

THU-378
Outcomes in adult patients with progressive familial intrahepatic cholestasis treated with odevixibat: subgroup analysis from the PEDFIC 2 study
Bertrand Roquelaure1, Henkjan J. Verkade2, Kathleen M. Loomes3, Janis M. Stoll4, Christine Clemson5, Tao Gu6, Jan Mattsson7, Philip Stein7,8, CHU Hospital de la Timone, Marseille, France;
9Department of Paediatrics, University of Groningen, Beatrix Children’s Hospital/University Medical Centre Groningen, Groningen, Netherlands;
10Children’s Hospital of Philadelphia, Philadelphia, PA, United States;
11Department of Paediatrics, Washington University School of Medicine, St. Louis, MO, United States; 12Albireo Pharma, Inc., Boston, MA, United States
Email: bertrand.roquelaure@ap-hm.fr

Background and aims: Progressive familial intrahepatic cholestasis (PFIC) is a group of rare genetic liver diseases characterized by cholestasis, pruritus, and progressive liver damage. Symptoms of PFIC typically present in infancy and often progress to end-stage liver disease by early adolescence; however, in some patients, symptom onset may not occur until adulthood. The safety and efficacy of odevixibat, an ileal bile acid transporter inhibitor, was evaluated in patients with PFIC in the phase 3 PEDFIC 1 and PEDFIC 2 studies. To improve our understanding of the effects of odevixibat treatment in adult patients with PFIC, we examined the efficacy and safety of odevixibat in adult patients from PEDFIC 2.

Method: PEDFIC 2 is an ongoing, 72 week, open-label extension study in patients of any age with any type of PFIC; all patients receive odevixibat 120 µg/kg once daily. This analysis includes all adult patients enrolled in PEDFIC 2 and spans from patients’ first dose of odevixibat to a data cut-off of 31 January 2022. The following parameters were evaluated: patient-reported pruritus scores (range, 0–4; higher scores indicate worse symptoms), serum bile acid (sBA) levels, hepatic parameters (total bilirubin and alanine aminotransferase [ALT] levels), and treatment-emergent adverse events (TEAEs).

Results: Overall, 5 adult patients with PFIC (mean [range] age, 23.3 [19.5–26] years; 40% female) had enrolled in PEDFIC 2. At baseline, all patients had elevated sBAs and moderate-to-severe pruritus. Of these 5 adult patients, 3 had PFIC1 and 2 had PFIC2. Mean (range) exposure to odevixibat was 36 (24–65) weeks. At the data cut-off, 4 patients were ongoing in the study and 1 patient discontinued the study due to patient withdrawal of consent. From baseline to last assessment, sBA levels varied over time in some patients, but several patients had...
reductions in sBA levels, pruritus scores, total bilirubin levels, and/or ALT (Figure). Three of the 5 patients (60%) had at least 1 TEAE; most were mild to moderate in severity. Two patients experienced a serious TEAE; 1 patient had streptococcal septic arthritis and another patient with a history of pancreatitis experienced acute pancreatitis. None of the TEAEs were considered drug related, and no patient discontinued due to TEAEs.

**Conclusion:** Several adult patients with PFIC enrolled in the ongoing PEDFIC 2 study have experienced clinical benefits with odevixibat, including reductions in sBAs, pruritus, and/or improvements in hepatic parameters. Odevixibat was generally well tolerated in this adult population.

**THU-379**

**Association of liver injury and prognosis in patients with severe fever with thrombocytopenia syndrome**

Rui Huang1,2,3, Jian Wang1,2, Huali Wang1, Qun Zhang1, Zhiyi Zhang1, Shaoqiu Zhang1, Yifan Pan6, Bei Jia3, Xiaomin Yan1, Jie Li1,2,3, Chao Wu1,2,3. 1Department of Infectious Diseases, Nanjing Drum Tower Hospital, The Affiliated Hospital of Nanjing University Medical School, China; 2Institute of Viruses and Infectious Diseases, Nanjing University, China; 3Department of Infectious Diseases, Nanjing Drum Tower Hospital Clinical College of Traditional Chinese and Western Medicine, China; 4Department of General Practice, Nanjing Second Hospital, Nanjing University of Chinese Medicine, China; 5Department of Infectious Diseases, Affiliated Zhongda Hospital of Southeast University, China; 6Department of Infectious Diseases, Nanjing Drum Tower Hospital Clinical College of Nanjing Medical University, China

Background and aims: Severe fever with thrombocytopenia syndrome (SFTS) is an epidemic emerging infectious disease caused by a novel bunyavirus with high mortality rate (up to 50%). Liver injury have been reported as a common complication of SFTS patients. However, the prevalence of liver injury related to this disease and its clinical significance is not well characterized.

**Method:** Two hundred and ninety-one hospitalized SFTS patients were retrospectively included from three hospitals in China between October 2010 and August 2022. Presence of at least one of the
following conditions would be diagnosed as liver injury: alanine transaminase (ALT) or aspartate aminotransferase (AST) more than 3 upper limit of normal (ULN), or alkaline phosphatase (ALP) or total bilirubin (Tbil) more than 2 ULN.

Results: The median age of patients was 63.0 years and male accounted for 51.9%. A total of 65 (22.3%) patients were deceased. 60.1% of patients had liver injury, and the median levels of ALT, AST, ALP, and Tbil at admission were 76.4 U/L, 152.3 U/L, 69.8 U/L, and 9.9 μmol/L, respectively. Compared to survivors, non-survivors had higher levels of AST (253.0 U/L vs. 131.1 U/L, p < 0.001) and ALP (86.2 U/L vs. 67.9 U/L, p = 0.006), higher proportion of the elevated ALT (20.0% vs. 4.4%, p < 0.001) and liver injury (78.5% vs. 54.9%, p = 0.001) at admission. There were increasing trend of ALT, AST, and ALP in non-survivors, while survivors had stable or decrease trend of these parameters during hospitalization. The presence of liver injury (HR 2.015, 95% CI 1.053–3.848, p = 0.034) at admission was an independent risk factor of fatal outcome. Patients with liver injury had significant lower cumulative survival probability than patients without liver injury (p = 0.003).

Conclusion: Liver injury was common in patients with SFTS. The presence of liver injury is strongly associated with poor prognosis in patients with SFTS, indicating that liver injury indicators should be monitored during hospitalization.

THU-380
State of knowledge of alpha 1 anti-trypsin deficiency among practitioners specialized in liver transplantation in France: a national survey
Manon Evain1, Ilas Kounis1, Jérôme Dumortier2, Sebastien Dharancy3, Faouzi Saliba4, Audrey Coilly1. 1Hôpital Paul-Brousse Ap-Hp, Villejuif, France; 2Edouard Herriot Hospital, Lyon, France; 3Hospital Claude Huriez, Lille, France
Email: manon.evain@hotmail.fr

Background and aims: Alpha-1 antitrypsin deficiency (AATD) is one of the most common genetic diseases in Europe with a prevalence of heterozygosity of 1.6%. Although it is also responsible for liver damage leading to end stage liver diseases, AATD is not always diagnosed, even in the most severe patients who are candidates for liver transplantation (LT). Considering the recent advances in potential treatment and the understanding of AATD involvement in progression of liver diseases, we aimed to investigate the level of knowledge on AATD and the current practices of liver transplant physicians in France.

Method: A practice survey of 22 multiple-choice questions in the form of a questionnaire created and distributed via GoogleForm was sent by e-mail to the members of the French think tank in LT, GREF2. Adherence to the survey was 54%, including 89% hepatologists, 7.5% liver surgeons and 3.5% anesthesiologists. 81% of practitioners rated their level of knowledge as very low, low, or average, and only 22% answered the question of disease prevalence correctly. Half of the responders had >15 years of experience in high-volume LT centers. Only 57% of practitioners routinely performed AATD screening before LT. AAT dosage was used in 97% of cases for the screening but 47% knew that it is decreased by hepatocellular insufficiency and 20% by pregnancy. Only 47% knew that heterozygosity status could be a cofactor of liver disease progression. Furthermore, 62% of practitioners with <5 years of experience considered their level of knowledge to be low but systematically screened before LT in 75% of cases compared to 44% for practitioners with between 5 and 15 years of experience and 61% for practitioners with >15 years.

Conclusion: AATD is a poorly known disease among LT practitioners in France. A better knowledge of screening methods, diagnosis and treatment of the disease would allow a better management of the patients and their relatives.

THU-381
Symptom severity measured by polycystic liver disease-specific questionnaire score partly correlates with both total number of liver cysts and the presence of dominant cysts
Avisnata Das1, Benjamin Giles1, Ageel Jamil1, Joanna Dowman1, Andrew Fowell1, Richard Aspinall1. 1Portsmouth Liver Centre, Portsmouth, United Kingdom
Email: avisnata@gmail.com

Background and aims: The polycystic liver disease-specific questionnaire (PLD-Q) has been found to be useful in assessing severity of Polycystic Liver Disease (PLD) related symptoms. The PLD-Q score (from 0 to 100) is based on this questionnaire with higher scores indicating more severe symptoms. PLD-Q score has shown some correlation with PLD disease-severity stage (using Gigot’s classification) but not liver volume. Scarce literature exists correlating PLD-Q scores with Qian’s Grade of PLD and number of dominant cysts. Here we report variations in PLD-Q scores across Qian’s grades 2 to 4 and in patients with varying numbers of dominant cysts.

Method: We evaluated PLD-Q scores in a cohort of 39 fully phenotyped PLD patients in a single centre. Patients had 11 or more liver cysts either as isolated PLD or in conjunction with Polycystic Kidney Disease. We studied PLD-Q scores in three different PLD patient groups classified as per Qian’s classification-Grade 2 (11–20 cysts), Grade 3 (>20 cysts) and Grade 4 (>20 cysts with symptomatic hepatomegaly). We also looked at PLD-Q scores in three different patient groups according to number of dominant cysts (size >8 cm) with either zero dominant cyst, 1–2 dominant cysts and 3 or more dominant cysts. Cysts were radiologically evaluated using either CT/MRI/Ultrasound scan within 1-year prior to submission of PLD-Q score.

Results: In 7 patients with Qian’s Grade 2 disease, the PLD-Q score ranged from 17 to 68 with a mean of 34.7 and median of 33. In 22 Grade 3 patients, PLD-Q score ranged from 6 to 76 with a mean of 32.5 and median of 35. In 10 patients with Grade 4 disease, PLD-Q scores ranged from 31 to 83 with a median of 47 and median of 42.5. However, there was no statistically significant difference between the distributed means of PLD-Q scores within these three groups. (Independent sample t-test, 95% CI). Out of 38 PLD patients with radiologically calculated dominant cyst numbers, 26 had zero dominant cysts (Group A), 10 had 1–2 dominant cysts (Group B) while the remaining two had 3 dominant cysts each (Group C). The mean PLD-Q scores in Groups A, B and C were 36, 44.6 and 33.5.
respectively while the median scores were 35, 42.5 and 33.5 respectively. No statistically significant difference exists between the distributed means of PLD-Q scores within these groups.

**Conclusion:** Qian’s Grade 4 patients had the highest median PLD-Q score and highest-recorded score of 83 among all grades. Median PLD-score of Grade 3 exceeded that of Grade 2. Patients with 1–2 dominant cysts had the highest mean and median PLD-Q score, suggesting a greater impact on quality of life and supporting targeted intervention. However, there was no statistically significant difference in distributed means of PLD-Q scores between any two groups within the three different Qian’s Grade groups or between any two groups within the three dominant cyst numbers-based groups.

**THU-382**
**Online education yields significant gains in gastroenterologists’ knowledge of clinical manifestations of Wilson disease**
Sukhbir Bahra1, Adriana Stan1, Marinella Calle1, Maya Khalaf1, Gill Adair1, Karl Heinz Weiss2. 1Medscape, Education, Netherlands; 2Krankenhaus Salem der Evang. Stadtmmission Heidelberg, Germany

**Background and aims:** WD is a rare disorder in which excessive amounts of copper accumulate in the body, particularly in the liver, brain, and eyes. We developed an online continuing medical education (CME) activity titled: “Wilson Disease: The Great Masquerader.” We hypothesized that participation in this online CME education would lead to improved recognition of the different clinical manifestations of WD.

**Method:** An online 45 minute video CME activity (www.medscape.org/viewarticle/976141) consisting of a series of 6 expert commentaries was developed. Educational effect was assessed using a repeated-pair design with pre-/post-assessment (3 knowledge questions and 1 confidence question). A paired samples t-test was conducted for significance testing on overall average number of correct responses and for confidence rating, and a McNemar’s test was conducted at the question level (5% significance level). Cohen’s d with correction for paired samples estimated the effect size of the education (<0.20 modest, 0.20–0.49 small, 0.59–0.79 moderate, ≥0.80 large). Data were collected from 6/30/2022 to 9/30/2022.

**Results:** A total of 465 gastroenterologists outside US participated, of whom 55 completed all the pre-/post-activity questions. Overall 64% improved their knowledge related to the copper metabolism, clinical manifestations of WD and diagnostic strategies for WD (p < 0.001) indicating a considerable effect of the education (Cohen’s d = 0.85). 4 times more physicians answered all questions correctly after education (9% pre, 47% post). 62% of gastroenterologists had a measurable increase in their confidence in their ability to recognize manifestations of WD in clinical practice.

**Conclusion:** This online CME activity significantly improved gastroenterologists’ knowledge of the clinical manifestations of WD and strategies for timely diagnosis of WD in clinical practice.

**THU-383**
**Progressive familial intrahepatic cholestasis: KFSH and RC**
Faisal Abaalkhail1, Fahad Alsohaibani1, Musthafa Peedikayil1, Muath Najmi1. 1King Faisal Specialist Hospital and research center, Saudi Arabia

**Background and aims:** Progressive Familial intrahepatic cholestasis (PFIC) is a rare genetic disorder that results from defective mechanisms of bile secretion. There have been no studies describing...
PFIC in Saudi Arabia, Aim: to describe the different types of PFIC and their clinical features, treatment modalities and the outcome in Saudi Arabia.

Method: This is a retrospective study of all patients diagnosed with PFIC at the King Faisal Specialist Hospital and Research Centre in Riyadh from January 1, 2002 to December 31, 2020. All relevant information was

Results: 83 patients were identified with PFIC and type 3 was the commonest (59%), followed by type 2 (37.4%), type 1 (2.4%) and type 4 (1.2%). Males and females were affected equally. Mutation in ATP8B1, ABCB11 and ABCB4 genes were observed in 50% of PFIC type 1, 96% of type 2 and 93% of type 3, respectively. A total of 52 (63.4%) patients underwent liver transplantation; two patients with type 1 (100%), 22/30 (73.3%) with type 2, and 28/49 (57.1%) with type 3. Mean duration of disease before transplantation was 57 ± 71.3 months with a median of 30 months. Following liver transplantation, transplantation, symptomatic control was achieved in 49 patients (94.2%). Recurrence after transplant occurred in 5 (9.61%) patients within average of 41.5 months and a median of 17 months.

Conclusion: PFIC is considered a rare disorder in Saudi Arabia, however early recognition of this disease is important for appropriate management and early referral for liver transplantation evaluation. The overall rate of liver transplantation in our cohort was 63.4% with excellent five-year survival rate.

THU-384
Clinical picture of acute hepatitis in children-single center observations
Anna Mania1, Paweł Malecki1, Katarzyna Mazur-Melewska1, Magdalena Figlerowicz1. 1Poznan University of Medical Sciences, Department of Infectious Diseases and Child Neurology, Poznan, Poland Email: maniaanna@hotmail.com

Background and aims: The aim of the study was to analyze the clinical course and outcome of acute hepatitis in children considering new emerging viral agents.

Method: The study included all children with acute hepatitis admitted to tertiary care centers between 11.10.2021 and 30.11.2022. Clinical data were analysed including potential etiology, clinical and laboratory and imaging tests.

Results: The study included 36 children admitted to the tertiary care center due to acute hepatitis in analysed period. Median (M) age was 13 years (range 3 months-18 years). The most common causing factor was Epstein-Barr virus (EBV) (13/36 cases-13%), autoimmune hepatitis was detected 5/36 children (14%), hemophagocytic lymphohistiocytosis in 3/36 children (8%). SARS-CoV2 infection 2/36 children. Children with EBV-related-hepatitis were older (Median age M = 16 years vs 10 years; p = 0.0001) had significantly lower aspartate aminotransferase activity (Median AST M = 121 IU/l) when compared to non-EBV induced hepatitis (Median AST M = 290 IU/l); p = 0.01. The majority of children recovered from the infection. One fatal case of unknown etiology was detected.

Conclusion: The most common cause of acute hepatitis was EBV infection of self-limiting course. Certain proportion of patients suffered from life-threatening conditions.

THU-385
Differences in the rates of liver-related clinical events in paediatric patients with alpha-1 antitrypsin deficiency-associated liver disease in the United States
May Hagiwara1, Victoria Divino2, Swapna Munnangi2, Mark Delegge2, Suna Park1, Ed G. Marins1, Kaili Ren1, Charlton Strange3. 1Takeda Development Center Americas, Inc., Cambridge, MA, USA, United States; 2IQVIA Inc., Falls Church, VA, USA, United States; 3Medical University of South Carolina, Charleston, SC, USA, United States Email: ed.marins@takeda.com

Figure: (abstract: THU-384): Aspartate aminotransferase activity in EBV and non-EBV-related hepatitis.
Background and aims: Protease inhibitor (Pi) ZZ genotypes are associated with alpha-1 antitrypsin deficiency (AATD), which affects ~1 per 3000–5000 people in the USA. AATD is characterized by low levels of serum alpha-1 antitrypsin (AAT) and accumulation of misfolded AAT in hepatocytes, which can lead to liver disease in paediatric patients. The burden of liver-related clinical events among paediatric patients with AATD-associated liver disease was investigated by age group using large US claims and Ambulatory Electronic Medical Records (AEMR) databases.

Method: This was a retrospective analysis of administrative claims data from the IQVIA PharMetrics® Plus database linked to the IQVIA AEMR database (selection period: January 2012 to October 2021). PharMetrics Plus comprised 142 million enrollees with medical and pharmacy benefits and ≥ 1-month enrolment during the selection period. Inclusion criteria were: (1) at least one inpatient or at least two outpatient medical claims ≥ 90 days apart with a diagnosis of AATD in PharMetrics Plus, or (2) with a PiZZ/PiMZ genotype in AEMR and with linkage to PharMetrics Plus; (3) a liver disease diagnosis. A person-time approach was used to maximize the use of data. Liver-related clinical events of interest (identified by International Classification of Diseases-Ninth/Tenth Revision codes) included liver transplantation, ascites, gastrointestinal bleeds, spontaneous bacterial peritonitis, hepatocellular carcinoma and hepatic encephalopathy. These were evaluated separately and as a composite (defined as the occurrence of ≥ 1 of the six clinical events), and reported for the overall paediatric population and by age group (< 1, 1–5, and 6–17 years).

Results: In total, 123 patients met the eligibility criteria, of whom 41, 24, and 58 were aged < 1, 1–5, and 6–17 years, respectively. Median age was 5 years, 60% were male, and the median duration of observation was 31.5 months. Clinical event rates per person-year (PPY) by age group for the liver-related events are shown in Figure 1. Among patients aged < 1, 1–5, and 6–17 years, event rates were 0.07, 0.08, and 0.01 PPY for ascites, 0.03, 0.10, and 0.04 PPY for hepatic encephalopathy, 0.04, 0.08, and 0.02 PPY for gastrointestinal bleeds and 0.02, 0.06, and 0 PPY for liver transplant.

Conclusion: Liver-related clinical event rates were generally similar between paediatric patients with AATD-associated liver disease aged < 1 year and 1–5 years. In all age groups, ascites, gastrointestinal bleeds, and hepatic encephalopathy were more common than spontaneous bacterial peritonitis and hepatocellular carcinoma. Liver transplantation was more common in paediatric patients aged 1–5 years than in patients aged < 1 year and did not occur in patients aged 6–17 years. Among the study patients, no confirmed PiZZ/PiMZ genotype was identified.

Acknowledgments Writing assistance was provided by Elena Sugrue, PhD, of Oxford PharmaGenesis, Oxford, UK and funded by Takeda Development Center Americas, Inc.

Funding: This study was funded by Takeda Development Center Americas, Inc.

THU-386 Understanding the experience of patients with alpha-1 antitrypsin deficiency (AATD)-associated liver disease

Virginia Clark1,2, Suna Park1,2, Robert Krupnick4, Nicole Sparling6, Jason Ritchie5, Chitra Karki3, Justin Reynolds6. 1University of Florida, Gainesville, FL, United States; 2University of Florida, Gainesville, United States; 3University of Florida, Gainesville, Florida, United States; 4University of Florida, Gainesville, United States; 5Takeda Pharmaceuticals USA, Inc, Cambridge, MA, United States; 6IQVIA Patient Centered Solutions, Boston, MA, United States; 7IQVIA Patient Centred Solutions, New York, NY, United States; 8University of Florida, Gainesville, FL, United States; 9St. Joseph Hospital Medical Center, Phoenix, AZ, Creighton University School of Medicine, Phoenix, AZ, United States

Email: virginia.clark@medicine.ufl.edu

Background and aims: Alpha-1 antitrypsin deficiency (AATD) is a genetic disease that affects ~3.4 million people worldwide and manifests clinically as lung and/or liver disease. This study aimed to elicit characteristics of disease signs, symptoms, and impacts from patient interviews, and inform appropriate selection of clinical outcome assessments.
Method: One-to-one telephone interviews involving English-speaking, US adults with AATD-associated liver disease (AATD-LD), with a protease inhibitor (Pi) ZZ or MZ genotype, and without liver cancer were conducted by trained interviewers following a central Institutional Review Board-approved discussion guide. Confirmation of diagnosis was collected for all patients. A preliminary ‘concept list’ of disease signs, symptoms, and impacts was used to guide the patient interviews and was developed from a targeted literature review, patient blog searches, and clinician interviews with two gastroenterologists, two pulmonologists, and one hepatologist. A conceptual model of AATD-LD was developed based on the findings. Symptoms and impacts of AATD-LD were considered most salient/highly salient if reported by \( \geq 50\% / \geq 40\% \) of patients with a mean bothersomeness/disturbance rating of \( \geq 5 \). Concepts in italics were ‘highly salient’, defined as being reported by \( \geq 40\% \) of patients and with a mean bothersomeness/disturbance rating of \( \geq 5 \).

AATD, alpha-1 antitrypsin deficiency; AATD-LD, alpha-1 antitrypsin deficiency-associated liver disease; META VIR, Meta-analysis of Histological Data in Viral Hepatitis; Pi, protease inhibitor.

Conclusion: To our knowledge, this is the first qualitative study of the experience of patients with AATD-LD. Although experiences varied, several concepts were frequently reported and characterized as moderately/highly bothersome/disturbing, even in patients with

\[ \text{METAVIR stages: F2 (n = 6), F3 (n = 1), and F4 (n = 8). Eight patients had liver and lung disease; seven had liver disease only. Median time since AATD diagnosis was 12 years. Four patients had received a transplant (liver, n = 3; lung, n = 1). Of the 41 symptoms reported, the most salient were fatigue/tiredness (n = 14), respiratory infections (n = 10), shortness of breath (n = 10), confusion/difficulty concentrating (n = 8), and edema (n = 8; Figure 1). Highly salient symptoms were abdominal swelling (n = 7), acid reflux (n = 7), sleep disturbance (n = 7), vomiting (n = 7), abdominal pain/tenderness (n = 6), itchiness (n = 6), and back pain (n = 6). The most salient impacts were on work and employment, leisure activities, and relationships. Impacts on mobility (n = 6) were highly salient. Overall, emotional impacts were relatively disturbing (mean disturbance rating: 6.3), but each individual impact was reported by few patients.} \]
earlier fibrosis stages which are presumed to be asymptomatic. Clinical outcome assessments that can capture salient concepts are needed to assess the nuances of each patient’s experience.

Acknowledgments: Writing assistance was provided by Matthew Reynolds of Oxford PharmaGenesis, Oxford, UK and funded by Takeda Development Center Americas, Inc.

Funding: This study was funded by Takeda Development Center Americas, Inc.

THU-387
Acute liver failure due neonatal hemochromatosis: case with fatal outcome despite early diagnosis and treatment
Liudmyla Shostakovich-Koretska¹, Viktor Mavrutenkov¹, Tetyana Mavropulo². ªDnipro State Medical University, Infectious Diseases, Dnipro, Ukraine; ºDnipro State Medical University, Neonatological, Dnipro, Ukraine
Email: vvmavr@gmail.com

Background and aims: Neonatal hemochromatosis is a very rare, often fatal, iron metabolism disorder in newborns, which is characterized by iron overload of the liver and the development of antenatal acute liver failure. Neonatal hemochromatosis differs from hereditary, although both diseases have similar disorders of iron metabolism. Hereditary hemochromatosis is an autosomal recessive disease while Neonatal hemochromatosis is gestational alloimmune liver disease. The purpose of this study was to show the need to consider the possibility of hemochromatosis diagnosis in all cases of neonatal liver injury.

Method: A descriptive analysis of the features of the presentation and differential diagnosis of neonatal hemochromatosis that developed within the first day after the birth of a child using a wide range of diagnostics and modern approaches to treatment.

Results: The patient (girl) was born from the 2nd pregnancy, 38 weeks of gestation, weight 3500 g, length 55 cm, Apgar score 8 points. The first pregnancy ended in a spontaneous abortion. The girl was on a joint stay with her mother for 13 hours. Then the newborn suddenly had respiratory arrest, cardiac depression, convulsions. In the intensive care unit, the child had signs of acute liver failure with severe jaundice, hepatosplenomegaly, hemorrhagic, hepatorenal syndrome. Laboratory investigation revealed anemia, leukocytosis, thrombocytopenia, hypoglycemia, hypoalbuminemia, moderate increase transaminases, hyperbilirubinemia 343 mg/dl with the predominance of the direct fraction, severe coagulopathy. There were no data on the incompatibility of maternal and fetal blood types. Differential diagnostics was carried out with viral hepatitis, neonatal hepatitis, herpesvirus, congenital pathology of the biliary system, neonatal sepsis. Plasma Ferritin level 6713 ng/ml was very high compare with the normal level. A high level of ferritin was also confirmed during a second study which, after excluding other causes, made it possible to suspect neonatal hemochromatosis. An liver biopsy revealed giant cell transformation of hepatocytes without specific inclusions. The therapy included antibiotics, fresh frozen plasma, albumin, exchange transfusion session followed by intravenous immunoglobulin. After the therapeutic measures the child’s condition showed a short-term improvement, but Ferritin level remained high and the subsequent deterioration was accompanied by the progression of multiple organ disorders, which led to the child death at the age of 40 days. Autopsy revealed hepatosplenomegaly, severe jaundice and hemorrhagic syndrome. Histopathology revealed pathognomonic inclusions of hemosiderin in the liver, kidneys and lungs.

Conclusion: Due to the non-specificity of the first symptoms, neonatal hemochromatosis seems to be one of the most difficult for the differential diagnosis of diseases of the neonatal period. According to reports in one third of cases, mothers have a history of miscarriages with an unknown cause of death. In the presented case, a previous pregnancy ended with spontaneous abortion, which may also be related to these mechanisms. In the reported case, the disease manifested itself in the first hours after birth with rapid progression to fatal liver failure. In real practice, it is necessary to include neonatal hemochromatosis in the differential diagnosis in all cases of severe liver damage, any cases of spontaneous abortion, stillbirth or early postnatal death.
THU-388
Trans-jugular intrahepatic Porto-systemic shunt for Budd Chiari syndrome: single center experience
Amnah Alhanaee1,2, Hamad Alsuhaibani3, Faisal Joueidi4, Ali Albenmousa1, Ahmad Elhassan4, Abdullah asi4, Ahmed Joueidi4, Saad Alghamdi1, Waleed Alhamoudi1, Saad Albuahannami1, Dieter Clemens Broering1, Khalid Bzeizi1. 1King Faisal Specialist Hospital and Research Centre, Riyadh, Saudi Arabia; 2Tawam Hospital, Abu Dhabi, United Arab Emirates; 3AlFaisal University, Riyadh, Saudi Arabia; 4Faisal University, Riyadh, Saudi Arabia
Email: amnahalhanaee@gmail.com

Background and aims: Budd-Chiari syndrome (BCS) is a rare and life-threatening disorder secondary to hepatic venous outflow obstruction. It has a significant mortality rate if untreated. The management differs depending on the clinic presentation and usually follows a step-wise approach. Anticoagulation medication may be the only option, however interventional radiology procedures such as the trans-jugular intrahepatic portosystemic shunt (TIPS) and, if necessary, liver transplantation are lately widely applied. TIPS is regarded a relatively safe and effective treatment. We aimed to evaluate the feasibility and safety of TIPS in the management of BCS in Saudi Arabia

Method: All BCS patients presented to King Faisal Specialist hospital and Research Center and had TIPS during the period January 2010 and November 2022 were included in the analysis. The Aetiology, clinical presentation, laboratory and radiological parameters were all included. All patients underwent surveillance for hepatocellular carcinoma.

Results: A total of 71 patients, mostly females (63.3%) were included in the analysis. The mean age at the onset of symptoms was 38 years (range 19–69 years). Abdominal pain and jaundice were the most common presentations (87.3%). Proteins C and S deficiencies were found in 14 patients (19.7%) and Anti Phospholipid Syndrome in 13 patients (18.2%). The mean MELD score was 19 (range: 8–36) and most patients had Child-Pugh score ≥B (56.3%). BCS confirmation was made by doppler ultrasonography and cross-sectional abdominal imaging in all patients. All patients received anticoagulants pre and post TIPS. None of the patient died post TIPSS. TIPSS revision was performed on 47 patients (52.8%) and 6 patients (12.7) had more than 10 revisions.

Conclusion: TIPS is an effective modality of treatment for this uncommon condition. Morbidity due to TIPSS failure was relatively low in our cohort. TIPSS occlusion and the need for repeat revisions was the main limitation.

THU-389
The ancestral haplotype HLA-A3 does not influence the likelihood of advanced hepatic fibrosis or cirrhosis in C282Y homozygous haemochromatosis
John Olynyk1,2,3,4, Louise Ramm5, Richard Grainger5, Helen Currie5, Grant Ramm5, 1Edith Cowan University, Medical and Health Sciences, Joondalup, Australia; 2Fiona Stanley Hospital, Murdoch, Australia; 3Curtin University, Bentley, Australia; 4Curtin University, Medicine, Bentley, Australia; 5QIMR Berghofer Medical Research Institute, Herston, Australia
Email: john.olynyk@health.wa.gov.au

Background and aims: Advanced hepatic fibrosis occurs in up to 25% of individuals with C282Y homozygous haemochromatosis as a result of progressive iron overload. The aim of the current study was to determine whether human leukocyte antigen (HLA)-A3 haplotypes act as genetic modifiers of the likelihood of advanced hepatic fibrosis.

Method: Between 1972 and 2013 291 HFE C282Y homozygous individuals underwent clinical and biochemical evaluation, liver biopsy for fibrosis staging and phlebotomy treatment. Of these 133 also underwent HLA typing. Hepatic fibrosis was graded using the system of Scheuer as F0-2 (low grade fibrosis), F3-4 (advanced hepatic fibrosis), and F4 cirrhosis. We analysed the association between the severity of fibrosis and HLA-A3 homozygosity, HLA-A3 heterozygosity or absent HLA-A3 haplotype using categorical analysis.

Results: The mean age of HLA-A3 homozygotes (15 male, 9 female), heterozygotes (43 male, 22 female) and HLA-A3 null individuals (34 male, 10 female) was 40 years. There were no significant differences between the groups for mean (± SEM) serum ferritin levels (1320 ± 296, 1217 ± 124, 1348 ± 188ug/L), hepatic iron concentration (178 ± 26, 213 ± 22, 199 ± 29umol/g), mobilizable iron stores (9.9 ± 1.5, 9.5 ± 1.5, 11.5 ± 1.7 g iron removed via phlebotomy), frequency of advanced hepatic fibrosis (5/24 [21%], 13/63 [21%], 10/42 [24%], p = 0.751) or cirrhosis (3/24 [21%], 12/63 [21%], 4/42 [24%], p = 0.922), respectively.

Conclusion: HLA-A3 is not associated with the risk of liver biopsy-proven advanced hepatic fibrosis or cirrhosis in HFE C282Y homozygous haemochromatosis.

THU-390
Demographics, outcomes, and costs of Wilson’s disease hospitalizations: a nationwide cohort study
Ankoor Patel1, Matthew Pelton1, Carlos Minacapelli2, Carolyn Catalano2, Vinod Rustgi2, 1Rutgers-Robert Wood Johnson Medical School, Medicine, United States; 2Rutgers-Robert Wood Johnson Medical School, Gastroenterology and Hepatology, United States
Email: ahp60@rwjms.rutgers.edu

Background and aims: Wilson’s disease (WD) is a rare, autosomal recessive disorder. Current treatment is focused on chelators and copper antagonists. Data on hospitalization, outcomes, and costs in patients with WD are scarce Using the National Inpatient Sample (NIS) we studied evaluated mortality, length of stay (LOS), and costs among patients with Wilson’s Disease in the USA.

Method: We performed a retrospective cohort study using the National Inpatient Sample (NIS) from 2007 to 2017. Wilson’s Disease patients were identified using ICD-9/10 codes. Mortality, LOS and costs were primary outcomes A Charlson Comorbidity Index (CCI) score was calculated for each participant using admission records.

Results: Of the 16,950 WD hospitalizations included, a majority were female (57.01%). Liver failure was diagnosed in 4.93%. The prevalence of depression was 2.01%. The mortality rate and mean LOS were 2.49% and 4.81 days, respectively. The average cost of hospitalization was $33,483; however, total charges ranged from $696 to $1,673,546. The number of hospitalizations with a primary diagnosis of WD peaked in 2010 followed by a gradual decrease in number of hospitalizations between 2011 and 2016.

Conclusion: Our study shows clinical characteristics and outcomes of patients with Wilson’s Disease in the USA from an inpatient healthcare database. The risk of liver failure was low. Patients with WD are responsible for significant healthcare cost burden with a wide variation likely due to orthotopic liver transplant.
THU-391
Proteomics for the study of biomarkers in Wilson’s disease
Li Li1, Jie Su1,1, Amina Abudzi1,1, Rui Hua1,1. 1The First Hospital of Jilin University, China
Email: huar@jlu.edu.cn

Background and aims: Wilson’s disease (WD), also known as hepatolenticular degeneration, is an autosomal recessive genetic disease caused by ATP7B gene mutation resulting in abnormal copper metabolism and corresponding organ damage. The clinical manifestations are complex and diverse, and genetic, gender, age and other factors make the diagnosis of the disease more difficult. The current diagnostic methods for WD still have some shortcomings: the determination of ceruloplasmin level, 24-hour urinary copper and hepatic copper is easily affected by other factors; Genetic testing is expensive. Therefore, it is particularly important to explore more sensitive and specific markers for the diagnosis of this disease. This study aims to use proteomics tools to search for potential markers of WD and provide diagnostic basis for WD.

Method: We used quantitative proteomics studies to reveal differentially expressed proteins (DEPs) between 20 WD subjects and 10 healthy controls. Then, we used gene ontology (GO), KEGG and other methods to enrich and cluster the differential proteins, so as to obtain more sensitive and specific markers for the diagnosis of WD.
Background and aims: Emphysematous pancreatitis (EP) is a rare, life-threatening complication of acute necrotizing pancreatitis. EP is associated with various forms of bacteria including gas-forming organisms such as Escherichia coli and Clostridium perfringens. An abdominal CT is the imaging of choice given its high sensitivity and specificity when gas is seen within or around the pancreatic parenchyma. We present a case of this rare condition that was successfully treated.

Method: A 64 year old male with a history of CAD, HFrEF, type 2 diabetes mellitus, peripheral vascular disease, hyperlipidemia, essential hypertension, and alcohol and tobacco use presented with one-day history of sudden onset, 5/10 sharp, epigastric abdominal pain that radiated to his back and which began after eating an omelet. The pain was worsened by inspiration. Associated symptoms included nausea and vomiting. He denied any fever, chills, constipation, diarrhea or any other symptoms. On exam, his temperature = 99.8o F, pulse = 119 bpm, Bp = 123/78 mm Hg, RR = 18 bpm, and SpO2 = 94% on room air. Abdominal exam was notable for a non-distended abdomen with normoactive bowel sounds. The abdomen was soft with epigastric tenderness to palpation: there was no guarding or rebound tenderness. Pertinent laboratory studies included: WBC = 7.43 × 109, lipase = 793 U/L, aspartate transaminase = 60 IU/L, alanine transaminase = 102 IU/L, and total bilirubin = 2.4 mg/dL. CT of the abdomen and pelvis with IV contrast showed interstitial edema with hypoenhancement throughout the pancreas and peripancreatic free fluid with gas surrounding the pancreas extending into the retroperitoneum. These findings were suggestive of either an acute gastric ulcer perforation, a fistula, or EP. The patient was admitted, kept n.p.o., and started on intravenous fluids and broad-spectrum antibiotics.

Results: Angiotensin, lysosome and TNF signaling pathways. A search of relevant literature found that cathepsin A (CTSA), intercellular adhesion molecule 1 (ICAM1), vascular cell adhesion molecule 1 (VCAM1) and matrix metalloproteinase 9 (MMP9) were significantly correlated with the onset of WD, which may be potential markers of WD.

Conclusion: We preliminarily found that CTSA, ICAM-1, VCAM1 and MMP9 could be used as potential markers of WD by proteomics, which still needs further study.

Figure: (abstract: THU-392).
negative (n = 7) and HBeAg positive (n = 7) serum HBsAg positive [log10 IU/ml 3.21 ± 1.09 >6 months] and serum HBV DNA [log10 IU/ml 4 ± 1.09]. Biotinylated DNA oligo complimentary to the single stranded region of HBV cccDNA was synthesized. The pull down assay was used to extract cccDNA together along with the binding proteins from both the HBeAg+ and HBeAg- patient’s liver tissues, further analysed by nano liquid chromatography coupled with mass spectrometry (nano LC/MS). HepG2.2.15 (with stably integrated HBV genome) was used for the in vitro knockdown studies. After 72 hours of knockdown, the cccDNA levels and the expression pgRNA and HBe and HBsAg proteins were measured by RT-qPCR and ELISA respectively.

Results: cccDNA and the bound proteins were subjected for proteomics analysis. Interestingly, in the HBeAg+, we found total 300 bound proteins significantly upregulated (≥2-fold) and 900 down-regulated (≤0.5-fold). [Cul4B, RACK1 (Receptor of activated protein C kinase 1), DDB2 (DNA damaging binding protein 2)] significantly upregulated (≥2-fold) and [repressor bound proteins DDx17, DDx5, METTL4 and PRDX1] (≤0.5-fold) were downregulated. We selected top three proteins for knockdown of DDB2, RACK1 and Cul4B using siRNAs in HepG2.2.15 cell lines.

Conclusion: We found cccDNA-bound proteomes correlated with viral load in different patient groups. DDB2, Cul4B and RACK1 were identified as novel nuclear cccDNA-bound proteins in high viral replicating group followed their validation by reduction of cccDNA levels by knockdown. This study provides new insights into the molecular status of cccDNA and potential antiviral targets and for the treatment prognosis of hepatitis B.

TOP-104
The TLR8 agonist Selgantolimod modulates Kupffer cell differentiation status and indirectly impairs HBV entry into hepatocytes via an IL-6-dependent mechanism
Armando Andres Roca Suarez1,2, Marie-Laure Plissonnier1,2, Xavier Grand1,2, Maud Michelet1,2, Guillaume Giraud1,2, Simon Fletcher3, Michel Rivoire4, Barbara Testoni1,2, Massimo Levrero1,2,5, Fabien Zoulim1,2,5, INSERM U1052, CNRS Umr-5286, Cancer Research Center of Lyon (CRCL), Lyon, France; 2University of Lyon, Université Claude-Bernard (UCBL), Lyon, France; 3Gilead Sciences Inc., 324 Lakeside Dr., Foster City, CA, 94404, United States; 4INSERM U1032, Centre Léon Bérard (CLB), Lyon, France; 5Hospices Civils de Lyon (HCL), Lyon, France
Email: fabien.zoulim@inserm.fr
Background and aims: Chronic HBV infection affects close to 300 million people worldwide and is one of the major etiologies for the development of cirrhosis and hepatocellular carcinoma. In spite of universal therapeutic options, HBV is still a global burden due to the limited therapeutic options available. Thus, achieving the goal of HBV cure will require a continuous effort in the development of new molecules and combination therapies. In this regard, the TLR8 agonist Selgantolimod (SLGN) has shown promising results during its clinical evaluation as an immunomodulatory agent against HBV. Although the effect of SLGN has been explored in the peripheral immune compartment, little is known regarding its intrahepatic response. Therefore, we aimed to characterize the transcriptional changes and intercellular communication events associated with the action of SLGN in the liver microenvironment.

Method: We analyzed publicly available single-cell RNA-seq (scRNA-seq) data in order to identify TLR8-expressing cell types in the human liver and established a method for their isolation. We characterized the transcriptomic and cytokine profiles of this population in response to SLGN. The indirect effect of SLGN was evaluated by RNA-seq in primary human hepatocytes (PHH) treated with SLGN-conditioned media (CM) and the quantification of viral parameters following HBV infection. Identified signaling pathways mediating this effect were validated by the analysis of liver transcriptomic data from HBV-infected patients.

Results: Our analysis determined that TLR8 is primarily expressed in the myeloid compartment of the liver. Therefore, we optimized a method for the isolation of Kupffer cells (KCs) from human liver resections. Using this model, we found that in vitro treatment of KCs with SLGN leads to the upregulation of markers that characterize monocyte populations (e.g., EREG, S100A12) and the downregulation of genes associated with the KC identity (e.g., SPIC, FOLR2). Interestingly, a similar profile was observed in response to LPS, suggesting this to be part of the general changes associated with an inflammatory response. Moreover, treatment of PHH with SLGN-CM produced in KCs led to the downregulation of NTCP and an impaired HBV entry into hepatocytes. Finally, co-treatment with SLGN-CM and an IL-6-inhibitory antibody identified IL-6 as the cytokine mediating this reduced HBV entry.

Conclusion: Our results suggest that in addition to its previously described therapeutic antiviral activity in HBV-infected hepatocytes, SLGN also has a prophylactic effect via an IL-6-dependent mechanism. Moreover, our characterization of SLGN sheds light into the general transcriptional programs regulating KC activation and underscores the importance of considering cell states when annotating hepatic cell populations based on scRNA-seq data.

Figure:

TOP-107
Intrahepatic CD8+ T cells correlate with significant declines in HBV viral load and S antigen following a single vaccination with VRON-0200 in an AAV mouse model

Mohadeseh Hasanpourghadi1, Andrew Luber2, Sue Currie2, Xiang Zhou1, Hildegund Ertl1.1 The Wistar Institute, United States; 2Virion Therapeutics, United States

Email: scurrie@viriontx.com

Background and aims: VRON-0200 is a therapeutic vaccine developed to achieve functional cure of chronic HBV. The vaccine contains a genetically encoded checkpoint modifier, glycoprotein D (gD), to enhance, broaden and prolong CD8+ T cell responses to HBV core and polymerase with the goal to eliminate HBV-infected hepatocytes and prevent further viral spread. We hypothesized that, by removing virus-infected hepatocytes, S antigen would decline without being targeted by the vaccine. Here we report on correlations between intrahepatic CD8+ T cell responses and HBV viral load and S antigen declines in an AAV mouse model following a single i.m. injection of VRON-0200 (AdC6-gDHBV2).

Method: C57BI/6 mice were tested for frequency and epitope specificities of IFN-gamma producing vaccine-insert-specific CD8+ T cells in blood, spleens, and livers, following a single i.m. dose of 1 × 1010 vp of a chimpanzee adenovirus vector (AdC6) expressing sequences of polymerase and core within gD (AdC6-gDHBV2), polymerase and core without gD (AdC6-HBV2) or nothing (controls). Efficacy was assessed in C57BI/6 mice injected i.v. with an AAV8-1.3HBV vector at doses of 109 or 1010 genome copies. At week 4, mice with high levels of circulating HBV genome copy numbers were vaccinated (n = 5–10/group) with a single i.m. dose of 1 × 1010 vp of AdC6-gDHBV2, AdC6-HBV2, or nothing (control). HBV DNA viral loads and HBsAg titers in sera were assessed before and after vaccination and relationships between viral parameters and frequencies of IFN-gamma producing CD8+ T cells were assessed by Spearman’s rank correlations.

Results: gD significantly enhances and broadens CD8+ T cell response in blood, spleens, and livers. In spleens, gD more than doubles the frequencies and breadth of CD8+ T cells. In AAV8-1.3HBV mice, at week 12, a single injection of AdC6-gDHBV2 achieves an HBV viral load decline of ≥3 log10, the same vaccine without gD reduced viral loads ≤1 log10. Viral loads increase or remain stable in control mice. HBV DNA copies/ml strongly inversely correlate with the frequency of IFN-gamma CD8+ T cells in livers and spleens (figure); S antigen levels correlate with HBV viral load and inversely correlate with CD8+ T cell frequencies.

Conclusion: VRON-0200 is the first therapeutic vaccine to show significant correlations between intrahepatic CD8+ T cells and HBV viral loads declines. S antigen declines were also observed and directly related to HBV clearance. These data further support the key role of HBV viral load and CD8+ T cells as end points for HBV functional cure and highlight VRON-0200’s clinical potential alone or in combination. A VRON-0200 Phase 1b multi-national study is scheduled to begin in 2023.
**TOP-108**

HBsAg induces mild activation, but not suppression, of intrahepatic immune cells as shown by single-cell RNA sequencing of fine-needle aspirates in chronic HBV patients

Zgjim Osmani, Boris Beudeker, Gertine Oord, Anthony Grooshuismink, Robert De Knecht, Eric Bindels, Harmen van de Werken, Andre Boonstra. 

1 Erasmus MC, Gastroenterology and hepatology, Rotterdam, Netherlands; 2 Erasmus MC, Hematology, Rotterdam, Netherlands; 3 Erasmus MC, Immunology, Rotterdam, Netherlands

Email: z.osmani@erasmusmc.nl

**Background and aims:** There is no curative treatment for chronic hepatitis B virus (HBV) infection. Circulating hepatitis B surface antigen (HBsAg) is hypothesized to be responsible for the lack of an effective immune response to HBV. So far, previous attempts have failed to provide us with a complete understanding of the effects of HBsAg. To determine the impact of HBsAg on immune subsets, we optimized a workflow to examine circulating and intrahepatic cells from fine-needle aspirates (FNAs) of the liver.

**Method:** We included 18 HBeAg-negative patients on tenofovir and entecavir treatment with normal transaminases. Isolated cells from blood and paired liver FNAs were sequenced by 10X Genomics single-cell RNA sequencing. Patients were divided into an HBsAg high (920–12447 IU/ml) and HBsAg low group (1–100 IU/ml). Bioinformatic and differential gene expression analyses were performed comparing the two groups.

**Results:** Clustering identified 36 clusters in blood (166,351 cells; n = 18) and 29 clusters in liver FNAs (35,513 cells; n = 8). Cluster frequencies were comparable between both groups, except for the KLRC2+ TIGIT+ NK cell cluster which was significantly decreased in the blood of patients with high HBsAg (avgFC 2.9). When comparing the HBsAg high vs. low group, the highest number of DEGs were observed in the CXCR6+ CD69+ liver-resident CD8 T cell cluster (15 DEGs). The inhibitory receptors KLRB1, KLRC1, and more importantly IFNG were upregulated by this cluster in the HBsAg high group, pointing towards a more activated cell state. Interestingly, the memory B cell clusters (10–14 DEGs) upregulated activation markers in the HBsAg high group, pointing towards a more activated cell state; primarily in NK-, B- and intrahepatic CD8 T cells.

**Conclusion:** Our workflow provided us with unique insights into the effects of HBsAg at single-cell resolution. Unbiased analyses show us for the first time, to our knowledge, that relatively high HBsAg levels trigger gene expression changes of immune subsets in blood and liver, collectively pointing towards a more activated cell state; primarily in NK-, B- and intrahepatic CD8 T cells.

**TOP-111**

Dating the origin and evolution dynamics of hepatitis D virus

Yibo Ding, Hongbo Guo, Qiudi Li, Dan Liu, Zhijiang Miao, Renxian Tang, Kuiyang Zheng, Qiuwei Pan, Wenshi Wang. 

1 Xuzhou Medical University, Jiangsu Key Laboratory of Immunity and Metabolism, Pathogenic Biology and Immunology, Xuzhou, China; 2 Kunming University of Science and Technology, Kunming, China; 3 Erasmus Medical Center, Department of Gastroenterology and Hepatology, Netherlands

Email: wenshi.wang@xzhmu.edu.cn

**Background and aims:** Chronic infection of hepatitis D virus (HDV) causes the most severe form of viral hepatitis. Although discovered more than 40 years ago, the origin and evolutionary landscape of HDV remain elusive. As a satellite virus of hepatitis B virus (HBV), it is poorly understood whether a co-evolution and co-migration relationship exists between HDV and HBV. We aim to map the evolutionary dynamics of HDV geographically and chronologically.

**Method:** Bayesian coalescent analysis was performed to analyze the phylogenetic relationships, time of origin, the most rapid
dissemination period, area of origin and transmission roadmap of HDV and HBV.

Results: We found the origin time of HDV and HBV and their rapid dissemination period are distantly separated in the timeline. Specifically, HDV jumped into human around 220 years ago and disseminated rapidly since 1990, whereas HBV jumped into human around 37,700 years ago with the most pronounced dissemination period starting 4500 years ago. In addition, HDV originated from South America, while HBV originated from Africa. And their propagation roadmaps were also distinct. Moreover, a striking geographic separation of HDV was observed. Both the fitness to HBV genotypes and the adaptation to human lineages contribute to the formation of HDV cladogenesis.

Conclusion: This study has delineated the origin and evolution landscape of HDV. The origin and dispersal of HDV and HBV are distinct both geographically and chronologically. This implies that instead of a co-evolution and co-migration relationship, HDV and HBV are disseminated rapidly since 1990, whereas HBV jumped into human around 220 years ago and originated from Africa. And their propagation roadmaps were also distinct. Moreover, a striking geographic separation of HDV was observed. Both the fitness to HBV genotypes and the adaptation to human lineages contribute to the formation of HDV cladogenesis.

Background and aims: PD-1 is one of the key inhibitory receptors regulating CD8 T cell exhaustion during chronic viral infection. However, the role of PD-1 in modulating T cell differentiation and function during acute HBV infection is not well defined. Moreover, it is unclear whether PD-1 directly causes HBV-specific CD8 T cell exhaustion during chronic HBV infection.

Method: To address these questions, we examined the impact of genetic depletion of PD-1 from HBV-specific CD8 T cells on their differentiation and function in acute self-resolving and persistent HBV replication mouse models.

Results: We observed a sustained increase of PD-1 expression on CD8 T cells in both the spleen and liver in mice with acute self-resolving HBV replication. PD-1+ CD8 T cells demonstrated significantly increased effector T cell differentiation, proliferation, effector cytokine production, and granzyme B expression in comparison to PD-1− CD8 T cells. Interestingly, transcriptome sequencing analysis revealed that PD-1+ CD8 T cells also expressed significantly higher inhibitory molecules such as TIGIT, LAG-3, CTLA-4 and CD244 compared to PD-1− CD8 T cells. This upregulation of inhibitory receptors was associated with decreased effector CD8 T cell proliferation and intracellular IL-2 and IFN-gamma production.

Conclusion: Our results demonstrate that PD-1 does not suppress effector CD8 T cell differentiation during acute HBV infection and HBV-specific CD8 T cell exhaustion can occur in the absence of PD-1.

Background and aims: CD8+ CTLs (Cytotoxic T lymphocytes) play a pivotal role to eliminate HBV. CTLs of chronic HBV patients fail to eliminate infected cells because of exhaustion. Stem cell memory T cells (Tscm) are a rare subset of memory lymphocytes with stem cell-like self-renewal capabilities. Tscm are expected to be useful in cancer therapy. In this study, we detected HBV-specific Tscm in patients with chronic hepatitis and investigated their functions by transferring the Tscm into HBV-infected human hepatocytes transplanted TK-NOG mice.

Method: We isolated CD8+ T cells by MACS technology using PBMCs of HBV patients with HLA-A24. HBV core or pol tetramer+ HBV-specific Tscm were detected using FACS.Canto2. Isolated Tscm from 8 HBV patients were labeled with CFSE and injected into 8 HBV-infected HLA-A24 human hepatocyte transplanted TK NOG mice. Serum HBV DNA and human albumin levels were monitored until the mice were sacrificed three or four weeks after the Tscm transfer. Hepatic mononuclear cells and splenocytes were isolated to study cell proliferation and intracellular IL-2 and IFN-gamma production.

Results: Detection of Tscm from patients with hepatitis B. HLA-A24 core and polymerase tetramer-positive Tscm were detected in 15 and 10 of 18 patients with chronic hepatitis B, respectively. The frequency of Tscm in these patients ranged from 0.6 to 38%. Transfer of Tscm to human hepatocyte transplanted TK-NOG mice. To explore a possibility of Tscm administration therapy to treat HBV infection with Tscm, we transferred 10^4 5 Tscm from 8 chronic HBV patients to 8 TK-NOG mice with HLA-A24 hepatocytes after HBV infection. Four mice were sacrificed three weeks after human cell injection and remaining four were sacrificed four weeks after the Tscm transfer. Apparent HBV DNA reduction was seen in 5 of the 8 mice. Human albumin levels also declined in these 5 mice suggesting the elimination of HBV-infected hepatocytes. Histological analysis of mouse liver tissue three and four weeks after human cell transfer revealed mild and severe mononuclear cell infiltration. These infiltrating cells were positive for human CD8-alpha-1 staining, suggesting that the transferred TSCMs had differentiated into CTLs and caused hepatitis. No mice showed signs of GVHD. High levels of human blood cells were recovered from the liver and spleen of the mice three weeks after injection but dramatically decreased one week later. IL-2 and IFN-gamma producing cells were more abundantly detected in mice sacrificed four weeks after T-cell transfer than three weeks. Most of these
cytokine-producing cells were tetramer-positive, suggesting that these cytokines were produced from CTLs reactive to HBV peptides. **Conclusion:** We detected Tscm specific to HBV and showed a possibility of Tscm therapy for chronic HBV infection.

**FRI-217**

**RBD1016-a novel anti-HBV GalNAc-siRNA drug resulted in sustained HBsAg reduction and seroconversion in mice models**

Li Ming Gan1, Shuquan Zheng2, Feng Li2, Zhaoxu Guo2, Hong Yu2, Hongyan Zhang2, Zicai Liang2, Shan Gao2. Ribocure Pharmaceuticals Ab, Sweden; 2Ribo Life Science Co., Ltd, China

Email: ganlm@ribolia.com

**Background and aims:** RBD1016 is a siRNA drug intended for treatment of chronic HBV infection, by targeting HBV X gene with pan-genotypic coverage. RBD1016 is in Phase 1 clinical stage for the treatment of CHB patients. Here we report the preclinical data from in vivo proof of concept studies using RBD1016 in two relevant mouse models of human HBV.

**Method:** To evaluate the efficacy of RBD1016, C57B/6N-Tg (1.28HBV)/Vst mice (or HBV transgenic mice) and rAA V8-1.3HBV (or AA V-HBV) animal models were used to investigate the anti-HBV effect of RBD1016 administered at different doses and different treatment regimens.

**Results:** 1. Single dose of RBD1016 resulted in dose-dependent knockdown of HBV viral markers in transgenic mice. An effective reduction of HBsAg by RBD1016 (max reduction 3.33 log10 IU/ml) was observed in HBV transgenic mice, which lasted for at least three months (Figure 1A). RBD1016 could also achieve substantial and durable reduction of HBeAg and HBV DNA (Figure 1B) in a dose-dependent manner. 2. RBD1016 resulted in HBsAg seroconversion and synergistic effect on HBV DNA reduction combined with ETV (Figure 1C). The combination of RBD1016 and ETV demonstrated a synergistic effect on serum HBV DNA inhibition, with serum HBV DNA reduced up to 4.91 log10 IU/ml, and the profound inhibition was maintained even after discontinuation of ETV on Day 29 until the end of the study (Figure 1D). 3. A good PKPD correlation between liver RBD1016 concentration and serum HbsAg. There was a good correlation between RBD1016 liver concentration and HBsAg level in the plasma, supporting the use of HBsAg reduction in estimating drug concentration in the liver in human studies. 4. Pre-clinical safety profile. Based on 13 weeks’ GLP toxicity studies, no observed adverse effect levels (NOAEL) were defined at 600 and 400 mg/kg in mice and monkeys, respectively, which supports large safety windows for ongoing and future studies in man.

**Conclusion:** The non-clinical studies of RBD1016 showed a significant and dose-dependent reduction of HBsAg on transgenic mouse model and AAV-HBV mouse model, which was further accompanied with HBsAg seroconversion. RBD1016 alone and in combination with drugs of other mode of action have the potential to contribute to functional cure of HBV in patients with chronic HBV.

**FRI-218**

**HBV infection reshapes host chromatin accessibility and affects choline and iron metabolism**

Vincenzo Alfano1, Giuseppe Rubens Pascucci2, Giacomo Corleone3, Francesca De Nicola4, Alexia Patuelli5, Francesca Casuscelli di Tocco5, Massimiliano Cocca5, Claude Caron de Fromentel5, Oceane Floriot5, Rivoire Michel6, Massimo Levrero7, Francesca Guerrieri5. 1Cancer Research Center of Lyon (CRCL), UMR Inserm 1052 CNRS 5286 Mixte Clb, Université Lyon 1 (UCBL1), Lyon, France; 2IIT Sapienza, Italy; 3UOSD Safu, Italy; 4Regina Elena National Cancer Institute, Oncogenomic and Epigenetic Unit, Italy; 5Inserm U1052-Crcl, Lyon, France; 6Inserm U1032-Clb, France; 7Dept of Hépatology, Hospices Civils de Lyon (HCL)-University Claude Bernard Lyon 1, France

Email: vincenzo.alfano@inserm.fr

Effects of RBD1016 on HBV viral markers in transgenic mice. HBsAg was measured by ELISA, HBV DNA was quantified by qPCR, respectively (A, B); Serum HBsAb can be detected after a single or repeated dose of RBD1016 in 62.5% AAV mice, HBsAb level was much higher in repeated dose (C); Additive inhibition of serum HBV DNA was observed for RBD1016 in combination with ETV in HBV transgenic mice (D).

Figure: (abstract: FRI-217).
Background and aims: HBV remains a major health problem worldwide with 250 million people chronically infected and at risk to develop liver cirrhosis and HepatoCellular Carcinoma (HCC). A complex host-virus interaction is responsible for both HBV-specific T and B cells dysfunction and the persistence of the viral cccDNA minichromosome, the two key challenges for HBV cure. The extent of HBV impact on the liver transcriptome remains controversial. Transcriptional activation in eukaryotic cells has been tightly linked with disruption of nucleosome organization at accessible genomic sites of remodeled chromatin. We used ATAC-seq (Assay for Transposable Accessible Chromatin followed by high throughput sequencing) to probe open chromatin and detect early changes in chromatin accessibility in HBV-infected Primary Human Hepatocytes (PHHs).

Method: HBV-infected PHHs (2 h/72 h) from 2 donors were used for ATAC-seq and analysis. The libraries were sequenced (75 × 2 cycles) on a NextSeq 500 Illumina.

Results: ATAC-seq analysis revealed an average of 2000 and 3500 cellular Differentially Accessible Regions (DARs) at 2 h and 72 h post infection (p.i.) respectively, indicating that after HBV infection an increasing number of genomic sites (including promoters, intragenic and distal intergenic regions) change their chromatin accessibility over time. Overall, the regions with different chromatin accessibility were enriched in genes involved in metabolism (KEGG) and GSEA analysis revealed an important role of the chromatin regulating complex PRC2 complex at 72 h p.i.Interestingly, the 1804 DARs, that are equally impacted by HBV infection in both the donors, enriched the pathway of choline metabolism in cancer, which affects PRC2 function. The integration of the ATAC-seq and RNA-seq data allowed us to identify 614 genes that had significant changes in both the analysis at 72 h p.i. These targets confirmed the impact of HBV infection on liver metabolism, and revealed a strong involvement of the iron metabolism in the cellular response to HBV infection. We validated the expression of iron-related genes and we found that HBV infection significantly upregulated the iron uptake in the cells. Finally, using the iron chelator Ferrostain-1, we showed that lowering the available iron levels results in a drastic inhibition of viral replication.

Conclusion: Altogether these results challenge the commonly accepted concept of HBV as a “stealth” virus and show that HBV infection impacts on host cell chromatin landscape and specific transcriptional programs. In particular, HBV imposes a reshaping of key cell metabolic pathways (e.g., choline and iron metabolism).

Finally, we showed that available iron levels impact on HBV replication.

FRI-219 Identification of unique liver NK cells in HBV and a new perspective on exhaustion-related NK cell phenotypes by single-cell RNA sequencing

Boris Beudeker1, Arda Karaoglu1, Gertine Oord1, Anthony Grooshuismink1, Noé Axel Montanari1, Remco Hoogenboezem2, Eric Bindels2, Harmen van de Werken2, Robert De Knegt3, Andre Boonstra1, Erasmus MC, Gastroenterology and Hepatology, Rotterdam, Netherlands; 2Erasmus MC, Hematology, Rotterdam, Netherlands; 3Erasmus MC, Immunology, Rotterdam, Netherlands

Email: p.a.boonstra@erasusmc.nl

Background and aims: NK cells play an important role in the body’s response to chronic hepatitis B virus (HBV) infection. Understanding the impact of stably suppressed HBV on NK cell activation or inhibition is crucial for improving protective immunity and developing effective HBV cure therapies.

Method: Blood NK cells of HBeAg-negative HBV patients with low viral load were phenotyped and functionally tested. To provide a comprehensive and unbiased profile of the composition and transcriptional states of NK cells, paired blood and fine needle liver aspirates of treated HBV patients were single-cell RNA-sequenced (scRNAseq) and compared to healthy control datasets.

Results: scRNAseq analysis revealed distinct NK cell subsets in patients with chronic HBV. We observed a reconfiguration of peripheral NK cells in HBV patients, including a heterogeneous activation-related gene signature and increased TIGIT expression. Contrary to previous hypotheses, we found limited expression of T-cell exhaustion related genes in peripheral NK cells. Our analysis of paired blood and liver NK cells is to date the largest, revealing a unique population of intrahepatic NK cells that clusters with blood NK cells in multidimensional analysis. These intrahepatic cells expressed immediate early genes (FOS/JUN), and genes encoding proinflammatory cytokines (IFNG). scRNAseq of unprocessed ex vivo HBV liver aspirates profiled the tissue-resident phenotype of NK cells and revealed pronounced proinflammatory features, accompanied by high expression of the inhibitory factor TIGIT, as compared to blood. Our analysis of inhibitory genes in liver-resident NK cells showed a link between TIGIT expression and cytotoxicity and proinflammatory transcriptional profiles in both HBV and healthy liver. Our extensive analysis of NK cell phenotype and function in 101 cases of stably suppressed HBV or healthy patients with spontaneous HBsAg loss showed a link between TIGIT frequency on CD56dim NK cells and the clinical phase of HBeAg-negative HBV, as well as the duration of antiviral therapy. No other well-known activation or inhibitory proteins, such as PD1, TIM-3, CD86, or CD38 were found to be associated with these factors.

Conclusion: Blood and liver NK cell subsets of HBV patients expressed limited T-cell exhaustion associated features, and expression of TIGIT was linked with favorable clinical outcomes and highly active NK cell subsets. Besides liver-resident NK cells, also activated liver-infiltrating NK cells were observed. In conclusion, our findings demonstrate the potential of targeting blood and liver NK cells as a strategy to cure HBV, especially as novel anti-HBV compounds are being developed in combination with NUC therapy.

FRI-220 Impact of pegylated interferon-alpha in combination with Bulevirtide in HBV/HDV infected humanized mice

Tassilo Volz1,2, Jonathan Kolbe1, Annaika Volmari1,2, Lena Allweiss2,3, Marc Luettegamm1,2, Simon Fletcher4, Meghan Holdorf4, Robert Muench1, Maura Dandri1,2,1 University Medical Center Hamburg-Eppendorf, Internal Medicine, Hamburg, Germany; 2German Center for Infection Research, DZIF, Hamburg-Lübeck-Borstel-Riems Site, Germany; 3University Medical Center Hamburg-Eppendorf, Medical Microbiology, Virology and Hygiene, Hamburg, Germany; 4Gilead Sciences, Foster City, United States

Email: m.dandri@uke.de

Background and aims: Chronic hepatitis D (CHD) is a complex viral disease for which treatment remains challenging. The entry inhibitor bulevirtide induces a significant decline in HDV RNA and ALT reduction/normalization in CHD patients after 24 weeks, but longer treatment durations and/or combination therapies are needed to accelerate HDV decline and increase cure rates (Wedemeyer, Lancet Inf Dis 2022). Pegylated interferon-alpha (pegIFNα) is also used to treat CHD but has high rates of viral relapse. In a small phase II study, the combination of BLV with pegIFNα had superior antiviral efficacy relative to either agent alone (Wedemeyer, J Hep 2020). However, the underlying mechanism(s) by which PEG-IFNα improves the antiviral response to BLV remains unclear. The aim of this in vivo study was to evaluate the antiviral efficacy of BLV and pegIFNα administered alone or in combination using HBV/HDV infected immunodeficient humanized mice.

Method: uPA/SCID/IL2Rγc-/- (USG) mice reconstituted with adult primary human hepatocytes (PHH), were stably infected with HBV and superinfected with a recently cloned patient-derived HDV viral isolate (GT-1p) (Giersch, JHEP Rep 2022). Animals (n = 5–6 per group) received BLV (2 μg/g once per day) and pegIFNα (25 ng/g, twice per day) − Pegylated interferon-alpha in combination with Bulevirtide in HBV/HDV infected humanized mice
Background and aims: Nearly four-and-a-half decades after the discovery of Hepatitis E virus (HEV) as the etiological agent of viral hepatitis in human, treatment options remain limited to the off-label use of the nucleoside-analog ribavirin (RBV) and pegylated interferon α (pegIFNα), providing a rationale for the combination effect of these agents observed in CHD patients.

FRI-221
Automated high-throughput image-based screen discovers targets for treatment of hepatitis E virus infection
Mara Klöhn1, Yannick Brüggemann1, Marc Windisch2, Daniel Todt1, Eike Steinmann1. 1Ruhr Universität Bochum, Molecular and Medical Virology, Bochum, Germany; 2Molecular Virology, Center for Integrative Infectious Disease Research, Heidelberg University Hospital, Germany.

Background and aims: Nearly four-and-a-half decades after the discovery of Hepatitis E virus (HEV) as the etiological agent of viral hepatitis in human, treatment options remain limited to the off-label use of the nucleoside-analog ribavirin (RBV) and pegylated interferon α (pegIFNα), providing a rationale for the combination effect of these agents observed in CHD patients.

Method: We screened up to 9,500 compounds derived from FDA-approved drug-libraries and carried out dose-response assays of up to 170 of the most promising compounds by utilizing subgenomic HEV reporter replicons of genotype 3 expressing a GFP gene as a marker for viral replication in hepatoma cells. Furthermore, we tested the top hits in infection experiments with the human-derived HEV-3 p6 and the wild-boar HEV-3 83-2 virus.

Results: We discovered at least 5 compounds that markedly inhibit viral infection at low micromolar concentrations in hepatoma cells. Finally, infection experiments with HEV-3 p6-FL and HEV-3 83-2 virus identified Capivasertib and Ipatasertib, two pan-inhibitors of the serine/threonine kinase Akt to inhibit virus infection in vitro.

Conclusion: In conclusion, screening drug-repurposing libraries proved to be a versatile tool for identifying novel drugs against HEV infections, but most importantly, our results suggest that pan-Akt inhibitors may be promising therapeutic candidates for the treatment of HEV infections.

FRI-222
The hepatitis E virus ORF2 protein forms amyloid-like protein aggregates which may be pathogenic in human neurons
Jungen Hu1, Giulia Mizzon2, Chiara Olmeo3, Ann-Kathrin Mehner1, Rebecca Fu1, Jan Birkel1, Andrew Freistaedter1, Claudio Acuna3, Ralf Bartenschlager2,4, Viet Loan Dao Thi1,4. 1Chica and Heinz Schaller Research Group, Department of Infectious Diseases, Virology, Heidelberg University Hospital, Germany; 2Molecular Virology, Center for Integrative Infectious Disease Research, Heidelberg University Hospital, Germany; 3Chica and Heinz Schaller Research Group, Institute for Anatomy and Cell Biology, Medical Faculty Heidelberg, Germany; 4German Centre for Infection Research (DZIF), Partner Site Heidelberg, Germany.

Background and aims: Hepatitis E virus (HEV) is an important human pathogen. Immunocompromised patients can become chronically HEV-infected and suffer from extrahaepatic manifestations, especially neurological disorders. HEV genomic RNA was detected in the cerebrospinal fluid of chronic HEV patients and in the brains of HEV-infected animals. In HEV-infected cells, three different forms of the capsid protein ORF2 have been described: a glycosylated, a cleaved, and an infectious form. How the expression of the different ORF2 forms is regulated, where progeny particles assemble, and how they traffic through the cell is poorly understood. We want to investigate HEV assembly by studying ORF2 in host cells. We also...
want to analyze if ORF2 is involved in HEV-induced neuro-pathogenesis.

**Method:** We engineered a new full-length fluorescence HEV reporter and derivates by tagging ORF2 using the split GFP system (ORF2-GFP11), which allowed us to perform correlative light-electron microscopy (CLEM) and live-cell imaging studies. We used human induced pluripotent stem cell (iPSC)-derived neurons to study potential HEV-induced neurological disorders.

**Results:** The ORF2-GFP11 reporter virus replicated to similar levels as WT HEV and made infectious progeny particles. HEV ORF2-GFP11 infection of cells expressing GFP1–10 led to the formation of ~2 μm long rod-shaped GFP-positive ORF2 structures in the cytoplasm. By staining with ORF2 antibodies, we confirmed the formation of these structures in a range of WT HEV-infected cell types, including iPSC-derived hepatocytes and neurons. In HEV WT-infected neurons, calcium concentrations appeared to be lower compared to non-infected neurons. To our surprise, both the supposedly secreted and the infectious ORF2 forms formed large structures in the cytoplasm. Further, ectopically expressed WT ORF2 formed the same structures, suggesting it to be the sole viral determinant. By CLEM and electron tomography analysis, we found that the ORF2 protein formed aggregates composed of orderly stacked tubular filaments with a periodicity of ~35 nm, reminiscent of amyloid fibrils.

**Conclusion:** We have generated a full-length fluorescence HEV reporter for the first time. The ORF2 protein can form large, cytoplasmic, amyloid-like protein structures which may be involved in the pathogenesis in HEV-infected neurons. We are currently investigating how the structures are formed and if they play a role in progeny HEV assembly processes.

**FRI-223.**  
**Hepatitis B virus infected hepatocytes are resistant to cell death induction by virus-specific T cells.**  
Emely Springer1, Annika Schneider1, Joseph Trapani2, Daniel Hartmann3, Norbert Hueser2, Melanie Laschinger3, Percy A. Knolle1, Dirk Wohlleber1, 1Technical University of Munich, Institute of molecular Immunology, Munich, Germany; 2Peter MacCallum Cancer Centre, Melbourne, Australia; 3University Hospital München rechts der Isar, Department of Surgery, Munich, Germany  
Email: emely.springer@tum.de

**Background and aims:** Hepatitis B virus (HBV) infection is considered as global health problem with more than 290 million cases of chronic hepatitis B. Although infection of hepatocytes with HBV induces anti-viral CD8 T cell response, viral clearance by CD8 T cells takes weeks or may develop into persistent infection. The reasons for failure of the immune system are manifold and not entirely understood. We recently identified that viral infections renders hepatocytes more susceptible for immune-mediated cell death induction by reducing the mitochondrial stress resilience. Here, we demonstrate that HBV infected hepatocytes do not only escape the non-canonical CTL effector function but are also more resistant towards CD8 T cell mediated killing. This identifies a so far not appreciated immune escape of HBV at the level of immune cell effector function against virus-infected hepatocytes. Overcoming this immune escape bears the promise to help in immune-mediated clearance of HBV-infected hepatocytes.

**FRI-224**  
**A novel imaging approach to investigate hepatitis E virus entry**  
Rebecca Fu1, Zoe Engels1, Jasmin Weihs1, Jungen Hu2, Viet Loan Dao Thi1,2, Schaller Research Group, Department of Infectious Diseases, Virology, University Hospital Heidelberg, Heidelberg, Germany; 2German Centre for Infection Research (DZIF), Partner Site Heidelberg, Heidelberg, Germany  
Email: vietloan.daothi@med.uni-heidelberg.de

**Background and aims:** Hepatitis E virus (HEV) is a major causative agent of acute hepatitis and mainly transmitted faecal-oral. HEV particles in faeces are non-enveloped (nHEV) and responsible for host-to-host transmission, while those in the blood possess a cell-derived lipid envelope (eHEV) allowing HEV to disseminate within the host. Studies on nHEV entry pathways have been controversial and no entry receptor has been identified for either form yet. A previous study proposed integrin alpha 3 (ITGA3) as a potential host factor of nHEV entry, but no follow-up studies have been made. In this study, we aimed to develop a new imaging approach, combined with the use of entry inhibitors, to study single HEV particles upon cell entry.

**Method:** We used fluorescent in situ hybridization and immunofluorescence staining to detect the HEV genome and the capsid, respectively. We knocked out (KO) the partner of ITGA3, namely integrin beta 1 (ITGB1), in hepatoma cells. We used chemical inhibitors, siRNAs, GFP-tagged Rab proteins together with their dominant-negative counterparts to study the cell entry pathways used by the two HEV forms.

**Results:** We successfully established the detection of single incoming HEV particles during early hours of infection (Figure 1A). We found that the binding and infection of nHEV but not eHEV particles was less efficient in ITGB1 KO cells as compared to WT cells. We observed that the genome dissociated from the capsid approximately 7 h post-infection (p.i.), suggesting a rather slow entry process. Endosomal acidification inhibitors led to intracellular capsid accumulation and thus unsuccessful genome release. Affirmingly, these inhibitors decreased both eHEV and nHEV infection in a dose-dependent manner. However, eHEV exhibited higher sensitivity to these inhibitors than nHEV (Figure 1B). For nHEV, knocking down the early endosome marker Rab5 had only a minor effect, while the knockdown of the recycling and late endosome markers Rab11 and Rab7 resulted in strong capsid accumulation and thus unsuccessful cell entry and infection. In contrast, we found eHEV entry to rather depend on the classic endocytic pathway based on Rab5 but not Rab11.
Conclusion: Using our novel entry assay, we found that the two HEV forms differentially depend on integrins and that they use likewise differential pathways to enter the cell. Our efforts shall lead to a better understanding of the HEV cell entry mechanism and may ultimately contribute to the development of specific anti-HEV therapies.

FRI-225
CTLA4 inhibits anti-HBs secretion by blocking BCR signaling pathway in chronic hepatitis B infection
Minxin Mao¹, Shengxia Yin², Yawen Wan³, Ming Li¹, Yu Geng¹, Xin Tong², Jie Li², Chao Wu¹,².
¹Department of Infectious Diseases, Nanjing Drum Tower Hospital Clinical College of Traditional Chinese and Western Medicine, Nanjing University of Chinese Medicine, Nanjing, China; ²Department of Infectious Diseases, Nanjing Drum Tower Hospital, The Affiliated Hospital of Nanjing University Medical School, Nanjing, China; ³Department of Infectious Diseases, Nanjing Drum Tower Hospital Clinical College of Xuzhou Medical University, Xuzhou Medical University, Xuzhou, China
Email: dr.wu@nju.edu.cn

Background and aims: It has been reported that there is no significant change in the number of HBsAg specific B cells in chronic hepatitis B (CHB) patients. However, the vast majority of

Gene sequencing of peripheral blood B cells in CHB patients showed that CTLA4 expression was increased

Figure: (abstract: FRI-225).
CHB patients are anti–HBs negative. B cells are the main source of antibodies in humoral immunity against HBV infection. It is believed that the deficiency of anti–HBs is caused by the dysfunction of anti–HBs secretion by HBsAg specific B cells. Therefore, more attention should be paid to the activation of HBsAg specific B cells and the cause of the inhibition of anti–HBs secretion.

Method: Peripheral blood B cells from 4 healthy controls (HC) and 4 CHB patients were collected by flow sorting technology for single cell sequencing, and the sequencing results were analyzed by GO analysis. Blood samples were collected from CHB patients and HC, and the changes in the proportion of peripheral blood B cells were detected by flow cytometry. HBsAg specific B cells were identified by fluorescent dye labeling. Peripheral blood B cells from CHB and HC were sorted by flow cytometry, and B cell cytokines, signaling pathways and antibody secretion by blocking CTLA4 signaling pathway were detected. Using immunocapture precipitation (CO-IP), anti-CTLA4 antibody was used to precipitate CTLA4 protein complex, and the protein complex was analyzed by protein general spectrum to identify the differences in phosphorylation levels of downstream proteins and related proteins bound to the complex.

Results: GO analysis showed that the expression levels of multiple proteins in the BCR signaling pathway of B cells were decreased, suggesting that the BCR signaling pathway was blocked. Flow cytometry analysis of peripheral blood B cells from CHB patients and HC showed that CTLA4 protein was highly expressed in B cells from CHB patients, and the increase of CTLA4 expression was more significant in HBsAg specific B cells. We further phenotyped infiltrating B cells in liver biopsy tissues from 5 CHB patients and found that the expression level of CTLA4 in liver B cells was positively correlated with peripheral blood B cells. Ellispot assay showed that after blocking CTLA4, B cells in some CHB patients recovered the ability to secrete anti-HBs. Calcium flow experiments showed that BCR dependent calcium flow was significantly reduced in HBsAg specific atMBC cells infected with chronic HBV infection, and the conduction of calcium flow was partially restored after the addition of anti-CTLA4. Western Blot test found that HBsAg specific atMBC BCR signaling pathways in cell signal more abnormal protein phosphorlation levels, after adding anti-CTLA4 p-Src, p-BLNK rise obviously, BCR intracellular signal transduction recovered to a certain extent. CO-IP results showed that the phosphorylation level of CTLA4 signaling pathway downstream was inhibited.

Conclusion: High expression of CTLA4 protein in circulating B cells and liver-infiltrating B cells blocks BCR signaling, thereby inhibiting anti-HBs secretion. Therefore, the abnormal expression of CTLA4 protein on B cells may be one of the reasons for the loss of virus specific humoral response during CHB infection.

FRI-226
Transcriptional analysis of HBV infected liver after treatment with selgantolimod reveals longitudinal changes in both inflammation-related pathways and B cell receptor repertoire
Nikita Kolhatkar1, Circe McDonald1, Sam Kim1, Leonard Sowah1, Jeffrey Wallin1, Wan-Long Chuang2, Yao-Chun (Holden) Hsu1, Gilead Sciences, Inc., Foster City, United States; 2Kaohsiung Medical University Chung-Ho Memorial Hospital, Taiwan; 3-DA Hospital, Center for Liver Diseases, Taiwan
Email: holdenhshu@gmail.com

Background and aims: GS-US-389–5458 is an open label phase1b study of selgantolimod, an oral selective small molecule agonist of Toll-like receptor 8 (TLR8) in special populations of subjects with chronic hepatitis B (CHB). Here we investigate the effect of selgantolimod on the periphery and liver microenvironment in the inactive carrier (IC) population of CHB.

Method: IC CHB subjects (HBV DNA <2000 IU/ml, qHBsAg ≤1000 IU/ml and ALT ≤ULN by AASLD 2018 guidelines) received weekly dosing of 3 mg selgantolimod for 24 doses. Paired core needle liver biopsies were collected from 4 IC participants during screening as well as week 23 2-6 hours post selgantolimod dosing. Matching PBMCs and fixed whole blood samples were collected at the same timepoints. RNA was isolated from the peripheral and liver tissue samples and bulk RNAseq, T-cell receptor (TCR), and B-cell receptor (BCR) sequencing was performed using Illumina TruSeq and Takara SMARTer TCR/BCR Profiling Kits. RNAseq alignment was performed using TopHat and Cufflinks. Differentially expressed genes were identified using a linear mixed effect model (DESeq2). Changes in immune pathways of interest were characterized using single-sample Gene Set Enrichment Analysis (ssGSEA). Immune cell composition was estimated using quianTseq. Clonotype assembly for BCR and TCR sequencing utilized an MiXCR pipeline. Repertoire diversity was quantified using Inverse Simpson Index.

Results: Transcriptional profiles of paired liver biopsies and matched peripheral blood were compared to evaluate modifications in these compartments after treatment with selgantolimod. While we did not observe consistent alterations to the peripheral transcriptional landscape, there were some notable changes in all subjects within the liver. Specifically, a number of genes had increased expression, including regulation of macrophage chemotaxis (CSF1), inflammatory cytokines (STAT1, IL6, TNFAIP3, MYD88, TLR7), activation and proliferation of cytotoxic T cells (CD69, CD44, TAP1), and mature B cell differentiation (LYN). Cell deconvolution analyses showed an increase in the averages of M1 Macrophages (1.7-fold), regulatory T cells (4.6-fold), and B cells (1.9-fold) within the liver. TCR analysis of the liver did not indicate consistent expansion or shifts within the liver microenvironment despite increases in T cell activation-related genes. Analysis of B cell receptor repertoires in liver revealed an increase in clonotypic diversity after treatment (mean 1.8-fold). Additionally, we identified a specific heavy chain V gene family, 3–74 that had expanded in the liver but not the periphery upon treatment in two of the four subjects (ranging from ∼1.5–5-fold increase within the liver).

Conclusion: Our data indicate that selgantolimod treatment in CHB patients could drive upregulation of inflammation-associated genes within the liver microenvironment, promoting activation of pro-inflammatory myeloid, B and T lymphocytes. Additionally, subsequent weekly treatment with selgantolimod may drive changes to the B cell compartment to both increase diversity of the immunoglobulin repertoire and enrich specific antibody families that may be specific to HBV.

FRI-227
HBs-directed T cell engager antibodies foster efficient recruitment of T cells and lead to strong reduction of Hepatitis B virus infection in livers of human liver chimeric mice
Annika Volmari1,2, Oliver Quitt3, Pin Xie4, Tassilo Volz1,2, Lena Allweiss1,2, Ke Zhang4, Ulrike Protzer2,3, Maura Dandri1,2
1University Medical Center Hamburg-Eppendorf, 2Medical Department, Hamburg, Germany, 3German Center for Infection Research (DZIF), Hamburg-Luebeck-Borstel-Riems and Munich sites, Germany, 4Technical University Munich/Helmholtz Munich, Institute of Virology, School of Medicine, Germany, 5SCG Cell Therapy, Shanghai, China
Email: a.volmari@uke.de

Background and aims: Current treatment options for chronic Hepatitis B (CHB) efficiently suppress viral replication but rarely achieve a functional cure. Virus-specific adaptive immunity is lacking or dysfunctional in CHB patients and restoration of a functional antiviral T cell response has the potential to promote cure. Recent studies have shown that bispecific antibodies binding HBV envelope proteins (HBVenv) on infected hepatocytes and CD3 and CD28 on T cells target and kill HBV infected cells (Quitt et al J Hepatol 2021). The aim of this study was to assess liver targeting and antiviral efficacy of these T cell (Tc-) engager antibodies in vivo in HBV infected human liver chimeric mice in the presence of high circulating HBsAg levels.

Method: Humanized mice that were stably (12w) or partially (4w) infected with HBV received PBMCs isolated from healthy human
blood at day 0 and 4 of treatment and four i.p. injections of a combination of bispecific Tc-engager antibodies recognizing HBV env and either CD3 or CD28 (1 mg/kg body weight, every 3 days). Control mice received PBMCs and PBS. Virological markers and cell infiltration were determined by qPCR, ELISA, immunofluorescence, RNA in situ hybridization (RNAscope) and flow cytometry.

**Results:** In vitro assays showed high specificity of the Tc-engager antibodies and determined an optimal treatment ratio of 1:1 to induce efficient activation of T cells, elimination of target cells and antiviral effects. Treatment of stably HBV-infected mice (median viremia of $7 \times 10^8$ HBV DNA copies/ml; median HBsAg $3 \times 10^3$ IU/ml) with Tc-engager antibodies and human PBMCs induced strong intrahepatic recruitment of human CD4+ and CD8+ T cells. Antibody treatment resulted in reduction of viremia (1.4log), circulating HBsAg (0.69log) and HBeAg (0.55log) in only 11 days. Intrahepatic levels of HBV pregenomic (pgRNA) (0.71log), HBV DNA (1.4log) and cccDNA (0.59log) were efficiently reduced. Histology and RNAscope revealed reduced numbers of HBCAg+ cells and substantially lower HBV-RNA in infected hepatocytes. These changes were accompanied by a transient increase of ALT, increased expression of TNF-α, and reduction of human serum albumin, indicating human hepatocyte killing. Treatment of partially infected mice efficiently reduced intrahepatic levels of HBV RNA (0.71log), HBV DNA (1.10log) and cccDNA (0.80log), demonstrating specific recognition of infected cells also in livers harboring lower numbers of HBV+ cells.

**Conclusion:** Treatment of HBV-infected humanized mice with bispecific Tc-engager antibodies after transfer of human PBMCs efficiently reduced HBV viral load in vivo, demonstrating their recruitment to the liver and potent recognition of infected hepatocytes despite the presence of high circulating HBsAg levels, as well as induction of both cytolytic and cytokine-mediated HBV-specific T cell immunity.

**FRI-228**

**HBV and HDV interaction and variability in a superinfection mouse model: role of type I interferon**

Beatriz Pacín Ruíz1,2,3, Gracián Camps Ramón4, Maria Francesca Cortese1,2,3, Josep Gregori5, Selene Garcia-García1,2,3, David Taberner1,2,3,4, Víctor Vazquez Aranguren1,4, Adrian Najarro1, Cristina Olague Michelotearena1, Ariadna Rando-Segura1, Josep Quer1, Rafael Esteban1,2, Mar Riveiro Barciela1,3, Maria Buti3,4,5, David Taberner1,2,3,4, Víctor Vazquez Aranguren1,4, Rafael Esteban1,2,3,4, Maria Buti3,4,5, Gloria González-Aseguiñola6, Francisco Rodríguez-Frias7,8,9,10,11,12,13,14,15,16, Vall d’Hebron Barcelona Hospital Campus, Microbiology/Liver Unit, Barcelona, Spain; 2Universitat Autònoma de Barcelona, Biochemistry and Molecular Biology Department, Bellaterra, Spain; 3 Carlos III Health Institute, Network Center For Biomedical Research in Hepatic and Digestive Diseases (CIBEREd), Madrid, Spain; 4University of Navarra, Center for Applied Medical Research (CIMA), Pamplona, Spain; 5Vall d’Hebron Barcelona Hospital Campus, Liver Unit, Liver Disease, Laboratory-Viral Hepatitis, Barcelona, Spain; 6Vall d’Hebron University Hospital, Liver Unit, Department of Internal Medicine, Barcelona, Spain Email: beatriz.pacin@vhir.org

**Background and aims:** The hepatitis delta virus (HDV) inhibits the hepatitis B virus (HBV) replication and, differently from its helper, it induces the interferon pathway, leading to the expression of mutagenic enzymes such as ADAR1. This study aimed to inspect the relationship between HDV and HBV variability and the role of type I interferon (IFN-I) by studying both viruses’ variability upon HDV superinfection in an HBV-expressing transgenic (HBVtg) mouse model knock-out for the IFNα-β receptor (HBVtg/IFNAR-KO).

**Method:** HBVtg/IFNAR-WT and HBVtg/IFNAR-KO mice were infected with $5 \times 10^{10}$ viral genomes of an adeno-vector expressing luciferase or HDV. HBV expression was weekly monitored by quantifying the HBV DNA and RNA in plasma. Intrahepatic viral RNA was extracted at 7- and 21-days post injection (dpi) to quantify the pregenomic RNA (pgRNA) and to study HBV and HDV quasispecies (QS) in respectively HBX (5′-HBX between nucleotide [nt] 1255 to 1611 and 3′-HBX between 1596 and 1936) and HDAG (nt 912–1298 in genome) by next-generation sequencing (NGS). QS variability between the groups was evaluated by identifying the single nucleotide variations (SNVs), whereas HDV editing was quantified by evaluating the percentage of haplotypes with the A281G variation (editing site).

**Results:** A strong reduction of circulating HBV DNA and RNA was observed in presence of HDV especially at 21 dpi. This effect reverted when the IFN-I pathway was inhibited. This trend was not confirmed in liver tissue, where similar concentrations of pgRNA were observed between groups. Several SNVs, especially C to T transition, were specifically identified in HDV HBVtgxIFNAR-WT mice and involved trans-activation domain of the HBX gene at intrahepatic level. HDV genome editing was low at 7 dpi, and increased at 21 dpi, especially in HDV HBVtgxIFNAR-WT mice ($p = 0.002$). Several SNVs, remarkably A to G transitions, were also spotted in HDAG (75 vs 28 for 7 vs 21 dpi, respectively). Notably, most of the SNVs observed at 7 dpi were also identified at 21 dpi for both HBV and HDV QS.

**Conclusion:** In our model, the presence of HDV mainly interfered with HBV particle release rather than intrahepatic expression. Of note this effect seems IFN-I dependent. Several transitions, typical of the intracellular mutagenic enzymes, were observed in both HBV and HDV, and some of them were identified at both timepoints, suggesting that these enzymes might contribute to the viral variability by acting on viral mutational hotspot. In HBV, some of these variations specifically interested the trans-activation domain of the HBX gene and could probably contribute to HBV inhibition.

FRI-229

**Rapid functional secretome analysis of HBV-specific T cells to guide clinical management of CHB patients**

Nina Le Bert1, Apostolos Kofdas2, Anthony Tan1, Lung-Yi Mak2, Sophie Stretch2, Shou Kit Hang1, Haiyan Ma3, Ariel Lee3, Yun Jie4, Upkar Gillii5, Qi Chen1, Qing Zhu4, Antonio Berteolletti4, Patrick Kennedy5. 1Duke-NUS Medical School, Singapore; 2Queens Mary University of London, United Kingdom; 3Cell Diagnostics/Hyris, Singapore; 4Britten Biosciences Limited, United States Email: antonio@ duke-nus.edu.sg

**Background and aims:** Control of Hepatitis B virus (HBV) infection requires functional virus-specific T cells, yet clinical management of patients with chronic HBV infection (CHB) relies exclusively on the assessment of virological and biochemical biomarkers. We aimed to develop a robust rapid assay to measure cytokines secreted or induced by HBV-specific T cells (secretome) with efficient throughput and minimal invasiveness to allow the integration of immunological biomarkers in CHB clinical management.

**Method:** We designed a rapid HBV-specific T cell test method based on the stimulation of whole blood with customized peptide mixtures covering the envelope, nucleoprotein, polymerase and X protein of different HBV genotypes followed by the quantification of plasma cytokines (IFN-γ, IL-2, IL-10, granzyme B, TNF-α, IL-4). The assay performance was tested in healthy HBs vaccines ($n = 32$) and in treated ($n = 31$) and treatment naïve ($n = 42$) CHB patients. In selected patients, the sensitivity of the assay was compared with ex vivo and in vitro expansion ELISpot assays and by spiking known numbers of engineered HBV-specific CD8 T cells into whole blood.

**Results:** Cytokines produced by peptide mixtures covering the different HBV proteins can be individually measured utilizing only 2 ml of whole blood from HBs vaccines and CHB patients. Sensitivity of the assays was comparable and at times even superior to traditional T cell assays. Spiking known numbers of HBV-specific CD8 T cells into whole blood demonstrated that this assay can detect as little as 50–100 HBV-specific T cells in 400 μl of whole blood, a sensitivity corresponding to an HBV-specific T cell frequency in total T
cells of 0.02–0.04%. The quantity and ratio of cytokines detected in different CHB patients revealed a vast heterogeneity of secretome profiles. Through multiple logistic regression, the measured immunological parameters were capable of accurately (ROC AUC = 0.9363) segregating untreated CHB patients with high or low viral load.

Conclusion: We demonstrated that we can accurately assess quantity and multi-functionality of HBV-specific T cells in patients without complex in-vitro manipulation in a small volume of whole blood. The assay sensitivity is comparable with known frequencies of circulating HBV-specific T cells in CHB. Global measurement of cytokines secreted or induced by HBV-specific T cells provides a novel biomarker for the interpretation of host-viral interactions in different categories of CHB patients and can signpost the selection of novel immunotherapies.

FRI-230
Identification and functional analysis of miR-4461 associated with hepatitis B-derived hepatocellular carcinomas
Aiko Sakai1, Masaya Sugiyama1. 1National Center for Global Health and Medicine, Japan
Email: msugiyama@hosp.ncgm.go.jp

Background and aims: The development of hepatocellular carcinoma (HCC) due to hepatitis B is difficult to predict. One reason is that its pathogenesis is not due to a persistent accumulation of inflammation. The molecular changes that occur in cells persistently infected with hepatitis B virus (HBV) are not clear on a cell-by-cell basis. The impact of those HBV-infected cells on the pathogenesis of the disease is also unknown. In this study, single-cell RNA-seq (scRNA-seq) analysis of HBV-infected cells was performed to investigate changes in gene expression on a single-cell basis. The molecules relating to HCC were identified and their functions were analysed.

Method: After the infection of primary hepatocytes with HBV, their scRNA-seq analysis was performed. scRNA-seq data were compared between HBV RNA-positive and negative hepatocytes (cell populations in the same environment) in one dish. The miR-4461 levels of HuH7 and HepG2 cells with and without HBV were identified and analyzed for cell proliferation, invasion and migratory capacity. Target genes to which miR-4461 bound were explored by in vitro assay. miR-4461 was quantified in HCC and non-HCC areas using resected liver tissue of hepatitis B and non-B/non-C.

Results: The primary hepatocytes were infected with HBV and then scRNA-seq was performed. miR-4461 was significantly reduced in HBV-infected hepatocytes. miR-4461 expression was reduced when HBV replication plasmids were transfected into HuH7 and HepG2 cells. siRNA knockdown of miR-4461 enhanced the proliferation, invasive and migratory capacity of HuH7 and HepG2 cells. miR-4461 expression levels were confirmed in liver tissues from hepatitis B and non-B/non-C HCC patients. In non-B/non-C specimens, no difference of the miR-4461 expression was observed in both HCC and non-HCC areas compared to normal liver tissue. On the other hand, in hepatitis B specimens, the expression of miR-4461 was lower than that of normal liver (p < 0.05); in addition, the expression in HCC areas was lower than non-HCC areas (p < 0.05). Target genes of miR-4461 were explored using database and in vitro assay. Then, the FGA gene was one of the targets of miR-4461.

Conclusion: The miR-4461 pathway was suggested to be associated with the establishment and pathogenesis of HBV infection. miR-4461 levels were reduced in liver tissue derived from hepatitis B, and a more significant reduction was observed in HCC area, suggesting that this pathway could be a useful biomarker for HBV-derived HCC.

FRI-231
Reduced hepatic bile acid uptake and blocked hepatitis B viral infection after oral administration of novel small molecule inhibitors of the sodium taurocholate co-transporting polypeptide (NTCP)
Kalliopi Pervolaraki1, Jean-Christophe Vanherck1, Charlene Marcadet1, Lieven Verhoey2, Amse De Meyer2, Madina Rasulova2, Heryhyoung Lyoo3, Jasmine Paulissen2, Hendrik Jan Thibault2, Kristof De Vos4, Patrick Chaltin4, Johan Neyts5, Pieter Annaert1, Philip Meuleman2, Arnaud Marchand1, Matthias Versele1, Stan van de Graaf1. 1CISTIM Leuven vzw, Leuven, Belgium; 2Chent University, Chent, Belgium; 3Katholieke Universiteit Leuven, Leuven, Belgium; 4Centre for Drug Design and Discovery, Leuven, Belgium; 5Amsterdam Um, locatice AMC, Amsterdam, Netherlands
Email: k.f.vandegraaf@amsterdamumc.nl

Background and aims: The sodium taurocholate co-transporting polypeptide (NTCP, SLClOAI) is selectively expressed on the basolateral membrane of hepatocytes and is the main transporter of conjugated bile acids. NTCP also serves as the entry receptor for the hepatitis B virus (HBV) and hepatitis delta virus (HDV). Daily injection with bulevirtide, previously known as Myrcludex-B, a synthetic peptide mimicking the NTCP-binding domain of HBV, is approved in the EU for treatment of patients co-infected with HBV and HDV. Preclinical studies suggest that pharmacological inhibition of hepatitis B salt uptake using bulevirtide ameliorates cholestatic liver injury. Both treatment of viral hepatitis and cholestatic liver diseases require chronic treatment, thus indicating the necessity of orally available small molecule inhibitors for this liver-specific transporter/receptor.

Method: A comprehensive drug discovery effort was conducted to identify and optimize potent and selective small-molecule inhibitors of NTCP-mediated bile acid uptake and HBV/HDV entry with adequate in vitro ADME characteristics. Several examples were evaluated for impact on bile acid disposition in sandwich-cultured human hepatocytes. Oatp1a1/b1 deficient mice were used to determine in vivo impact on bile acid kinetics. Finally, effects of a lead compound on HBV infection were determined in a urokinase-type plasminogen activator-severe combined immunodeficiency (uPA-SCID) humanized liver mouse model.

Results: Several new compounds were synthesized with single-digit nM potency for NTCP and high selectivity (>100×) against ASBT and BSEP mediated bile acid uptake. Consistently, derivatives of this series dose-dependently reduced intracellular bile acid levels in sandwich-cultured human hepatocytes. PK/PD experiments in Oatp1a1/b1 deficient mice and in uPA/SCID humanized liver mice illustrated prolonged target engagement (elevation of serum bile acid levels) allowing for once daily oral dosing schedules. In vitro infection studies demonstrated low nM HBV and HDV entry inhibition, similar to bulevirtide. Finally, a lead compound completely blocked HBV infection in vivo using once daily oral administration in a humanized liver mouse model.

Conclusion: Here we developed orally bioavailable small molecule inhibitors of NTCP with similar anti-HBV efficacy as bulevirtide. This strategy can also be applied to lower hepatocellular bile acid accumulation in cholestatic disease.

FRI-232
The divergent C-terminus of L-HDAg regulates the dynamic life cycle of HDV and the responses to lonaframb treatment
Hongbo Guo1, Qiudi Li2, Yi Ni2, Kuiyang Zheng3, Stephan Urban2, Wenshi Wang1. 1Jiangsu Key Laboratory of Immunity and Metabolism, Department of Pathogenic Biology and Immunology, Xuzhou Medical University, Xuzhou, China; 2Department of Infectious Diseases, Molecular Virology, University Hospital Heidelberg, Germany
Email: wenshi.wang@xzhmu.edu.cn

POSTER PRESENTATIONS
Background and aims: Different life-cycle kinetics of Hepatitis D virus (HDV) genotypes 1–8 were reported previously. C-terminal extension, the only difference between L- and S-HDAg, enables L-HDAg to inhibit HDV replication, but also mediate HDV assembly, explaining the double mode-of-actions of lonafarnib on HDV. Besides blocking HDV assembly, lonafarnib promotes intracellular HDV replication solely via inhibiting L-HDAg isoprenylation, while not through an off-target effect on host prenylated proteins. Conclusion: The divergent C-terminus of L-HDAg per se is not the underlying cause to explain the different kinetics of HDV 1–8. During HDV envelopment, the isoprenylated site and the hydrophobic residues of C-terminus, together with the isoprenylated site, support HBV envelopment, while not needed for non-HBV envelopment. In contrast, the isoprenylated site, but not the prolines and hydrophobic residues, contributes to the trans-inhibitory function of L-HDAg, explaining the double mode-of-actions of lonafarnib on HDV. Besides blocking HDV assembly, lonafarnib promotes intracellular HDV replication solely via inhibiting L-HDAg isoprenylation, while not through an off-target effect on host prenylated proteins.

Method: Constructs to express chimeric or mutant L-HDAg were created. Their roles in HDV replication and production were investigated using northern blot, reverse-transcription quantitative PCR, and an HDV trans-complementary system established.

Results: C-terminus of L-HDAg of HDV 1–8, although highly divergent, inhibits HDV replication and supports virus production with similar efficacy. The prolines and hydrophobic residues of C-terminus, together with the isoprenylated site, support HBV envelopment, while not needed for non-HBV envelopment. In contrast, the isoprenylated site, but not the prolines and hydrophobic residues, contributes to the trans-inhibitory function of L-HDAg, explaining the double mode-of-actions of lonafarnib on HDV. Besides blocking HDV assembly, lonafarnib promotes intracellular HDV replication solely via inhibiting L-HDAg isoprenylation, while not through an off-target effect on host prenylated proteins.

Conclusion: The divergent C-terminus of L-HDAg per se is not the underlying cause to explain the different kinetics of HDV 1–8. During HDV envelopment, the isoprenylated site and the hydrophobic residues of C-terminus, together with the isoprenylated site, support HBV envelopment, while not needed for non-HBV envelopment. In contrast, the isoprenylated site, but not the prolines and hydrophobic residues, contributes to the trans-inhibitory function of L-HDAg, explaining the double mode-of-actions of lonafarnib on HDV. Besides blocking HDV assembly, lonafarnib promotes intracellular HDV replication solely via inhibiting L-HDAg isoprenylation, while not through an off-target effect on host prenylated proteins.
miR-26a targets USP15 to robustly suppress hepatitis E virus replication via the enhancement of RIG-I-mediated type I interferon response

Jikai Zhang1, Dan Liu1, Zijie Wang1, Renxian Tang1, Hongbo Guo1, Wenshi Wang1. 1Xuzhou Medical University, China
Email: wenshi.wang@xzhmu.edu.cn

Background and aims: Hepatitis E virus (HEV) infection is the leading cause of acute viral hepatitis globally. However, no specific antivirals are available. Being one of the key host natural antiviral responses, small noncoding RNAs (miRNAs) represent a novel antiviral strategy. Nevertheless, the key miRNAs that regulate HEV life cycle remain largely elusive.

Method: IFN-β promoter activities were determined by dual luciferase reporter (DLR) assay. The mRNA levels of IFN-β, interferon stimulated genes (ISGs) and USP15 or the relative level of HEV RNA were determined by real-time quantitative PCR (qRT-PCR), respectively. The protein levels of USP15, RIG-I, IRF3 and HEV ORF2 were verified by immunoblotting or immunofluorescence assay (IFA). The interaction between USP15 and key elements of IFN pathway or the ubiquitination levels were determined by co-immunoprecipitation (co-IP) and immunoblot analyses.

Results: Herein, we found that miR-26a robustly suppressed HEV replication via the specific inhibition of USP15 expression. Mechanistic investigation revealed that USP15 interacts directly with the retinoic acid-inducible gene I (RIG-I) to deubiquitinate K63-linked RIG-I, thus negatively regulating type I interferon (IFN) signalling. Conversely, miR-26a, by downregulating USP15, promotes RIG-I K63-ubiquitination to enhance type I IFN antiviral responses, resulting in an active antiviral state against HEV. Intriguingly, the activation of type I IFN responses could suppress miR-26a expression, serving as an intrinsic negative feedback loop to maintain balanced activating signals.

Conclusion: This research identified a new anti-HEV miRNA and elucidated the antiviral mode-of-action. miR-26a may serve as a potential antiviral candidate for combating HEV infection.

Altered metabolic program initiates immune activation leading to hepatitis B surface antigen seroconversion in mild and severe hepatitis B reactivation patients

Jayesh Kumar Sevak1, Mojahidul Islam1, Anoushka Saxena1, Gayantika Verma1, Manoj Kumar2, Ankur Jindal2, Gayatri Ramakrishna3, Shiv Kumar Sarin2, Nirupma Trehanpati1. 1Institute of Liver and Biliary Sciences, Molecular and Cellular Medicine, New Delhi, India; 2Institute of Liver and Biliary Sciences, Department of Hepatology, New Delhi, India
Email: trehanpati@gmail.com

Background and aims: Rate of seroconversion in hepatitis B reactivation (rHBV) patients is based on the clinical syndrome. Along with elevated bilirubin, coagulopathy, ascites, hepatic encephalopathy, organ failure, systemic immune and metabolic responses play vital role in morbidity and mortality. Therefore, our aim was to understand the immune and metabolic responses in mild, severe and ACLF leading to seroconversion.

Method: Total sixty-seven rHBV patients (age 42 ± 13) with raised ALT (>5XULN) and HBV DNAlog104−8 categorized as mild (n = 42, INR < 1.5), severe (n = 10, INR > 1.5, bilirubin >2.5XULN) and ACLF (n = 15) were studied at baseline, week (wk) 12 and 24. Soluble inhibitory molecules and plasma metabolomics was assessed using multiplex bead array and mass spectrometry respectively. High dimensional immune cell profiling was done by flow cytometry.

Results: Of 67 patients, 12 were seroconverted, 7 from mild and five from severe group, but none was seroconverted from ACLF group.
Baseline, no significant difference was observed in the proportions of total CD4/CD8, central memory (CM), TEMRA, B cells, THF cells and soluble inhibitory receptors except effector memory (EM) which was significantly compromised in ACLF patients compared to mild and severe. At baseline, metabolomics analysis revealed, 32 commonly expressed metabolites associated with beta alanine, arginine, ornithine, porphyrin, urobiolinogen metabolism and valine, leucine and isoleucine biosynthesis in mild and severe groups. Which play critical role in exiting T cells from quiescence and leading to T cell activation and cytokine secretion. At wk 12, all B cell subsets including naïve, mature, activated, classical memory, plasma B cells were significantly increased in mild patients compared to severe and ACLF. In severe and ACLF patients, soluble TIM3, LAG3, PDL2, CD27 and CD80 and atypical memory B cells were significantly appeared more with decline in Tfh cells indicating exhausted B cells and formation of short lived plasma B cells. Further, in severe and ACLF patients, unique metabolites pertaining to purine, taurine, hypotaurine, phenylalanine metabolism were expressed with critical role in immune inhibition and anti-inflammatory response. At wk 24, B cells and THF were significantly increased in mild and severe but declined in ACLF. In ACLF 75 unique metabolites associated with TCA cycle, Phenyllalanine, tyrosine, tryptophane biosynthesis, alanine, aspartate and glutamate metabolism leading to insulin resistance and metabolic alterations.

Conclusion: Our results show that metabolism of beta alanine, arginine, ornithine, porphyrin and urobiolinogen contribute immensely to immune activation. Increase levels of soluble inhibitory molecules in ACLF leads to immune and metabolic dysfunction and multiorgan failure.

FRI-236
HBsAg level defines different clinical phenotypes of chronic HBV infection eAg(-) related to the quality of the HBV-specific CD8 cell response

Jeniffer Martínez1,2, Henar Calvo Sánchez1,2,3, Julia Peña Asensio1, Carlos J. Esteban1,3, Juan Ramón Larrubia2,3,4,5. 1Department of Hepatology, Hospital General Universitario Gregorio Marañon, Madrid, Spain; 2Hospital Universitario de Guadalajara, Translational Hepatology Unit, Spain; 3University of Castilla-La Mancha, School of Medicine, Spain; 4University of Alcalá, Department of Biology, Spain; 5University of Alcalá, Department of Medicine and Medical Specialties, Spain

Email: juan.larrubia@uah.es

Background and aims: Chronic e-Ag-negative HBV infection (CIBE(-)) is characterized by little progression of liver fibrosis and a vigorous HBV-multispecific CD8+ cell response. The level of HBV surface antigen (HBsAg) could differentiate different subtypes of CIBE(-). Aims: To evaluate whether HBsAg level correlates with different clinical phenotypes of CIBE(-) and with the quality of the HBV-specific CD8+ cell response.

Method: An analytical cross-sectional study was performed in a cohort of 56 patients with CIBE(-) followed-up for at least one year (95% CI: 5.5–7.5) with ALT<50 IU/ml, HBV viral load (VL) <20,000 IU/ml, APRI<0.5 and Fibroscan <7 KPa. HBsAg level (<300 IU/ml, 300–1000 IU/ml, >1000 IU/ml) was correlated with ALT, AST, APRI, liver stiffness by elasticity, platelets, HBV VL, percentage of HBV VL measurements >2000 IU/ml, APRI/years of evolution ratio, Fibroscan (KPa)/years of evolution. In HLA-A2 positive patients we also analyzed the proliferation capacity of HBV-specific CD8+ cells against core18-27, polymerase456-63 and envelope183-91 epitopes after antigenic encounter, using pentameric technology by flow cytometry.

Results: A positive linear trend was observed between HBsAg level and APRI level (p = 0.002), Fibroscan (p = 0.004), ALT (p = 0.018), AST (p = 0.009), HBV VL (p = 0.037), frequency of HBV VL > 2000 IU/ml (p = 0.046) and a negative correlation with platelet level (p = 0.024), although all these values were always within the normal range. The frequency of cases with HBV-specific CD8+ cell response against at least two HBV epitopes was significantly higher in cases with HBsAg < 1000 IU/ml (p = 0.037) and this was due to a different response against polymerase456-63 (p = 0.022). This response was decreased in cases with HBsAg > 1000 IU/ml, while the response against HBV core18-27 was preserved and the response against envelope183-91 was abolished, regardless of HBsAg level. Cases with preserved CD8+ cellular response against HBV polymerase456-63 had lower KPa/years of infection (p = 0.036) and APRI/years of infection (p = 0.004). The intensity of specific CD8+ HBV-polymerase456-63 CD8+ response was negatively correlated with Fibroscan (KPa)/years of evolution (p = 0.027).

Conclusion: Some CIBE(-) patients with HBsAg > 1000 IU/ml present indirect data of higher degree of inflammation, liver stiffness and speed of fibrosis progression which are related to an altered anti-HBV-polymerase456-63 CD8+ cell response. In cases of CIBE(-) with HBsAg > 1000 IU/ml, the cytotoxic T cell response against polymerase should be evaluated and if absent, a liver biopsy should be performed to evaluate the need for treatment.

FRI-237
Chimeric bio-nanoparticles induce targeted HBeAg seroconversion in a HBV hydrodynamic injection mouse model

Yianni Droungas1,2, Hugh Mason1, Chee Leng Lee1, Rachel Hammond1, Stephen Locarnini1, Renae Walsh1, Hans Netter1, Peter Revill1,2, 1Victorian Infectious Diseases Reference Laboratory, Royal Melbourne Hospital at the Peter Doherty Institute for Infection and Immunity, Australia; 2Department of Microbiology and Immunology, The University of Melbourne, Victoria, Australia

Email: peter.revill@mh.org.au

Background and aims: The hepatitis B e antigen (HBeAg) is a secreted viral protein important for establishing chronic HBV infection. HBeAg seroconversion is a current treatment end point and a preceding step to functional cure. This project utilised HBeAg-epitope expressing bio-nanoparticles (HBeAg-BNP) as immunogens in a hydrodynamic injection (HDI) mouse model of HBV persistent replication. HBeAg seroconversion was investigated as a novel therapeutic strategy.

Method: HBeAg-BNP candidates were bioengineered using a panel of HBeAg-specific epitopes. Immunogenicity studies were performed in BALB/c mice to identify the most immunogenic HBeAg-BNP candidates, which were then tested using the HDI mouse model. HBV markers of replication, protein expression and antibody production were assessed.

Results: Immunisations of naïve BALB/c mice with HBeAg-BNPs induced HBeAg-specific immune responses against the inserted HBeAg epitopes. Sera from HBeAg-BNP treated BALB/c mice detected HBeAg peptides and native HBeAg by ELISA. Two candidate HBeAg-BNPs (BNP1 and BNP2) were further tested using the HDI mouse model of persistent HBV replication, resulting in 40% (BNP1, 3/7 mice) and 66% (BNP2, 8/12 mice) HBeAg seroconversion. In addition, HBsAg loss was observed almost 20% of the HBeAg-BNP2 group (2/12 mice), with modest (up to 0.9 log) reductions in HBV DNA also observed in some BNP2-treated mice. HBeAg seroconversion, HBsAg loss, or reductions in HBV DNA were not observed in any wild-type BNP control mice (0/7). No difference was observed in the abundance of anti-core positive hepatocytes in BNP treated, or wild-type BNP control mice.

Conclusion: This is the first study to show that HBeAg-BNPs trigger HBeAg-specific immune responses against the native HBeAg and induce its seroconversion. In turn, treatment with HBeAg-BNP2 led to HBsAg loss and HBV DNA reductions in some mice, although did not lead to antibody-mediated clearance of HBV infected hepatocytes. These findings suggest that targeting HBeAg and the induction of anti-HBe antibodies should be further investigated as a novel therapeutic approach.
FRI-238

Pharmacodynamic durability of ALG-125755, a GalNAc-conjugated siRNA, correlated with total and RNA induced complex (RISC) bound siRNA in mouse liver

Kusum Gupta1, Megan Fitzgerald1, Jin Hong1, Cheng Kao1, Cheng Liu1, Kha Le1, Suchet Mukherjee1, Dinah Misner1, Meenakshi Venkatraman1, Matt McClure1, Sushmita Chanda2, John Fry1, David Smith1, Julian Symons1, Lawrence Blatt1, Leonid Beigelman1, Tse-I Lin2, 1Aligos Belgium Bv, Leuven, Belgium

Background and aims: For the functional cure of chronic hepatitis B, a sustained loss of hepatitis B surface antigen (HBsAg) is required. Targeted small interfering RNAs (siRNAs) have recently demonstrated significant clinical reduction of HBsAg. ALG-125755 is a novel N-acetylgalactosamine (GalNAc)-conjugated siRNA currently in clinical development. Here we demonstrate its mechanism of action, and correlate the durable pharmacodynamics to total and RNA induced silencing complex (RISC) bound siRNA in mouse liver in the adenovirus-associated virus (AAV)-HBV mouse efficacy model.

Method: To confirm the mechanism of action of ALG-125755, argonaut-2 (AGO-2) degradation of the target S-region HBV RNA sequence induced by the antisense strand (AS), ALG-125736, was qualitatively measured using denaturing polyacrylamide gel electrophoresis. Total and RISC-bound siRNA quantification was performed in the harvested livers from a previously reported adeno-associated virus (AAV)-HBV mouse efficacy study, where a 10 mg/kg single dose or repeat doses up to 70 days at 5 mg/kg every other week (Q2W) or four every weeks (Q4W) demonstrated significant and durable decline in serum HBsAg. Liver samples (Days 14, 28, 70, each prior to the dose, and postdose timepoints at Days 98 and 168) from the single dose and repeat (Q2W) dose groups were analyzed by liquid chromatography-high resolution accurate mass method for total siRNA and immunoprecipitation/reverse transcription-quantitative polymerase chain reaction method for RISC-bound siRNA.

Results: The AS, ALG-125736, complementary to the highly conserved S-region of the HBV RNA sequence, induced cleavage of the target RNA sequence from the S-region of HBV by AGO-2. The engagement of ALG-125755 with AGO-2 protein was confirmed in vitro and also in vivo in the AAV-HBV mouse. Following a single dose in AAV-HBV mice, the half-life of RISC-bound siRNA (23.5 days) was two times longer than that of the total liver siRNA (11.7 days). Upon repeat Q2W dosing, kinetics of RISC-bound siRNA was similar to the total siRNA. Sustained RISC-bound siRNA concentrations were achieved upon repeat dosing. RISC-bound siRNA was quantifiable through the last study day 168 with the repeat dose (Q2W regimen) and at up to 98 days following a single dose. The durability of HBsAg reduction corresponded with both the total and the RISC-bound siRNA.

Conclusion: Binding of ALG-125755 to AGO-2 was demonstrated in vitro and in vivo, confirming that the mechanism of action for ALG-125755 is consistent with that of an siRNA. Pharmacodynamic response of HBsAg reduction and durability correlated with total siRNA and RISC-bound siRNA in mouse liver. The long half-life of the RISC-bound siRNA indicates that dosing in human could be less frequent than monthly dosing.

FRI-239

A potent human PD-L1 siRNA leads to significant reduction of AAV-HBV infected hepatocytes via immune activation in human PD-1/PD-L1 double knock in mice

Jin Hong1, Dawei Cai1, Saul Montero1, Hua Tan1, Vivek Rajwanshi1, Aneerban Bhattacharya1, Kang Hyunsoon1, Min Luo1, Leonid Beigelman1, David Smith1, Lawrence Blatt1, Julian Symons1, Leonid Beigelman1, 1Aligos Therapeutics, South San Francisco, United States

Email: kgpu@aligos.com

Background and aims: T cell exhaustion is characteristic of chronic hepatitis B (CHB) and contributes to the persistence of hepatitis B virus (HBV) infection. PD-1/PD-L1 is the dominant co-inhibitory axis mediating T cell exhaustion in CHB patients. Monoclonal antibodies against PD-1 or PD-L1 have been tested in CHB patients and have shown promising results. However, the dose of antibodies administered were significantly lower in CHB patients than in cancer patients to minimize immune related adverse events. Compared with antibodies, subcutaneously (SC) delivered siRNA have a short half-life in plasma and exposure is mainly concentrated in the liver, thereby reducing the potential for systemic toxicities. We have developed a GalNAc conjugated human PD-L1 (hPD-L1) siRNA lead molecule, ALG-072571, that demonstrated significant reduction of AAV-HBV infected hepatocytes through immune activation in human PD-1/PD-L1 double knock in (KI) mice.

Method: siRNAs were synthesized on a MerrImade synthesizer. In vitro human PD-1 knockdown was evaluated in the SNU-387 cell line by RT-qPCR. GalNAc PD-L1 siRNA pharmacodynamics (PD) were studied by assessing Poly IC induced human PD-L1 levels in double KI mice. In double KI mice chronically infected with AAV-HBV, ALG-072571 and HBV siRNA ALG-125819 were dosed SC as single agents (8 x 7.5 mg/kg QW and 4 x 5 mg/kg QOW respectively) or in combination. Serial serum collections were tested for HBsAg, HBeAg, HBV DNA and ALT. Terminal serum samples were assayed for anti-HBsAg antibody. Mouse livers were stained for HBeAg, HBsAg and CD3 using IHC and scored for positive cells.

Results: Unconjugated ALG-072571 containing novel siRNA stabilization chemistries showed an EC50 of 90 pM in reducing hPD-L1 RNA in SNU387 cells. In a PD study, a single SC 7.5 mg/kg dose of ALG-072571 reduced liver hPD-L1 RNA by 71% and protein by 45%. In parallel FACS analysis, the cell surface hPD-L1 level in liver CD45+ immune cells were reduced by 18% and in Kupffer cells by 37%. In an AAV-HBV study using double KI mice, ALG-072571 repeat dosing reduced HBsAg, HBeAg and HBV DNA by 3.3 log10 IU/ml, 1.73 log10 PEIU/ml and 4.5 log10 IU/ml respectively. ALT elevation was observed preceding the viral marker reductions. In liver IHC HBeAg staining, the core positive hepatocyte percentages were approximately 60% for the vehicle control and ALG-125819 alone groups, but not detectable in ALG-072571 alone and combination groups. ALG-072571 alone and in combination also showed CD3+ T cell infiltration in the liver and anti-HBsAg antibody in the serum of mice with the lowest HBsAg levels.

Conclusion: Liver targeted PD-L1 siRNA therapy may lead to restoration of immune responses against HBV and consequent clearance of HBV infection.

FRI-240

Impact of cirrhosis and long-term follow-up on the inflammatory milieu after hepatitis C virus (HCV) elimination by direct-acting antiviral (DAA) therapy

Moana Witte1,2,3,4, Carlos Oltmanns1,2,3,4, Jan Tauwald1,2,3,4, Gordon Grabert5,6, Leon Kalix5,6, Daniel Dehncke5,6, Hagen Schmaus3,4, Heiner Wedemeyer1, Benjamin Maasoumy1, Tim Kacprowski5,6, Anke Kraft1,3,4, Markus Cornberg3,4,5,6, 1Hannover Medical School, Department of Gastroenterology, Hepatology and Endocrinology, Germany; 2German Center for Infection Research (DZIF), Hannover, Germany; 3Center for Individualized Infection Medicine (CIM), Hannover, Germany; 4Twincore, Center of Experimental and Clinical Infection Research, Hannover, Germany; 5Peter L. Reichertz Institute for Medical Informatics of Technische Universität Braunschweig and Hannover Medical School, Division Data Science, Braunschweig, Germany; 6Braunschweig Integrated Centre for Systems Biology (BRICS), Technische Universität Braunschweig, Braunschweig, Germany

Email: witte.moana@mh-hannover.de
Background and aims: DAA therapy results in sustained virologic response in over 99% of patients with chronic HCV. However, a proportion of patients remain at risk for long-term sequelae, such as fatigue or development of hepatocellular carcinoma (HCC), suggesting persistent biological alterations. Following our previous results showing the impact of chronic HCV on the inflammatory milieu in the context of short-term follow-up of 12–24 weeks after DAA therapy, we now aim to further investigate the effect of viral elimination in cirrhotic and non-cirrhotic patients at long-term follow-up.

Method: 104 chronic HCV patients, 47 with cirrhosis (age 57.31 ± 9.37, elastography 34.17 ± 17.49), of whom 8 developed HCC, and 57 without cirrhosis (age 57.90 ± 11.70, elastography 7.65 ± 2.50), were treated with DAA. Plasma samples were available at baseline, at the end of treatment, and at long-term follow-up (median: 96 weeks). 40 inactive HBSAg carriers (HBeAg negative, ALT normal) and 16 healthy individuals served as controls. Plasma levels of 92 soluble immune markers (SIM) were measured by Olink Proteomics using a proximity extension assay.

Results: Compared with controls, 43 SIM were statistically significantly altered at baseline in all chronic HCV patients (Welch Two Sample t-test, adjusted p value <0.05). However, an independent comparison between cirrhotic and non-cirrhotic HCV patients revealed very distinct SIM profiles (49 altered SIM in cirrhotics, 24 altered SIM in non-cirrhotics compared to controls). Moreover, SIM dynamics after DAA treatment differed significantly between cirrhotic and non-cirrhotic patients. Compared to controls, no SIM was significantly changed anymore in non-cirrhotics at long-term follow-up, while 39 SIM were still significantly (adjusted p value<0.05) modified in cirrhotics. Of the SIM that were elevated at baseline in both HCV patients with and without cirrhosis, 16 of these “HCV-specific SIM” (including CXCL10, CXCL11, IL-8, PD-L1, IL-15RA, HGF) were still significantly elevated in cirrhotic patients at long-term follow-up, while 39 SIM were still significantly (adjusted p value<0.05) modified in cirrhics. Of the SIM that were elevated at baseline in both HCV patients with and without cirrhosis, 16 of these “HCV-specific SIM” (including CXCL10, CXCL11, IL-8, PD-L1, IL-15RA, HGF) were still significantly elevated in cirrhotic patients at long-term follow-up in addition to “cirrhosis-specific” SIM (e.g., IL-6, FGF-23, CXCL6, CCL25, MMP-10, MCP-1). Interestingly, some of these “HCV-specific SIM” (e.g., HGF) showed different dynamics in patients who developed HCC compared to matched cirrhotic controls without HCC.

Conclusion: After successful HCV elimination, the HCV specific inflammatory milieu remains altered in cirrhotic patients. Our data suggest that “HCV-specific” and “cirrhosis-specific” changes in the inflammatory milieu can be distinguished. Some of the SIM, known to be associated with carcinogenesis, show different dynamics over time in HCC patients, suggesting a possible link between an altered inflammatory milieu and HCC development.

FRI-241
Preclinical pharmacokinetic, pharmacodynamic and efficacy relationships of ALG-093702, a liver targeted PD-L1 small molecule inhibitor, in different in vivo models

Heleen Roose1, Qingling Zhang2, Kha Le2, Andreas Jekle2, Kristina Rekstye-Matiene1, Sarah Stevens2, Ruchika Jaisinghani3, Cheng Liu2, Sandra Chang2, Antitsa Stoycheva2, Lawrence Blatt2, Leonid Beigelman3, Julian Symons2, Sushmita Chanda4, Francois Gonzalez2, Tongfei Wu1, 1Aligos Belgium Bv, Belgium; 2Aligos Therapeutics, Inc., United States

Background and aims: The PD-1/PD-L1 immune checkpoint pathway is an attractive target to reverse immune tolerance in chronic hepatitis B (CHB). However, due to the systemic immune adverse effects associated with antibodies, a lower dose of PD-1/PD-L1 antibodies has been used in CHB vs the dose used for cancer. ALG-093702 is a liver-targeted PD-L1 small molecule inhibitor that preferentially partitions into the liver and thereby may potentially mitigate extra-hepatic on-target related toxicity. Characterizing the relationship between pharmacokinetics (PK), pharmacodynamics (PD) and the efficacy of ALG-093702 is critical for selecting the dosing strategy of new liver targeted PD-L1 inhibitor drugs.

Method: Preclinical pharmacokinetic, pharmacodynamic, and efficacy relationships of ALG-093702, a liver targeted PD-L1 small molecule inhibitor, in different in vivo models

Results: Oral dosing of ALG-093701, a prodrug of ALG-093702, was used for in vivo PK/PD/efficacy studies. In vivo PK/PD/efficacy were assessed in humanized-PD-L1 MC38 subcutaneous xenografts and/or a liver metastasis mouse model.

Results: ALG-093702 inhibited PD-1/PD-L1 interaction with picomolar IC50 values (IC50 = 0.048 nM) and increased TCR signaling in Jurkat cells with an EC50 of 5.9 nM. In an ex vivo study, ALG-093702 activated HBV-specific T cells from an HBV-infected patient and assessed by measuring IFN gamma release. Oral dosing of ALG-093701, a prodrug of ALG-093702, was used for in vivo PK/PD/efficacy studies. In vivo PK/PD/efficacy were assessed in humanized-PD-L1 MC38 subcutaneous xenografts and/or a liver metastasis mouse model.

Results: ALG-093702 inhibited PD-1/PD-L1 interaction with picomolar IC50 values (IC50 = 0.048 nM) and increased TCR signaling in Jurkat cells with an EC50 of 5.9 nM. In an ex vivo study, ALG-093702 activated HBV-specific T cells from an HBV-infected patient to a similar extent as durvalumab. In mouse pharmacokinetic studies, ALG-093702 exhibited significantly higher liver concentrations vs. other tested tissues (liver/lung ratio of 10). In a humanized-PD-L1 MC38 subcutaneous mouse model, oral dosing 50 mg/kg of ALG-093701 achieved a similar extent of PD-L1 target occupancy and tumor growth inhibition as durvalumab. This study also demonstrated that the PD-L1 target occupancy was correlated with ALG-093702 tumor concentration.
Background and aims: Current treatment options for chronic HBV infection can slow disease progression, but “cure” of HBV infection is a rare event. Therefore, several new therapeutic strategies aimed at “functional cure” (HBsAg loss) are currently being developed. Immune responses are thought to be important for HBV disease progression and HBV cure. Human gamma-delta (γδ) T cells have been shown to play a role in various infectious diseases and are enriched in solid tissues such as the liver, suggesting a role in liver-associated diseases. However, their role in chronic HBV infection remains largely unknown. The aim of this study is to investigate the phenotype, function, and T-cell receptor (TCR) repertoire of γδ T cells in patients with chronic HBV infection with different viral and clinical characteristics, including patients discontinuing long-term NA therapy.

Method: We performed in-depth ex vivo phenotyping of 87 chronic HBV patients with different HBsAg and HBeAg levels and controls using a 28-color full-spectrum flow cytometry panel. In addition, PBMC from selected patients were stimulated with phytohemagglutinin. In addition, TCR sequencing of TCR gamma and TCR delta from mass-sorted Vγ9+ and Vγ9- γδ T cells was performed using an NGS approach with Illumina MiSeq. In addition, the transcriptome of γδ T cell subsets was analyzed by single-cell sequencing. Intrahepatic γδ T cells from some subjects were examined.

Results: We detected and further characterized two distinct γδ T cell populations (CXCR6+ γδ T cells and CD16+ γδ T cells) that were differentially abundant in patients with high (>3.87 log) and low (<3.87 log) HBeAg levels, whereas HBsAg levels made no difference. Thus, patients with higher HBeAg levels had a higher frequency of CXCR6+ γδ T cells (similar phenotype to the recently described CXCR6+CD8+ “autoaggressive” T cells). Analysis of liver tissue samples revealed a higher frequency of CXCR6+ γδ T cells in the liver compared with blood. A pilot study showed that patients with marked ALT flares after discontinuation of NA treatment had an increase in CXCR6+ γδ T cells. Interestingly, two patients with similar CXCR6+ γδ T cell kinetics had similar γδ TCR diversity and showed subsequent HBsAg loss. In contrast, CD16+ γδ T cells were significantly increased in patients with low HBeAg levels, and after stimulation, CD16+ γδ T cells showed more cytotoxicity (granzyme B) than CD16- γδ T cells. Transcriptome analyses are ongoing.

Conclusion: Our data suggest that γδ T cells may be involved in the immunopathogenesis in chronic HBV infection. We describe two distinct γδ T cell populations that may support viral control in distinct situations but also contribute to hepatitis.

FRI-243
Recombinant hepatitis E viruses harboring a split luciferase tag in the ORF2 capsid protein
Maliki Ankavay1, Nathalie Da Silva1, Noémie Oechslin1, Katja Dinkelborg2, Patrick Behrendt3, Darius Moradpour1, Jérôme Couttenoire1, 1Lausanne University Hospital (CHUV) and University of Lausanne, Lausanne, Switzerland, Service of Gastroenterology and Hepatology, Lausanne, Switzerland; 2TWINCORE Centre for Experimental and Clinical Infection Research, Experimental Virology, Germany; Email: maliki.ankavay@chuv.ch

Background and aims: Hepatitis E virus (HEV) infection is the most common cause of acute viral hepatitis worldwide. The viral genome harbors three open reading frames (ORF). The ORF2 protein corresponds to the viral capsid. Molecular studies of the HEV life cycle have been hampered by the lack of robust and sensitive cell culture systems. Hence, the main receptor for HEV cell entry is still elusive and there are no specific antiviral drugs against HEV so far. Here, we aimed to develop a convenient, quantitative and potentially scalable reporter system for HEV infection and replication.

Method: Transposon-mediated random insertion was exploited to identify functional insertion sites within the HEV ORF2 protein. Full-length viral genomes with in-frame insertions of a split luciferase (HiBiT) tag in the capsid protein were characterized by immunofluorescence and immunoblot analyses as well as functional assays. Luciferase activity was quantified by luminometry.

Results: Transposon-mediated random insertion and sequencing of viable genomes identified functional insertion sites in the HEV capsid protein. HEV harboring a HiBiT tag in C-terminal sites remained infectious and functional in terms of RNA replication and capsid secretion, allowing for antibody-free detection and quantitation of capsid protein by luciferase assay. As a proof-of-concept, the antiviral effect of ribavirin and sofosbuvir could be assessed in a quantitative manner. Moreover, neutralization of purified quasi-enveloped and naked HEV by convalescent sera and specific monoclonal antibodies could be measured conveniently. Finally, a broad-scale kinase inhibitor screen identified several compounds with potent antiviral activity that are currently being validated and further characterized in terms of mode of action.

Conclusion: Identification of functional insertion sites enabled tagging of the HEV capsid protein with a highly sensitive and quantitative miniaturized luciferase reporter. Tagged HEV allowed for convenient read-out of infection and replication, with a potential to develop large-scale screening assays for entry inhibitors and other...
Identification of resistance-associated variants after sofosbuvir treatment in chronic hepatitis E patients

André Goemer1, Mara Klöhn1, Michelle Jagst1, Maximilian Nocke1, Thomas Hörvaritis1, Julian Schulze zur Wiesch2, Svenja Hardtke2, Tobias Müller3, Heiner Wedemeyer4, Markus Cornberg4, Patrick Behrendt4, Eike Steinmann1, Daniel Todt1, 1Molecular and Medical Virology, Germany; 2University Medical Center Hamburg-Eppendorf, Germany; 3Charité-Universitätsmedizin Berlin, Berlin, Germany; 4Medizinische Hochschule Hannover, Hannover, Germany

Email: andre.goemer@rub.de

Background and aims: Hepatitis E virus (HEV) infections remain a serious problem in immunocompromised patients, leading to chronic infections in about 50% of cases. As of now, off-label use of Ribavirin is the only treatment option, since no HEV-specific antivirals are available. Recently, the hepatitis C virus polymerase inhibitor sofosbuvir was however evaluated as a potential antiviral against HEV in vitro and in vivo. The most comprehensive investigation was a 24-week multicenter phase II pilot trial, were nine chronically HEV-infected patients were treated with sofosbuvir. HEV RNA transiently decreased by 2 log, but increased back to pre-treatment levels within 24 weeks of treatment onset. We aim to identify the reason for viral recurrence by characterizing changes in the viral population during treatment.

Method: For this, we performed amplicon deep sequencing to characterize viral population dynamics in the nine patients treated with sofosbuvir. In addition, we used an HEV-based reporter cell culture system to characterize high-frequency variants that might affect sensitivity to sofosbuvir.

Results: Most patients had highly divergent HEV populations, which suggest a high adaptability to treatment-related selection pressures, possibly associated with the emergence of treatment-resistant variants. We identified amino acid substitution from different time points and singled out substitutions that had become dominant in multiple patients (A1343V, K1383N, D1384N, V1479I, G1634R). These were then cloned into an HEV-3 replicon system to assess their effect on replication fitness and sensitivity to sofosbuvir. The half maximal effective concentration (EC50) was up to 20-fold higher than control, suggesting that variants associated with lower susceptibility were possibly associated with the emergence of treatment-resistant variants. We identified amino acid substitution from different time points and singled out substitutions that had become dominant in multiple patients (A1343V, K1383N, D1384N, V1479I, G1634R). These were then cloned into an HEV-3 replicon system to assess their effect on replication fitness and sensitivity to sofosbuvir. The half maximal effective concentration (EC50) was up to 20-fold higher than control, suggesting that variants associated with lower susceptibility were possibly selected during sofosbuvir treatment. In particular, substitution A1343V, which occurred in eight of nine patients during treatment but was not present at baseline, showed a strong increase both in combination with V1479I (20-fold) and as a single substitution (10-fold).

Conclusion: In conclusion, viral population dynamics play a critical role during antiviral treatment. High population diversity during sofosbuvir treatment led to the selection of variants with higher fitness. In particular, the A1343V substitution selected in most patients showed an increased sofosbuvir resistance in vitro, which may have led to treatment failure in vivo.

FRI-245

HBsAg kinetics at month 9 after analogue treatment discontinuation in chronic hepatitis B eAg (-) predicts long-term HBV control

Henar Calvo Sánchez1,2, Julia Peña Asensio1,1,1, Jeniffer Martínez1,2, Alberto Delgado1, Joaquin Miquel1, Eduardo Sanz de Villalobos1, Alejandro González Praetorius1, Miguel Torralba1,2, Juan Ramón Larrubia1,2, 1University of Alcalá, Department of Medicine and Medical Specialties, Spain; 2University of Alcalá, Department of Biology, Spain

Email: juan.larrubia@uah.es

Background and aims: Withdrawal of nucleos (t)ide analogue (NUC) treatment in eAg (-) chronic hepatitis B (CHBeAg (-)) may lead to HBV control. However, there are no markers that predict who benefits from this strategy. Objective: To assess whether HBsAg kinetics after NUC suspension is associated with long-term HBV control.

Method: A longitudinal study of 22 CHBeAg (-) patients previously treated with NUCs for more than 3.5 years and with liver fibrosis <3 was performed. After discontinuation of treatment, patients were followed monthly in the first quarter and quarterly thereafter, with a follow-up of three years. HBV viral load, HBsAg level and serum alanine aminotransferase (ALT) level were quantified at each follow-up visit. At the end of follow-up (month 36), a patient was considered to be HBV infection controller if the viral load (HBV36) was <2000 IU/ml and the ALT level (ALT36) was normal. We analyzed whether the decrease in HBsAg at month 9 after treatment discontinuation correlated with HBV control at month 36 post-suspension and with the probability of having a multi-specific HBV-functional CD8+ cell response, according to the predictive logistic regression model previously described by our group (Peña-Asensio et al. Aliment Pharm Ther 2022).

Results: After discontinuation of treatment with NUCs, an overall decrease in HBsAg level was observed after 36 months of follow-up (p < 0.001), which was greater in the group with HBV36 < 2000 IU/ml (p = 0.004). The percentage of HBsAg level decrease after 9 months of NUC treatment discontinuation correlated with the presence of HBV36 < 2000 IU/ml and normal ALT36 (Area under ROC curve: 95% CI: 0.58–0.92, p = 0.037). The absence of HBsAg decline at month 9 after NUC suspension presented a 100% negative predictive value of viral control at month 36, while a decline ≥40% was associated with a 100% predictive positive value of HBV36<2000 IU/ml. The level of HBsAg decline at month 9 correlated positively with the probability of having a functional HBV-multispecific CD8+ cell response at the end of treatment, (r = 0.566, p = 0.009). Percentage of HBsAg variation after 6-month NUC stop correlated with the clinical status at end of follow-up (HBsAg loss, inactive carrier, grey zone, re-treatment), (p = 0.002).

Conclusion: A decrease in HBsAg level ≥40% at month 9 after NUC discontinuation in CHBeAg (-) is associated with long-term HBV control, while the absence of decrease implies reactivation of infection during follow-up. The level of HBsAg decline at month 9 correlates positively with the likelihood of having recovered a functional HBV-multispecific CD8+ cell response.
Background and aims: There is renewed focus on the importance of non-specific bystander T cells as major contributors to hepatic immunopathology in chronic hepatitis B (CHB). It is key to ascertain details on this understudied immune cell population to provide further insights into the reasons for immunological failure of novel therapies for CHB cure. We studied the phenotypic innate-like properties of global CD4 and CD8 T cells in treatment naive and experienced patients with CHB compared to healthy controls (HC) to determine any differences and correlated these with clinical parameters.

Method: Forty-six subjects (47.8% male, median age 39.5 years) were studied [CHB; 20, HC; 26]. The proportion of activated (HLA-DR+) T cells was determined along with the expression of NK cell receptors (NKRs), markers of T cell differentiation and residency by multi-parameter flow cytometry. The impact of antiviral therapy in a cohort of CHB subjects was also analysed [median tenofovir treatment duration 7.6 years; median ALT: 43 (range: 31–72) U/L; median HBV DNA: 7.1 log IU/ml at treatment initiation].

Results: The overall proportion of HLA-DR+ T cells was higher in CHB patients compared to HCs, and significantly higher on CD4+T cells (3.1% vs 1.3%, p = 0.041). T cell expression of CXCR6 (0.7% vs 0.3%, p = 0.010) and the NKRs, NKG2A (4.4% vs 1.7%, p = 0.015) and Nkp30 (2.0% vs 0.9%, p = 0.023) was increased in CHB, consistent with immunopathology. We noted augmented expression of NKG2A and CD56 (both p < 0.0001) on the activated (HLA-DR+) proportion of CD8 T cells compared to their HLA-DR- counterparts. On analysing CHB subjects undergoing antiviral therapy, the expression of NKRs (NKG2A: CD4; 35.4% vs 2.2% and CD8; 28.4% vs 3.6% (both p < 0.001); NKG2D: CD4; 79.6% vs 2.4% and CD8; 20% vs 5.9% (both p < 0.01); Nkp30: CD4; 2.9% vs 0.7% and CD8; 3.3% vs 0.5% (both p < 0.01)) and the residency marker CXCR6 (CD4; 10.6% vs 0.4%, p < 0.0001, CD8; 2.4% vs 0.3%, p = 0.011) remained significantly higher in those on antiviral therapy, despite undetectable HBV DNA and ALT normalisation, compared to those with CHB treatment naive patients with bona-fide immune control, indicating that the bystander innate like immune defects are not recovered by current antiviral therapy.

Conclusion: CHB is associated with increased non-specific innate like activated T-cells, potentially causing immunopathology. Antiviral therapy is unable to reverse these immune cell defects suggesting the need for earlier treatment or add on therapies to achieve CHB cure.

Background and aims: Direct-acting antivirals have increased the SVR attainment rate to 95%; however, still, there is an HIV-CHC coinfected population that is non-responders to DAA therapy. As both HIV and HCV coinfection is tightly associated with dyslipidemia characterizing specific alterations in the lipidome of HIV-CHC coinfected patients will give important pathophysiologic insights. The primary aim of the present study is to identify baseline lipid species that could be used for the early stratification of HIV-CHC coinfected non-responders of the DAA therapy at baseline.

Method: This study identified N = 43 of N = 2064 HCV patients as HIV-CHC coinfected. These patients received Sofosbuvir and Daclatasvir as standard HCV therapy. Based on the post-therapy HCV RNA status, these patients were further segregated as responders (n = 10) and non-responders (n = 10) to standard DAA therapy. Amongst them, 20 paired patient samples were identified, and their baseline and post-therapy (3 months) plasma samples were subjected to untargeted lipidomics analysis using LC-MS/MS.

Results: HCV-HIC coinfected patients had dyslipidemia; comparative lipid analysis at baseline of DAA non-responders with responders identified 198 differentially expressed lipids ([DEL-90 Up; 108 Down; FC > 1.5, p < 0.05). The class with the maximum number of (DELs) was PE (Phosphatidylethanolamine-45 Up; 41 Down), PC (Phosphatidylcholine 20 Up; 21 Down), and others. Comparative analysis of the post-therapy lipidome profile of non-responders with responders revealed 261 DEL (96 UP and 165 Down; FC > 1.5, p < 0.05). Among 198 DEL, the class with the maximum number of DEL were PE (30 Up and 66 Down), PC (22 Up;27 Down), and others. We found that post-therapy downregulation of 27 lipids (Major classes altered PC and PE) and upregulation of 41 lipid species (Major classes altered PC and PE and DG) is linked with DAA therapy response. Surprisingly, non-responders at baseline have very high levels of PE and PC, which decreases post-therapy, suggesting their role in negating the DAA response. DAA therapy induces a net 60X reduction of PE in non-responders and a 12X reduction in PC. Finally, non-responders at baseline have a very high abundance of lipid species like ((PC (20:1/18.3); FC > 122; p < 0.05; AUC > 0.99), ((PE (18.0): p; FC > 589; p < 0.05; AUC > 0.99) and, all the selected clinical indicators positively correlated with HCV viral load AST, ALT and APRI score suggesting their role in Viral replication.

Conclusion: The lipidome profile of DAA non-responders and responders is distinct and crucial in determining DAA response. Increase in plasma PE [PE (18.0) p and PC [PC (20:1/18.3)] are the two major classes that negate DAA response and are key lipid indicator for non-response.
Intrahepatic characterization of virological and immunological markers in two distinct populations of chronic hepatitis B: baseline assessment of core liver and fine needle aspiration biopsies from the investigational INSIGHT study

Pietro Lampertico12, Tarik Asselah3, Edward J. Gane4, Scott K. Fung5, Patrick Kennedy6, Thomas Vanwolleghem2, Ewa Janczewska8, Julian Schulze zur Wiesch9, Mark S. Sulkowski10, Hans Wils11, Daniele Filippo Colombo11, Nadia Neto11, Ewoud de Troyer11, Koen Van den Berge11, Hinrich Göhlmann11, Jeroen Aerssens11, John Jerzorwski12, Zacharias Anastasiou12, Oliver Lenz11, Thierry Verbinnen11, Thomas Kakuda14, Carine Guinarid-Azadian11, Marianne Tuefferd11, Michael Biermer11, Foundation IRCCS Ca’ Granda Ospedale Maggiore Policlinico, Division of Gastroenterology and Hepatology, Milan, Italy; “CRC A. M. and A. Migliavacca” Center for Liver Disease, Department of Pathophysiology and Transplantation, University of Milan, Milan, Italy; 3Université de Paris-Cité, INSERM Umr1149, Department of Hepatology, AP-HP Hôpital Beaujon, Clichy, France; 4University of Auckland, New Zealand Liver Transplant Unit, Auckland, New Zealand; 5University Health Network, Toronto, Canada; 6Barts and The London School of Medicine and Dentistry, London, United Kingdom; 7University of Antwerp, Faculty of Medicine and Health Sciences, Laboratory of Experimental Medicine and Pediatrics, Viral Hepatitis Research Group, Antwerp, Belgium; 8Medical University of Silesia in Katowice, Faculty of Public Health in Bytom, Bytom, Poland; 9University Medical Center Hamburg, Eppendorf, Hamburg, Germany; 10Johns Hopkins University, Baltimore, United States; 11Janssen Pharmaceutica

Figure: (abstract: FRI-247).
Background and aims: Treatment of chronic hepatitis B (CHB) patients with the siRNA JNJ-73763989 (JNJ-3989) and nucleos (t)ide analogs (NAs) ± the CAM-E JNJ-56136379 (JNJ-6379), has shown profound reductions in hepatitis B viral serum markers. The INSIGHT study (NCT04585789) aims to assess intrahepatic and peripheral changes in immunologic and virologic markers in response to JNJ-3989 based combination regimens in participants with CHB.

Method: INSIGHT is a phase 2, open-label, parallel-group, multicenter study across 9 countries in Europe, North America, and Oceania, in CHB participants who are hepatitis B e-antigen (HBeAg)-positive and not currently treated (NCT; Group 1) or HBeAg-negative and virologically suppressed (VS) by NA (Group 2). Patients are receiving JNJ-3989 + NA ± JNJ-6379 for 48 weeks. Paired percutaneous core liver biopsies as well as fine needle aspiration biopsies (FNABs; uniform protocol across sites) are being collected to investigate potential differences and changes in hepatitis B viral markers and intrahepatic immune status. Viral markers are assessed by immunofluorescent (IF) staining combined with single cell digital droplet PCR from fresh frozen tissue sections; immune cells are characterized by single cell RNA sequencing from FNABs. This analysis focuses on baseline biopsies and the comparison of the two distinct subgroups of CHB participants.

Results: Baseline liver samples were collected from 20 out of 24 enrolled participants, 10 per group. Currently, analysis of four core liver biopsies from each group has been completed. Ranges of serum viral marker levels were numerically higher for participants in Group 1 vs Group 2, consistent with the higher proportion of HBeAg- and HBcAg-positive hepatocytes in Group 1 vs Group 2 (Figure). Out of individually isolated hepatocytes, a numerically higher frequency of cccDNA positive/HBV RNA positive cells and a lower frequency of cccDNA positive/HBV RNA negative hepatocytes was observed in Group 1 vs Group 2, in line with the difference in liver IF and serum viral markers between the two groups. 19/20 FNAB samples collected at baseline were successfully profiled with approximately 200 genes/cell quantified (Group 1: n = 9; 15,828 liver resident cells; Group 2: n = 10; 21,925 liver resident cells). On average, 1988 cells per sample were profiled, varying from 282 to 5200 cells. Differential expression of interferon stimulated genes between Groups 1 and 2 was observed in liver CD8+ T-cells, mucosal-associated invariant T-cells (MAIT), and natural killer (NK) cells. A few markers in intrahepatic immune cells were associated with peripheral HBsAg levels, including overexpression of TNF in MAIT cells in participants with HBsAg <1000 IU/ml across both groups.

Conclusion: The INSIGHT study successfully employed a harmonized approach of multicenter biopsy collection with central sample analysis of liver resident cells at the single cell level. At baseline, NCT HBeAg-positive participants had numerically higher serum viral biomarker levels reflected by greater proportions of HBsAg+, HBeAg-, and HBV RNA-positive hepatocytes than VS HBeAg-negative participants. Interestingly, differences in immune cell RNA expression were modest between groups, with 14 genes significantly differentially expressed in MAIT/CD8+ T-cells or NK cells (associated with False Discovery Rate <10%).

FRI-249
Epigenetic modulation by DNA methyltransferase inhibition may enhance the effect of immune checkpoint inhibitors to restore HBV-specific T cell responses
Melanie Urbanek-Quaing1,2,3, Carlos Oltmanns1,2,3,4, Jasmin Mischke1,2,3, Heiner Wedemeyer1,3,5, Cheng-Jian Xu1,2,4, Anke Kraft1,2,3,4, Markus Cornberg1,2,3,4, Hannover Medical School, Gastroenterology, Hepatology and Endocrinology, Germany; TWINCORE, Hannover, Germany; German Center for Infection Research (DZIF), Hannover, Germany; Center for Individualized Infection Medicine (CiiM), Hannover, Germany; Hannover Medical School, Gastroenterology, Hepatology and Endocrinology, Hannover, Germany

Background and aims: Functional cure of chronic hepatitis B virus (HBV) infection (defined by loss of HBsAg) is rarely achieved, emphasizing the need for novel therapeutic approaches. A hallmark of chronic infection is a dysfunctional immune system and the presence of exhausted T cells with a distinct epigenetic signature. There are several approaches to improve their function, such as checkpoint inhibition with anti-PDL1. However, anti-PDL1 alone is unable to remodel the epigenetic patterns associated with exhaustion and thus may prevent durable improvement of the immune response. Our goal is to target these epigenetic imprints of exhaustion in chronic HBV infection to improve the effect of anti-PDL1 on HBV-specific immune responses.

Method: We performed a 10-day stimulation culture with peripheral blood mononuclear cells (PBMC) from 44 individual chronic HBV patients with varying levels of HBsAg and HBcAg. PBMCs were stimulated with HBV core or polymerase overlapping peptide pools (42 patients) or HLA-restricted peptides HBV core18 or pol455 (13 patients). In addition, cells were treated with the checkpoint inhibitor anti-PDL1 alone or in combination with the DNA methyltransferase inhibitor (DNMTi) decitabine. HBV-specific immune responses were analyzed by multicolor flow cytometry. In addition, DNA methylation was analyzed using the Illumina Human Methylation450 BeadChip Array.

Results: After pretreatment with DNMTi followed by anti-PDL1 treatment on day 3 post-stimulation, we observed a markedly improved IFNgamma+ response of HBV-specific CD4+ T cells and CD8+ T cells in some patients. This effect was heterogeneous, with some patients showing a 2- to 100-fold increase compared with anti-PDL1 treatment alone. For example, the combination of anti-PDL1 and DNMTi increased total HBV core-specific CD4+ and CD8+ T cell responses in 42% and 39% of cases, respectively, compared with anti-PDL1 alone. HLA-restricted HBV peptide-specific CD8+ T cell responses were improved in 46% of cases, with a more pronounced effect on pol455-specific responses. Correlation with methylation data and HBV antigen levels is ongoing.
Conclusion: The results confirm that epigenetic signatures of T cells may play an important role in the immune response to HBV. Targeting epigenetic modifications by combining DNMTi and checkpoint inhibitors has not been tested in chronic HBV, but seems to be a promising concept to improve HBV-specific immune responses.

FRI-250
Reduction in quantity and function of HBcAg-specific B cells indicates the response to anti-viral therapy in chronic HBV-infected patients receiving ETV or TDF treatment
Li Wang1, Ning Ling1, Wenhui Peng1, Gaoli Zhang1, Min Chen1. 1Key Laboratory of Molecular Biology for Infectious Diseases (Ministry of Education), Institute for Viral Hepatitis, The Second Affiliated Hospital, Chongqing Medical University, China
Email: mchen@hospital.cqmu.edu.cn

Background and aims: Recently, hepatitis B virus core antigen (HBcAg)-specific B cells have been reported to be associated with the disease phase of chronic hepatitis B virus (HBV) infection, but their changes and roles in anti-viral therapy remains unknown yet. Here, features of HBcAg-specific B cells were investigated in chronic HBV-infected (CHB) patients during entecavir (ETV) or tenofovir disoproxil fumarate (TDF) treatment.

Method: Fifty-six treatment-naive, fifty-one ETV-treated, and twenty-nine TDF-treated CHB patients were enrolled in this study. The frequency and phenotype of circulating HBcAg-specific B cells were examined by flow cytometry using fluorescently labeled HBcAg and surface markers. The function of antibody-secretion of HBcAg-specific B cells was assessed by HBcAg-specific enzyme-linked immunospot (ELISpot) assays.

Results: Compared to treatment-naive patients, ETV/TDF-treated CHB patients displayed lower frequencies of total HBcAg-specific B cells, and their memory and class-switched subsets, especially in HBeAg-negative patients. Meanwhile, the proportion and antibody-producing ability of HBcAg-specific B cells progressively declined with the prolonged duration of antiviral therapy. The number of antibody-producing HBcAg-specific B cells positively correlated with the serum level of HBV DNA, HBsAg, or HBeAg. Notably, HBcAg-specific B cells from CHB patients with maintained virological response (MVR) showed significantly lower percentages of total and classic memory population, lower expression of CXCR5 and CD38, while higher expression of CXCR3 than those with low-level viremia (LLV).

Conclusion: Long-term ETV/TDF treatment led to a gradual reduction in the quantity and function of HBcAg-specific B cells. A lower proportion of HBcAg-specific B cells was potential to predict a better response to antiviral therapy.
Background and aims: In the context of chronic hepatitis C (CHC), co-infection with HIV has a negative impact on liver damage progression. Recently, extracellular vesicles (EVs) have gained relevance in liver diseases as intercellular communicators thus mediating pathological processes. HCV and HIV have been described to modify the microRNA (miRNA) content of EVs, but little is known about their impact on pathogenesis or their possible role as liver damage biomarkers. We aimed to characterize the plasma derived-EVs miRNA signature of HCV+ and HCV+/HIV+ patients and to explore their expression regarding the severity of liver fibrosis, to assess its impact on pathogenesis.

Method: EVs were purified and characterized from 50 CHC plasma samples [36% significant fibrosis (F ≥ 2)] [21 HCV+ (52.4% F ≥ 2) and 29 HCV+/HIV+ (22.6% F ≥ 2)]. EVs-derived total RNA was extracted and massively sequenced. Then, miRNA identification, significant differential expression (SDE) analysis [fold change (FC) ≥ 1.5; adjusted p value (p.adj) ≤ 0.2], target gene prediction and pathway enrichment analysis (p.adj ≤ 0.5) were performed. The diagnostic value of SDE miRNAs was assessed by ROC curves analysis.

Results: Differential expression analysis of plasma EVs-miRNAs according to severity of liver fibrosis demonstrated 2 SDE miRNAs.
(miR-122-5p and miR-92a-3p, up- and down-regulated in the F ≥ 2 group, respectively) which in silico regulate genes involved in cytoskeleton organization. Within HCV+ subgroup, 4 up- (miR-122-5p, miR-320c, miR-3615, miR-320a-3p) and 4 down-regulated miRNAs (miR-374b-5p, let-7a-3p, miR-199a-5p, miR-142-5p) were found in F ≥ 2 patients. Together, they regulate genes involved in macrophage activity and cell growth/death regulation. In turn, the HCV+/HIV+ subgroup displayed 11 up- (miR-4508, miR-122-5p, miR-451a, miR-1290, miR-1246, miR-107, miR-15b-5p, miR-194-5p, miR-22-5p, miR-20b-5p, miR-142-5p) and 7 down-regulated miRNAs (miR-328-3p, miR-335-3p, miR-125a-5p, miR-423-3p, let-7d-3p, miR-128-3p, miR-10a-5p). These miRNAs regulate the expression of genes involved in the RNA silencing machinery. Regarding diagnostic performance of SDE miRNAs to discriminate F ≥ 2 cases (AUROC ≥ 0.800) in each group different miRNAs were identified: HCV+: miR-3615 miR-374b-5p, let-7a-3p, miR-142-5p, miR-320a-3p and miR-320c and HCV+/HIV+: miR-423-3p, miR-128-3p, miR-194-5p, miR-10a-5p, miR-328-3p, miR-22-5p, miR-125a-5p, let-7d-3p, miR-335-3p, miR-451a, miR-122-5p and miR-1246.

Conclusion: chronic HCV+ and HCV+/HIV+ patients with different stages of liver fibrosis present a differential profile of EVs-derived miRNAs. This specific miRNA signature would allow elucidation of possible mechanisms involved in clinical evolution and identification of biomarkers of unfavorable progression specific for each group, plausible to be used in a diagnostic panel.

FRI-252
Prophylactic vaccine against hepatitis D virus (HDV) superinfection
Mattí Sällberg¹, Lars Frelin¹, Gustaf Ahlén¹, Jingyi Yan¹, Panagiota Maravelia¹, Philip Cunnah², Ana-Rita Ricardo², Nico Mertens³, Richard Bethell⁴. ¹Karolinska Institutet, Laboratory Medicine, Stockholm, Sweden; ²Rodon Biologics, Portugal; ³Bionmer, Netherlands; ⁴SVF Vaccin, Sweden
Email: matti.sallberg@ki.se

Background and aims: Chronic infection with HDV caused by a superinfection of a chronic HBV infection is a major cause for severe liver disease. There is currently no vaccine that can protect patients with chronic HBV infection against a superinfection with HDV. We are therefore developing such a vaccine.

Method: A fusion protein containing multiple PreS1 genotypes and hepatitis D virus antigen (HDAg) of genotypes 1 and 2 was previously generated and to protect against HDV superinfection in vitro and in vivo. To generate a protein suitable for large scale production according to good manufacturing practice, protein variants were generated that were optimized for protein expression and stability and were tested for immunogenicity.

Results: The original protein described in Burn et al (Gut 2022; 10.1136/gutjnl-2022-327216) was found to be unstable when produced in large scale. Modified versions yielded proteins that were more stable and that were able to be produced at much higher expression levels in E.coli. Importantly, the modified proteins were equal, or even more immunogenic in mice with respect to both PreS1-specific antibodies and PreS1 and HDAg specific T cells.

Conclusion: We have now developed a potential protein-based prophylactic vaccine candidate against HDV superinfection that can be produced at high expression levels and with a good stability for large scale production according to GMP for phase1, 2, and 3 clinical trials. This may be the first prophylactic vaccine against HDV superinfection.

FRI-253
Rat hepatitis E virus infection in a rat model has multiphasic viral replication kinetics
Zhenzhen Shi¹, Xin Zhang², Niels Cremer³, Johan Neyts³, Harel Dahari¹, Suzanne Kaptein². ¹Loyola University Chicago, Program for Experimental and Theoretical Modeling, Division of Hepatology, Department of Medicine, Stritch School of Medicine, United States; ²KU Leuven Department of Microbiology and Immunology and Transplantation, Rega Institute, Laboratory of Virology and Chemotherapy, Belgium
Email: suzanne.kaptein@kuleuven.be

Background and aims: Hepatitis E virus (HEV) is the causative agent of hepatitis E in humans and a leading cause of acute viral hepatitis. It is also responsible for chronic hepatitis in immunosuppressed patients worldwide. The virus is mainly transmitted fecal-orally, through the consumption of contaminated drinking water or infected undercooked meat of pigs. Additionally, HEV can also be transmitted via blood transfusions. Previously, we reported that athymic nude rats support the productive replication of rat HEV when injected

Figure: (abstract: FRI-253).
in comparison to HBeAg positive wildtype genomes. In HBeAg-negative genomes a strong decrease of intracellular and especially extracellular HBsAg amounts in combination with a HBsAg-retention in the endoplasmic reticulum (Figure) was detected. Interestingly, rescue of HBeAg increased HBsAg amount but not release. However, infectivity of secreted viral particles was unaffected. In addition, the HBV-induced expression of the Nrfl2/ARE-dependently regulated gene NQO1 was more pronounced and strikingly ROS/Ras-related signaling was homogeneously deregulated leading to less active MAPK8 and MAPK10 in HBeAg-negative genomes. Sequence analysis revealed no conserved mutations between the HBeAg-negative genomes, which could explain these observations.

Conclusion: Our study indicates limited specificity of HBsAg composition for phase-discrimination when stratified by the viral genotype. In contrast, our in vivo data revealed evidence for a diminished HBsAg synthesis and release in HBeAg-negative genomes isolated from patients of the chronic infection phase. While presence of HBeAg increases HBsAg expression, it does not affect HBsAg release. Through regulation of ARE regulated genes and interference with ROS- and Ras-related pathways including MAPK8 and MAPK10, as key kinases of TNF alpha induced apoptosis, cytoprotective and possible immune escape mechanisms were found to be enhanced in the HBeAg-negative genomes. These changes are caused by an interplay of multiple polymorphisms, which occur naturally over the different phases of the disease, suggesting an evolutionary process.

FRI-255

(N)one size fits all: Genotype-matched analysis of different disease phases of chronic hepatitis B virus infection

Michael Basic1,2, Keerthiran Keerthiran Thiyagarajah1,2, Mirco Glitscher1, Anja Schollmeier1, Qingyan Wu1, Esra Görgülü1,2, Julia Dietz1, Fabian Finkelmeier1, Jonel Trebicka1, Stefan Zeuzem3, Christoph Sarrazin3,4, Eberhard Hildt1, Kai-Henrik Peiffer1,2,3, Paul Ehrlich-Institute, Institute of Virology, Langen, Germany; 1University Hospital Frankfurt, Department of Gastroenterology and Hepatology, Frankfurt, Germany; 1University Hospital Münster, Medical Clinic B, Münster, Germany; 1St. Josef-Hospital, Department of Internal Medicine and Liver Center, Wiesbaden, Germany Email: kai-henrik.peiffer@kgu.de

Background and aims: Based on the current EASL guideline chronic HBV infections are divided in five phases. Among others, quantitative (q)HBsAg levels and composition of HBsAg are used for phase-assignment, but depend also on the viral genotype. We aimed to analyse the impact of the disease phase on the clinical and molecular phenotype in a genotype-stratified approach.

Method: Sera of 503 patients, infected with HBV genotype A and D from disease phases 1–4 were analysed for HBV-DNA and qHBsAg levels, HBsAg composition and density of HBsAg-particles. Molecular characteristics of genotype A, B and D HBeAg-negative patient isolates with Precore (PC) mutation G1896A from phase 3 were investigated in comparison to respective HBeAg-positive genomes via WB, RT-PCR, oxyblot, immunofluorescence microscopy, density-, reporter-gen-, infectivity- and kinase-assay. HBeAg-impact was determined by site-directed mutagenesis of PC G1896A.

Results: When stratified by the genotype, no major impact on particle density and HBsAg composition was observed among disease phases 1–4 in the analysed sera of patients infected with genotype A or D. However, in vitro significant differences between HBeAg negative genomes (genotypes A, B and D) from disease phase 3 were observed

Conclusion: One primary human hepatocyte system to evaluate antisense oligonucleotide activity against clinically identified hepatitis B virus variants that contain mismatches in the bepirovirsen binding site

Alexander Koenig1, Jerome Bouquet2, Elise Angelini1, Michael Savarese1, Hardeep van Gijzen1, Robert Elston4, Dickens Theodore3, Melanie Paff2, Shi hyun You1, Christine Livingston1, 1GSK, Infectious Diseases Research Unit, Collegeville, United States; 2GSK, Clinical Biomarkers, United States; 3GSK, Computational Science, United Kingdom; 4GSK, Clinical Development, United Kingdom; 5GSK, Clinical Development, United States; 6GSK, Medicine Development Leaders, United States Email: christine.m.livingston@gsk.com

Background and aims: Bepirovirsen (BPV; GSK3228836) and GSK3389404, a GalNAc conjugated BPV, are anti-sense oligonucleotides (ASO) that target a conserved 20 nucleotide sequence present in FBV-infected rats, causing a chronic infection, which resembles the situation in immunocompromised individuals with chronic HEV (PMID: 27483350). Here, we aim to characterize HEV kinetics from infection to steady state in the rat model.

Method: Rat HEV LA-B350 (containing approximately 2 × 10^7 viral RNA copies) was injected in the tail vein of athymic nude rats in both the 12-day and 26-day experiments (n = 25). In the 12-day experiment, rats were treated once daily by oral gavage with either vehicle (n = 5) or ribavirin at a dose of 30 mg/kg (n = 5) or 60 mg/kg (n = 5) for 12 days. In the 26-day experiment, rats were left untreated (n = 10) for 26 days. Feces were collected at various time points after infection and analyzed for the presence of viral RNA by quantitative PCR.

Results: In the 12-day experiment, there is no difference in HEV replication kinetics between the control group and the group treated with ribavirin (30 mg/kg, once daily oral administration) (Fig. 1a and b). Three main viral phases were identified in these rats: a LLOQ phase that lasts ∼4 days (4.8 ± 1.7 days) (phase 1: P1), a plateau phase that lasts ∼4 days (phase 2: P2), and the beginning of a rapid ascension phase (phase 3: P3). In the rats treated with ribavirin 60 mg/kg, the viral load remained in the LLOQ (P1) phase (Fig. 1c). In the 26-day experiment, similar P1 and P2 phases were seen (Fig. 1d) as in the 12-day experiment (Fig. 1a and b). The 26-day experiment helped to fully characterize phase 3 (P3) that lasted until ∼18 day post infection (with viral doubling time of ∼5 days) that was followed by a high viral plateau (7.9 ± 0.5 log10 copies g−1 feces) (phase 4: P4) (Fig. 1d).

Conclusion: The rat HEV infection kinetics presented here is an important step in characterizing this experimental model system so that it can be effectively used to elucidate the dynamics of the HEV life cycle and possibly to predict the efficacy of (novel) antiviral therapeutics or vaccine candidates. Future studies need to reveal whether the viral kinetics in the feces reflect that in the liver and/or blood.
within all hepatitis B virus (HBV) mRNAs, including pgRNA. Despite the conserved nature of the binding site, single nucleotide polymorphisms (SNPs) within the binding site were identified in a limited number of pre-treatment clinical isolates from BPV B-Clear Phase 2b trial (NCT04449029) or within a publicly available database of sequences derived from clinical isolates. The goal of this study was to develop an in vitro system to evaluate the replicative fitness of HBV variants containing SNPs in the BPV/GSK3389404 binding site and to test the susceptibility of progeny virus to ASO treatment.

**Method:** Clinically identified BPV binding site SNPs, including C7A, C9A, C9T, T10G, A13C, were introduced into genotype D 1.3X HBV genome plasmids that enabled production of infectious viral stocks upon transient transfection in HepG2 cells. Primary human hepatocytes (PHH) were infected with wildtype (WT) HBV or HBV variants for 7 days followed by treatment with ASO GSK3389404 every 3–4 days. Secreted HBsAg levels were measured by ELISA on day 21 post infection. HBsAg levels secreted from mock-treated PHH served as a marker for transcriptional activity of the variants relative to HBV WT. The susceptibility of HBV variants to tool ASO GSK3389404 was evaluated by dose response analysis.

**Results:** Transfection of each of the 1.3X HBV variant genome plasmids resulted in comparable HBsAg production relative to HBV WT showing successful transfection and that the tested SNPs in the BPV binding site did not appreciably impact plasmid-driven HBsAg levels from HepG2 cells. In PHH, HBV WT and variants C9A, C9T, and T10G collected from HepG2 cells showed comparable infectivity as detected HBsAg levels were similar. In contrast, A13C and C7A variants displayed a several fold reduction of HBsAg, indicating reduced replicative fitness which impedes the interpretation of ASO susceptibility assessments. Among the variants with proportionate fitness to infect PHH and produce HBsAg, dose-response assessment provided evidence that the C9A variant exhibited reduced susceptibility to GSK3389404 compared to HBV WT.

**Conclusion:** We have developed a two-step in vitro model to provide an estimate of replicative fitness and evaluate ASO susceptibility of HBV variants with a SNP in the BPV binding site. Using this system, a few HBV variants identified from B-Clear baseline samples were evaluated. Clinical relevance of HBV variants with reduced susceptibility is under investigation.
virus uptake is enhanced by MNP and how MNP revive less infectious HBV particles.

**Figure:**

**Conclusion:** The study is the first one reporting the enhancing effect of suitable MNPs on a HBV virus infection system, which is characterized by very low infection rates. We took advantage of the properties of the rHBV infection system that allows visualization of infection and determined the optimal ratio of MNP to viral particles. This increased infection efficacy will allow to extend screening activities in HBV cell culture infection models and provide insights into the limiting steps in these systems.

**FRI-257**

A new glyco-biomarker for measuring infectious hepatitis B virus targeting surface antigen glycan isomer (HBsAgGi)

Kiyohiko Angata1, Maki Sogabe1, Hisashi Narimatsu1, Ayato Murata2, Takuya Genda2. 1RCMG Inc., Japan, 2Juntendo University Shizuoka Hospital, Department of Gastroenterology and Hepatology, Japan

**Background and aims:** Hepatitis B virus surface antigen (HBsAg) is a central marker to point-out HBV infection. However, HBsAg does not always distinguish infectious and non-infectious subviral particles, as it uses antibodies to S-HBs. We aimed to develop a new marker to measure infectious particles more efficiently than conventional HBsAg. We previously found that DNA-containing particles were recognized by a lectin recognizing O-glycans and then generated a new monoclonal antibody against O-glycosylated PreS2 domain of M-HBs [HBsAg glycan isomer (HBsAgGi)]. Here we show the biochemical characteristics and pilot clinical results of HBsAgGi.

**Method:** To characterize the HBsAgGi antibody, Western blotting, immunoprecipitation (IP) and immunostaining assays were performed. To investigate clinical utility of the HBsAgGi antibody, we established a new ELISA system and measured sera of chronic hepatitis B (CHB) patients before and after nucleos(t)ide analog (NA) treatment. Reverse-transcription PCR was also performed to detect HBV RNA in HBV particles immunoprecipitated by HBsAgGi antibody.

**Results:** Biochemical analysis demonstrated that the HBsAgGi antibody recognizes M-HBs but not L-HBs, which is not modified with O-glycan on the PreS2. Mutations in antigenic loop in S-HBs did not affect the binding of HBsAgGi antibody so far tested. HBsAgGi localized in ER to Golgi in M-HBs-expressing cells, suggesting generation of HBsAgGi through glycosylation pathway. ELISA assay showed HBsAgGi antibody specifically bound to M-HBs of genotype C. In treatment naïve CHB patients, serum HBsAgGi level was higher in HBe-positive patients compared to HBe-negative patients at baseline. HBsAgGi levels were significantly correlated with the HBV DNA level (p = 0.002, n = 32). After 48 weeks, HBV DNA was significantly decreased. In contrast, HBsAg level did not show a significant reduction while HBsAgGi level was significantly decreased. Immunoprecipitation experiments confirmed that both HBV DNA- and HBV RNA-containing particles were collected by HBsAgGi antibody.

**Conclusion:** HBsAgGi specifically presents in minor fraction of HBV particles containing M-HBs of genotype C, and less so in subviral particles, indicating that HBsAgGi antibody can properly detect infectious particles. Since both HBV DNA and HBV RNA were detected in HBsAgGi-bound fraction, HBsAgGi would be a new glyco-biomarker to monitor viral kinetics in CHB patients during NA therapy.

**FRI-258**

Pregnancy zone protein as a promising biomarker for HEV-related acute liver failure

Jian Wu1,2, Ze Xiang3. 1Department of Clinical Laboratory, The Affiliated Suzhou Hospital of Nanjing Medical University, Suzhou Municipal Hospital, Gusu School, Nanjing Medical University, 242 Guangji Road, Suzhou 215008, Jiangsu, China; 2The Chinese Consortium for the Study of Hepatitis E (CCSHE), China; 3Zhejiang University School of Medicine, Hangzhou 310009, Zhejiang, China

**Background and aims:** Timely and effective prognostic biomarkers for hepatitis E virus (HEV)-related acute liver failure (ALF) are urgently needed.

**Method:** We performed four tandem mass tag (TMT)-labeled quantitative proteome and targeted proteomics parallel reaction monitoring (PRM) studies on cross-sectional cohort 1 and 2 including 20 acute hepatitis E and 20 HEV-ALF patients respectively.

**Results:** Pregnancy zone protein (PZP) is a potential prognostic biomarker for HEV-ALF. PZP was identified by TMT and PRM quantitative proteomics. In the derivation cohort, PZP levels of the HEV-ALF patients in survival group were significantly higher than those of the dead group. According to the median level of PZP, HEV-ALF patients in the retrospective cohort 1 were divided into the high PZP (>1316.18 ng/L) and low PZP (≤1316.18 ng/L) groups. The survival time of the high PZP group was significantly longer than that of the low PZP group. Decreasing PZP levels were also correlated with the increasing number of failed organs. Compared with PZP levels at admission, levels at discharge increased significantly in the improvement group, and decreased significantly in both the fluctuation and deterioration groups. PZP levels were significantly negatively correlated with alanine aminotransferase, total bilirubin, and international normalized ratio levels. It was revealed that PZP level was highly correlated with survival time, clinical course and organ failure in HEV-ALF patients. Besides, multivariate logistic regression showed that laminin, hepatic encephalopathy, TBil, and PZP were independent factors affecting the prognosis of HEV-ALF patients, which were used to establish a novel prognostic model (ePLT). The assessment in the derivation and validation cohorts showed that the ePLT score was significantly superior to the MELD, KCH and Child-Pugh scores.

**Conclusion:** PZP is a promising prognostic biomarker, and ePLT is a high-performance prognostic score for HEV-ALF patients, which contribute to clinical decision-making in the management of HEV-ALF.
FRI-259
Quadruple mutation GCAC1809-1812TTCT leads to a better prognosis by decreasing HBV-mediated fibrogenic activity
Esra Görgülü1,2, Michael Basic2, Mirco Glitscher2, Keerthihan Keerthihan Thiagarajah2, Anja Schollmeier2, Alika Kubesch1, Julia Dietz1, Stefan Zeuzem2, Christoph Sarrazin4, Kai-Henrik Peiffer1,2,5, Eberhard Hildt2,6.
1University Hospital Frankfurt, Department of Gastroenterology and Hepatology, Germany; 2Paul Ehrlich-Institute, Virology, Germany; 3University Hospital Frankfurt, Germany; 4St. Josefs Hospital, Germany; 5University Hospital Muenster, Department of Internal Medicine B, Germany; 6German Center for Infection Research (DZIF), Germany
Email: esra.goerguelue@kgu.de

Background and aims: The quadruple mutation GCAC1809-1812TTCT (TTCT), which coexists with the basal core promoter double mutation A1762T-G1764A (BCP) and is localized in the basal core promoter and/or HBx, is prevalent in inactive carriers and is associated with significantly lower HBV DNA levels and inactive carrier status and thus a better prognosis. In vitro, GCAC1809-1812TTCT leads to decreased replication activity and significantly reduced HBeAg levels. This study aimed to further investigate the underlying mechanism by which the TTCT mutation impacts HBV pathogenesis, leading to a favorable course of the disease.

Method: Supergenomic constructs harboring BCP and TTCT mutation in different positions localized in the core promoter gene, the HBx gene or both were used to analyze their regulatory activity via reporter gene assays, western blots and qPCR analysis. Reactive oxygen species (ROS) levels were analyzed by oxyblot analyses and flow cytometry. Kinome profiling was performed to investigate the influence of the presence or absence of TTCT on kinase activity.

Results: In our analyses, the TTCT mutation in HBx and basal core promoter leads to a slightly higher induction of the Nrf2/ARE-dependent regulated gene NQO1 as well as lower ROS levels compared to the BCP mutation without TTCT or the wild-type. Strikingly, the presence of the TTCT mutation in HBx and basal core promoter shows downregulation of the serine/threonine kinases PKA, PKG2, and PRKX that contribute to liver fibrosis and upregulation of ERK5 and p38-gamma, which play important roles in hepatic inflammation, whereas the BCP mutation without TTCT enhances the adverse effects in comparison to wild-type HBV.

Conclusion: One potential explanatory approach to the better prognosis in the presence of TTCT mutation is the induction of
cytoprotective gene expression and downregulation of major kinases contributing to liver fibrosis.

FRI-260  
Growth factor stimulation enhances NTCP expression and improves in vitro HBV infection in hepatoma cells

Rodrigue Kamga Wouambo1, Maria Pfefferkorn1, Janett Fischer1, Jonathan Seltmann3, Madlen Matz-Soja1, 2, Thomas Berg1, Florian van Bömmel1. 1Leipzig University Medical Center, Division of Hepatology, Department of Medicine II, Leipzig, Germany; 2Rudolf-Schönheimer-Institute for Biochemistry, University of Leipzig, Leipzig, Germany  
Email: Maria.pfefferkorn@medizin.uni-leipzig.de

Background and aims: Cell culture systems supporting sustained and stable hepatitis B virus (HBV) infection represent an important tool for studying HBV replication and drug efficacy. However, many cell culture models lack stable HBV replication with sufficient expression of replication markers due to an increasing loss of the HBV entry receptor NTCP on the hepatocyte surface. Our study aimed at improving NTCP expression and HBV replication in a cell culture system by using a growth factor stimulation medium.

Method: HepG2-hNTCP-sec+ cells (kindly provided by M. Windisch) were seeded separately and in equal amounts in either Cellartis® hepatocytes maintenance medium (HMM; TaKaRa Bio, Ann Arbor, USA) (n = 6) or seeding medium (SM; DMEM with 10%FBS, 1%L-Glutamine, 1%Pen/Strep, 2.7%DMSO) (n = 6) for 24 h prior HBV inoculation. Consecutively, cells were infected with cell culture derived HBV (ccHBV, genotype D, MOI 10.000) for 18 h. Supernatant was collected every 2 days during 21 days post infection (dpi). HBV biomarkers HBeAg, HBV DNA, HBV RNA, HBsAg, large (LHBs), and middle (MHBs) antigen were quantified from supernatants. NTCP expression of HBV infected cells in HMM and SM media was quantified by qPCR relative to a stable housekeeping gene (TATABox binding protein-TBP).

Results: The cell growth of HepG2-hNTCP-sec+ cells cultivated with either SM or HMM showed no difference at 6 dpi (p = ns). However, at 14 dpi, cells cultivated in HMM revealed a 2-fold higher NTCP expression compared to cells cultivated in SM.

De novo secretion of HBV DNA and RNA began 2 dpi in cells cultivated in HMM vs. 2–4 dpi in SM and remained stable over the course of infection. Moreover, levels of HBsAg (ng/ml) increased from day 0 (24.5 ± 6.5 for HMM and 5.6 ± 0.5 for SM, p < 0.0001) to day 2 (157.0 ± 24.6 for HMM and 26.9 ± 4.8 for SM, p < 0.0001) with highest expression after 4 dpi (171.8 ± 31.9 for HMM and 40.8 ± 6.9 for SM, p < 0.0001). Similar to HBsAg levels, HBeAg levels (PEIU/ml) increased in HMM and SM cultivated cells from day 0 (2.6 ± 2.5 vs. 0.6 ± 0.5, p = n.s) to day 3 (22.9 ± 4.4 vs. 5.8 ± 2.2, p = 0.004), and were highest at 5 dpi (26.1 ± 4 vs 6.1 ± 0.8, p = 0.001), respectively. Interestingly, in HMM or SM cultivated cells, ratios of MHBs (12.0 ± 4.2% vs. 12.9 ± 3.3%, p = n.s) and LHBs (11.0 ± 6.2% vs. 11.8 ± 6.5%, p = n.s.) were similar and stable over the course of infection.

Conclusion: Using HMM increases NTCP expression and improves in vitro HBV infection and biomarker secretion in HepG2-hNTCP-sec+ cell culture models.
Hepatitis B virus antigens induce a dramatic LPS-like activation of inflammasome dependent on viral variability

Théophile Cocherie1, Elisa Teysou1, Adélie Gothland1, Sophie Sayon1, Alessandre Mazzola2, Anne-Genevieve Marcelin1, Vincent Calvez1, Eve Todesco1, Sorbonne Université, INSERM, Institut Pierre Louis d’Épidémiologie et de Santé Publique, AP-HP, Hôpitaux Universitaires Pitié-Salpêtrière-Charles Foix, laboratoire de virologie, F-75013, Paris, France; Sorbonne Université, Unité médicale de transplantation hépatique, AP-HP; Hôpital Pitié-Salpêtrière, 75013, Paris, France.

Background and aims: Inflammation mediated by inflammasome activation leads to pyroptosis, an important innate programmed cell death to control pathogens that could also be associated with multi-organ disturbances. Pyroptosis occurs in two steps. The first, called priming, increases the expression of gene of interests and the second signal leads to activation of caspases and pore formation on the membrane surface, followed by the release of pro-inflammatory cytokines such as IL-1β and IL-18. Hepatitis B virus (HBV) role regarding pyroptosis is highly disputed and may depend on HBV disease stage, antigens, strains and even on the immune cells studied and their localization.

The aim of this study was to assess the role of HBV antigens on priming step in monocyte-derived cells and to assess the impact of HBV variability. The hepatitis B virus (HBV) antigens on monocyte-derived cells, evoking a large and diffuse pyroptosis involvement during HBV infection. Interestingly, HBsAg-adw serotype poorly induced priming. These results suggest that the innate immunity response and, precisely, IL-1β secretion pathways are influenced by HBV variability. The impact on clinical outcomes should be further studied, particularly regarding the rate of infection chronicity, already reported as high for adw-serotype/genotype A HBV, and the putative impact on systemic inflammation.

Conclusion: We observed a very high priming activation for some HBV antigens on monocyte-derived cells, evoking a large and diffuse pyroptosis involvement during HBV infection. Interestingly, HBsAg-adw serotype poorly induced priming. These results suggest that the innate immunity response and, precisely, IL-1β secretion pathways are influenced by HBV variability. The impact on clinical outcomes should be further studied, particularly regarding the rate of infection chronicity, already reported as high for adw-serotype/genotype A HBV, and the putative impact on systemic inflammation.

Results: We observed that THP-1 cells incubated with HBeAg, HBsAg-adr and ayw serotypes and HBCAg induced a significantly higher IL-1β secretion than the negative controls. Notably, HBeAg and HBsAg-adr incubation led to huge IL-1β concentrations in the supernatant (median 17.6 ng/ml IQR [15.0–19.6] and median 15.4 ng/ml IQR [15.1–15.8], respectively), significantly higher than the positive control (cf. Figure 1). Moreover, among HBsAg, a dramatic difference was observed between the adr/ayw and adw serotypes, the latter inducing a much lower secretion than HBsAg derived from adr/ayw serotypes (median 0.3 ng/ml [1.5–4.5], not significantly different from the negative controls).

Methods: The effect of 3 purified proteins (HBsAg adr, adw and ayw serotypes), HBeAg and HBCAg antigens; Prospect protein specialists, Ness Ziona, Israel) on priming step was assessed on macrophage-like cells. THP-1 circulating monocytes were cultured with RPMI-hepes 10% FBS-0.05 mM 2-mercaptoethanol, plated in 96-wells plates and differentiated to macrophages with 10nM of PMA for 24 h. HBV proteins were added at 10ug/ml on the differenciated-THP-1. IL-1β was measured by luminiscence in the supernatant after 18 h of incubation and the addition of the signal 2-activator Nigericin at 10 µg/ml/ for 1 h. Controls included mock, cells primed by LPS at 1 µg/ml for 3 h only and cells primed by LPS at 1 µg/ml for 3 h and then activated by Nigericin. Comparison of IL-1β secretions were performed by Turkey’s multiple comparisons test after validation by Shapiro test of normality.

Figure: IL-1β secretion induced by HBV antigens

The graph represents measure of IL-1β secretion in supernatants of differenciated-THP-1 cells after incubation with different HBV proteins or LPS only (priming activator) or LPS following by the addition of Nigericin (activator of Signal 2). **p < 0.001; ****p < 0.0001.
increased replication capacity and identified determinants of viral replication in vitro and in vivo.

FRI-263
Thiourea derivatives exhibit antiviral property by inhibiting hepatitis B virus DNA replication and HBx-induced gene transcription
Jitendra Kumar1, Purnima Tyagi1, Shiv Kumar Sarin2, Vijay Kumar1.
1Institute of Liver and Biliary Sciences, Molecular and Cellular Medicine, India; 2Institute of Liver and Biliary Sciences, Department of Hepatology, India
Email: vijaykumar98@gmail.com

Background and aims: The transactivator HBx protein plays an important role in HBV replication and viral gene expression and has also been implicated in the development of hepatocellular carcinoma (HCC). The current antiviral therapies based on nucleos (t)ide analogs are effective at reducing viral replication but have no impact on the oncogenic functions of HBx. Therefore, HBx is considered as an important therapeutic target to control HBV and HCC. Earlier, we have shown that thiourea derivatives can suppress the expression of HBV DNA and viral antigens. Now we show that the antiviral property of thiourea derivatives is mediated at the Core promoter level resulting in the inhibition of HBx-dependent HBV replication as well as viral gene transcription.

Method: For viral replication studies, HepG2.2.15 cells were transiently transfected with the eukaryotic expression vector for viral HBx (X0) and treated with 10 µM of thiourea derivatives (DSA-00, DSA-02, and DSA-09) for 48 h. Total RNA was isolated and quantitated for pre-genomic (pgRNA) expression by RT-qPCR. To HBx-dependent viral gene transcription, HepG2 cells were transiently transfected with either X0 or its three deletion mutants (X5, X12, and X15) along with a luciferase reporter construct for HBV core promoter (nucleotides 1636 to 1851) (Fig. A). Transfected cells were treated with thiourea derivatives (DSA-00, DSA-02, and DSA-09) (10 µM each) and luciferase activity was measured in cell extracts.

Results: The enhancement in the expression of HBV pre-genomic RNA in the presence of HBx was inhibited to a significant level following treatment with DSA-00, DSA-02, and DSA-09 (Fig. 1B). Further, the HBV core promoter activity induced by HBx was also suppressed by all three thiourea derivatives (Fig. 1C). Interestingly, the three thiourea derivatives also inhibited the core promoter activity induced by two HBx deletion mutants X5 (ΔA) and X12 (partial ΔE) but not X15 (ΔA, B, F) (Fig. 1D).

Conclusion: The thiourea derivatives DSA-00, DSA-02, and DSA-09 were effective at suppressing the HBV pgRNA to significant levels. Further, these compounds also inhibited the HBx-induced HBV core promoter activity. The presence of A and B regions at N-terminus and C-terminal C region appeared to be crucial for the antiviral activity as the transactivation function of X15 mutant could not be suppressed in the presence of these molecules. Alternatively, thiourea derivatives which dock onto HBx in silico, are unable to bind to X15 mutant due to the absence of one or more interacting sites. This study suggests that thiourea derivatives specifically target HBx to exhibit its antiviral activity and thus, has the potential to be developed as a new class of HBV therapeutic.

Figure: (abstract: FRI-263): Inhibition of HBV replication and viral gene transcription by Thiourea derivatives. Illustration of HBx wild-type and deletion mutant constructs (A1). Transient transfection with X-0 and luc-core (A2) (1 µg each), the pre-genomic RNAs levels measured by RT-qPCR and calculated by Fold changes in HepG2.2.15 cells treated with thiourea derivatives for 24 hours (B). HBV Core promoter activity with ectopic expression of HBx in HepG2, followed by treatment with thiourea derivatives for 24 hours measured by luciferase assay (C). HBV core promoter activity measured by luciferase assay with HBx wild-type and deletion mutants followed by thiourea derivatives treatment for 24 hours (D). (*p < 0.05; **p < 0.001).
Background and aims: During pregnancy immunological changes, including the reduction of CD8 (+) T-cells, occur, creating an immununotolerant placental environment. Fas/Fas ligand pathway is responsible for maintaining placental homeostasis. Our study examined the role of Fas/Fas ligand induced apoptosis of CD8 (+) lymphocytes in the protection of fetus, from both HBV infection and CD8 (+) T-cell's cytotoxic effect.

Method: Our study included 50 HBSAg (+)/HBV DNA (+) pregnant women that gave birth with vaginal delivery. Peripheral and umbilical cord blood was collected and placental tissue was examined using hematoxlin-eosin staining, immunohistochemistry and double immunofluorescence in order to identify the T-cell's sub-populations in the decidua and the chorionic villi and detect apoptotic activity.

Results: Umbilical cord HBV-DNA positivity was correlated with high levels of maternal viremia (p < 0.0001). Decidua's CD8 (+) lymphocyte count was higher in women with low viral load (LVL) versus women with high viral load (HVL) (11.25 ± 7.23 versus 6.46 ± 3.84 per HPF, p = 0.043) and in women with absence of HBV-DNA in contrast with women with positive HBV-DNA in umbilical cord blood (11.00 ± 6.45 versus 4.86 ± 3.02 per HPF, p = 0.011). Decidua's CD8 (+)/CD28 (+) and CD8 (+)/Fas-Ligand (+) T-cells' percentage was higher in the LVL group (13 ± 1% vs 9 ± 1%, p = 0.026/51 ± 1% vs 45 ± 1%, p = 0.006), while the percentage of CD8 (+)/Fas (+) was higher in the HVL group (68 ± 1% vs 73 ± 1%, p = 0.035). The percentage of CD8 (+)/CD28 (+) lymphocytes was statistically lower than the percentage of CD8 (+)/Fas (+) and CD8 (+)/Fas-ligand (+) T-cells in both groups (p < 0.05).

Conclusion: High levels of maternal viremia relate to lower levels of CD8 (+) lymphocytes in the decidua probably due to activation of Fas/Fasligand apoptotic pathway resulting in the fetus protection both from CD8 (+) lymphocytes cytotoxic effect and HBV transmission.

FRI-265
Intrahepatic hepatitis B virus cccDNA amount and transcriptional activity in a well-characterized cohort of Gambian chronically infected patients: correlation with emerging serum viral markers

Anaëlle Dubois1, Sarah Heintz1, Damien Cohen1, Marie-Laure Plissonnier2, François Berby1, Marintha Heil2, Massimo Leverger1,3,4, Fabien Zoulim1,3,5, Yusuke Shimakawa6, Maud Lemoine7, Dalessandro Umberto8, Isabelle Chemin1, Barbara Testoni1, Marie-Laure Plissonnier1, Françoise Berby1, Marintha Heil2, Massimo Leverger1,3,4, Fabien Zoulim1,3,5, Yusuke Shimakawa6, Maud Lemoine7, Dalessandro Umberto8, Isabelle Chemin1, Barbara Testoni1.

Background and aims: Hepatitis B virus (HBV) is highly prevalent in Sub-Saharan Africa, where 80 million people are chronically infected with the virus. One of the most common cancers in the region, hepatocellular carcinoma, is mainly attributable to HBV infection. Natural history of HBV infection has mostly been studied in European and Asian cohorts, thus leaving completely unmet the need of data for the Sub-Saharan Africa, where mode of transmission, age of infection, and various genetic and environmental factors differ completely. Therefore, data relating to the natural history of HBV infection in these patients are much needed.

Method: 96 untreated chronically HBV infected (CHB) patients were retrospectively selected from samples collected in The Gambia in the frame of the PROLIFICA program. Paired liver biopsy and serum samples were analyzed for serum HBV DNA, quantitative (q)HBsAg, HBCAg (Lumipulse CLEA Assay) and alanine aminotransferase (ALT) levels. Liver total HBV DNA (HBV DNA), cccDNA and 3.5Kb RNA were assessed by droplet digital PCR (ddPCR) and cccDNA transcriptional activity was calculated as 3.5Kb RNA/cccDNA ratio. Liver histology scores were also available. Serum HBV RNA (cirB-RNA) was quantified by the Roche HBV RNA investigational assay for use on the cobas® 6800 System (LLOQ 10 cp/ml; linearity range 10 to 107 cp/ml; LOD ~ 3 cp/ml-Scholtes, J Clin Virol 2022).

Results: The large majority of patients were HBeAg (-), HBV genotype E and only 10% of them had ALT levels above twice the upper limit of normal. Median levels of serum HBV DNA were 2.9 (2.1–4.2) Log IU/ml and qHBsAg were 3.7 (2.5–4.9) Log IU/ml. All patients had quantifiable HBV DNA in their liver 0.4 (0.1–0.7) copies/cell, 90% had quantifiable cccDNA 0.02 (0.006–0.6) cp/cell and 85% quantifiable 3.5Kb RNA 0.09 (0.02–0.9), cccDNA amount was positively correlated with intrahepatic HBV DNA, 3.5Kb RNA and serum HBV DNA, but not serum qHBsAg. Moreover, the results clearly indicated the presence of two groups of patients with comparable cccDNA levels, but different transcriptional activity, which was not reflected in differences in the serum HBV DNA or qHBsAg levels. Eighty-five serum samples were available for HBCAg and cirB-RNA quantification, which were detectable in 35 and 33 samples, respectively. Both markers were highly correlated with intrahepatic HBV markers and in particular with cccDNA levels (R = 0.7, p = 0.0006 for HBCAg and R = 0.6, p = 0.02 for cirB-RNA), which was confirmed also in the group of patients with low cccDNA transcriptional activity.

Table: T-cell's subpopulations in the decidua and chorionic villi in the LVL vs the HVL group

<table>
<thead>
<tr>
<th>T-CELL SUBTYPE/PLACENTA'S HISTOLOGICAL AREA</th>
<th>LVL (HPF)</th>
<th>HVL (HPF)</th>
<th>P VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD3 (+) CHORIONIC VILLI</td>
<td>4.80 ± 8.61</td>
<td>2.38 ± 1.50</td>
<td>0.598</td>
</tr>
<tr>
<td>CD3 (+) DECIDUA</td>
<td>11.1 ± 6.58</td>
<td>10.00 ± 6.45</td>
<td>0.548</td>
</tr>
<tr>
<td>CD4 (+) CHORIONIC VILLI</td>
<td>4.85 ± 4.80</td>
<td>1.00 ± 1.00</td>
<td>0.762</td>
</tr>
<tr>
<td>CD4 (+) DECIDUA</td>
<td>6.05 ± 6.31</td>
<td>5.00 ± 1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>CD8 (+) CHORIONIC VILLI</td>
<td>6.25 ± 1.07</td>
<td>3.54 ± 5.14</td>
<td>0.265</td>
</tr>
<tr>
<td>CD8 (+) DECIDUA</td>
<td>11.25 ± 7.23</td>
<td>6.46 ± 3.84</td>
<td>0.043</td>
</tr>
</tbody>
</table>

Figure: (abstract: FRI-264).
Conclusion: To the best of our knowledge, this is the most comprehensive study evaluating the correlations between intrahepatic and serum HBV activity in people living with CHB in Sub-Saharan Africa. These data will contribute to a better understanding of the natural history of CHB and thus improve the management of African CHB patients. This work is supported by the French National Research Agency Investissements d’Avenir program (CirB-RNA project-ANR-17-RHUS-0003)

FRI-266
Hepatitis B pre-genomic RNA level has a prospective supporting role for predicting the outcomes of the hepatitis B virus inactive carrier phase
Prooksa Ananchuensook1, Pakkapon Rattanachaisit1, Siriporn Sukwasamarnmuay1, Panarat Thaimai1, Supachaya Sriphoosanaphan1, Kessarin Thanapirom1, Piyawat Komolmit1, 1Chulalongkorn University, Division of Gastroenterology, Department of Internal Medicine, Bangkok, Thailand Email: pkomolmit@yahoo.co.uk

Background and aims: Hepatitis B viral (HBV) DNA and quantitative hepatitis B surface antigen (qHBsAg) have been used as biomarkers to classify and predict complications in patients with chronic hepatitis B (CHB) infection. Pregenomic-RNA (pgRNA), the biomarker representing covalently closed circular DNA (cccDNA) activity in hepatocytes, has been associated with viral rebound after cessation of nucleotide analog (NA) treatment. However, the role of pgRNA in the inactive carrier (IC) phase is unclear. Therefore, our study aims to evaluate the utility of pgRNA in IC.

Method: Patients with CHB infection were included in this study and classified into IC and chronic hepatitis (CH) groups according to the European Association for the Study of the Liver (EASL) guidelines. The serum HBV pgRNA, qHBsAg, and HBV viral loads (VL) were quantified using digital polymerase chain reaction (PCR), immunoassay methods, and real-time PCR, respectively. The HBV pgRNA levels and percentage of patients with undetectable HBV pgRNA in each phase were analyzed using the Mann-Whitney U test and chi-square test. The outcomes, including spontaneous HBsAg loss defined as qHBsAg < 0.05 IU/ml and initiation of antiviral therapy in compliance with the indications outlined in the EASL guidelines, were reviewed. The factors associated with the outcomes were assessed using the Cox regression model.

Results: A total of 309 patients with CHB infection were enrolled. Of these, 154 (49.8%) were in the IC phase and 42 (27.1%) were HBeAg-positive. PgRNA quantity was detectable in 120 patients (38.3%). The log pgRNA showed a moderate correlation with log HBV DNA (r = 0.376, p < 0.001) and qHBsAg (0.416, p < 0.001). The proportion of patients with detectable pgRNA was significantly lower in the IC group (24.0%) than that in the CH group (53.5%). In the IC group, 126 (81.82%) patients were prospectively observed with a median follow-up time of 26 months (IQR 22.75–29.00). Six (3.9%) patients had spontaneous HBsAg loss, and all of them had qHBsAg <1,000 IU/ml and undetectable pgRNA. On the other hand, three (1.9%) patients required treatment. Of these, pgRNA was detected in all three (100%), while one (33.3%) had qHBsAg ≥1,000 IU/ml. On univariate analysis, log pgRNA was the only significant factor predicting the need for antiviral therapy, with an odds ratio of 2.85 (95% CI 1.04–7.76).

Conclusion: IC had a lower proportion of detectable pgRNA than the CH group. Furthermore, all patients with spontaneous HBsAg loss had undetectable pgRNA, while all subsequently required treatments had detectable pgRNA. Therefore, pgRNA may be a supporting biomarker that can be added to qHBsAg to improve the accuracy of predicted prognoses for patients in the IC phase of patients in IC.

FRI-267
Droplet digital PCR can quantify cccDNA in plasma of naive chronic HBV infected patients with low HBsAg levels
Ravinder Singh1, Gayatri Ramakrishna1, Ekta Gupta2, Manoj Kumar3, Shiv Kumar Sarin3, Nirupma Trehanpati4. 1Institute of liver and biliary sciences, Molecular and cellular medicine, Delhi, India; 2Institute of liver and biliary sciences, Virology, India; 3Institute of liver and biliary sciences, Hepatology, India; 4Institute of liver and biliary sciences, Molecular and cellular medicine, Delhi, India Email: trehanpati@gmail.com

Table 1: Factors associated with spontaneous HBsAg loss and future need for antiviral therapy in HBV IC phase.

<table>
<thead>
<tr>
<th></th>
<th>Spontaneous HBsAg loss</th>
<th>Future need for antiviral therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes (N = 6)</td>
<td>p-value</td>
</tr>
<tr>
<td></td>
<td>No (N = 120)</td>
<td>OR (95%CI)</td>
</tr>
<tr>
<td>Spontaneous HBsAg loss</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N (%)</td>
<td>median (IQR)</td>
<td></td>
</tr>
<tr>
<td>Age (years) Males</td>
<td>52.00 (39.75-58.00)</td>
<td>46.00 (40.00-54.00)</td>
</tr>
<tr>
<td></td>
<td>4.00 (39.76)</td>
<td>9.03 (8.13-10.05)</td>
</tr>
<tr>
<td></td>
<td>0.477</td>
<td>0.08 (1.15-3.03)</td>
</tr>
<tr>
<td></td>
<td>0.143</td>
<td>0.06 (1.83-20.01)</td>
</tr>
<tr>
<td></td>
<td>1.03</td>
<td>0.04 (1.33-3.33)</td>
</tr>
<tr>
<td>AST (U/L)</td>
<td>22.00 (19.30-24.55)</td>
<td>22.00 (18.00-26.00)</td>
</tr>
<tr>
<td></td>
<td>0.425</td>
<td>0.98 (1.14-2.00)</td>
</tr>
<tr>
<td></td>
<td>0.442</td>
<td>0.99 (1.06-2.00)</td>
</tr>
<tr>
<td></td>
<td>1.04</td>
<td>0.10 (1.30-2.00)</td>
</tr>
<tr>
<td>qHBsAg (IU/ml)</td>
<td>10.67 (5.00-69.66)</td>
<td>496.70 (288.40-2,834.00)</td>
</tr>
<tr>
<td></td>
<td>0.002*</td>
<td>621.30 (496-3,007.00)</td>
</tr>
<tr>
<td></td>
<td>0.99</td>
<td>0.04 (1.00-1.00)</td>
</tr>
<tr>
<td></td>
<td>0.97 (1.01-1.02)</td>
<td>0.96 (1.00-1.01)</td>
</tr>
<tr>
<td></td>
<td>0.206</td>
<td>0.96 (1.06-1.04)</td>
</tr>
<tr>
<td>pgRNA - Detectable</td>
<td>6 (100%)</td>
<td>3 (100%)</td>
</tr>
<tr>
<td></td>
<td>65 (45.8%)</td>
<td>29 (26.3%)</td>
</tr>
<tr>
<td>pgRNA - Undetectable</td>
<td>0 (100%)</td>
<td>3 (100%)</td>
</tr>
<tr>
<td></td>
<td>88 (73.5%)</td>
<td>94 (82.6%)</td>
</tr>
<tr>
<td>Log pgRNA</td>
<td>0.022</td>
<td>0.003*</td>
</tr>
<tr>
<td></td>
<td>p = 0.908</td>
<td>0.04 (1.04-7.76)</td>
</tr>
</tbody>
</table>

*pSignificant p-value ≤ 0.05.

ALT, alanine aminotransferase; AST, aspartate aminotransferase; CI, confidence interval; N, number; NA, nucleotide analog; pgRNA, pregenomic-RNA; qHBsAg, quantitative hepatitis B surface antigen; IU/ml, international unit/milliliter; OR, odds ratio; U/L, units per liter

Figure: (abstract: FRI-266).
Background and aims: The intranuclear episomal form of HBV DNA i.e., covalently closed circular DNA (cccDNA) is the main replicative and transcriptional unit of HBV. The cccDNA quantification can reflect the transcriptome, active replicon, and persistence of HBV and is done in liver biopsy tissue. There is no sensitive assay for the precise detection of cccDNA in circulation. We aimed to quantify cccDNA in the plasma of chronic HBV (CHBV) patients using three exonucleases followed by droplet digital PCR (ddPCR).

Method: Thirty-six treatment naïve CHBV (nCHBV) patients with low HBsAg (<2,000 IU/ml, HBsAg<sub>lo</sub>, Gr. I, n = 9) and high HBsAg (>2,000 IU/ml, HBsAg<sub>hi</sub>, Gr. II, n = 27) with HBV DNA (<2,000 IU/ml or >2,000 IU/ml) with ALT level >1.2 × ULN (ULN = 40 IU/L). To standardize the assay, an HBV genome integrated, tetracycline (tet) regulated HepAD 38 cell line was used as a positive control. Total viral DNA was isolated from tet-off HepAD38 cells and the patient’s plasma using Qiagen viral DNA isolation kit. Isolated viral DNA was treated with EXOI and EXO III enzymes to remove linear DNA and T5 exonuclease to remove relaxed circular HBV DNA and got purified cccDNA by phenol:chloroform:isoamyl alcohol (P:C:I) method. Further, to quantitate cccDNA, specific primers with FAM-tagged probe were used in a highly accurate and sensitive droplet digital PCR machine that can detect a single copy of cccDNA. Analysis was done by QuantaSoft Software using the Poisson correction method.

Results: Without enzyme treatment, the tet-off HepAD 38 cell line showed 2210 copies/µl including all three, linear, relaxed circular, and cccDNA forms of HBV DNA and got purified cccDNA by phenol:chloroform:isoamyl alcohol (P:C:I) method. Further, to quantitate cccDNA, specific primers with FAM-tagged probe were used in a highly accurate and sensitive droplet digital PCR machine that can detect a single copy of cccDNA. Analysis was done by QuantaSoft Software using the Poisson correction method.

Conclusion: This is the first sensitive and efficient protocol for cccDNA quantification in plasma. Using three exonucleases (EXOI, EXO III, and T5 exonuclease), this assay accurately and specifically quantifies cccDNA by droplet digital PCR even in patients with low HBsAg.

FRI-268 COVID-19 vaccination alters NK cell dynamics and transiently reduces HBsAg titers among patients with chronic hepatitis B
Hyunjae Shin<sup>1</sup>, Ha Seok Lee<sup>2</sup>, Ji Yun Noh<sup>3</sup>, June-Young Koh<sup>2</sup>, So-Young Kim<sup>2</sup>, Ji Yun Noh<sup>3</sup>, Moon Haeng Hur<sup>4</sup>, Min Kyung Park<sup>4</sup>, Yun Bin Lee<sup>5</sup>, Yoon Jun Kim<sup>6</sup>, Jung-Hwan Yoon<sup>7</sup>, Jae-Hoon Ko<sup>8</sup>, Kyong Ran Peck<sup>9</sup>, Joon Young Song<sup>7</sup>, Eui-Cheol Shin<sup>10</sup>, Jeong-Hoon Lee<sup>4</sup>, 1 Seoul National University College of Medicine, Department of Internal Medicine and Liver Research Institute, Seoul, Korea, Rep. of South; 2 Korea Advanced Institute of Science and Technology, Korea, Rep. of South; 3 Korea University Guro Hospital, Korea, Rep. of South; 4 Seoul National University College of Medicine, Department of Internal Medicine and Liver Research Institute, Seoul, Korea, Rep. of South; 5 Sungkyunkwan University School of Medicine, Korea, Rep. of South

Background and aims: COVID-19 vaccination may non-specifically alter the host immune system. This study aimed to evaluate the effect of COVID-19 vaccination on HBsAg titer and host immunity in chronic hepatitis B (CHB) patients.

Method: Consecutive CHB patients who had serial HBsAg measurements during antiviral treatment were included in this study.
Changes in the HBsAg levels after COVID-19 vaccination were analyzed. The dynamics of natural killer (NK) cells following COVID-19 vaccination were also examined using serial blood samples collected prospectively from 25 healthy volunteers.

**Results:** Vaccinated CHB patients (n = 2,329) had significantly lower HBsAg levels 1–30 days post-vaccination compared to baseline (median, −21.4 IU/ml from baseline), but the levels reverted to baseline by 91–180 days (median, −3.8 IU/ml). The velocity of the HBsAg decline was transiently accelerated within 30 days after vaccination (median velocity: −0.06, −0.39, and −0.04 log_{10} IU/ml/year in pre-vaccination period, days 1–30, and days 31–90, respectively). In contrast, unvaccinated patients (n = 468) had no change in HBsAg levels. Flow cytometric analysis showed that the frequency of NK cells expressing NKG2A, an NK inhibitory receptor, significantly decreased within 7 days after the first dose of COVID-19 vaccine (median, −13.1% from baseline; p < 0.001). The decrease in the frequency of NKG2A+ NK cells was observed in the CD56dimCD16+ NK cell population regardless of type of COVID-19 vaccine.

**Conclusion:** COVID-19 vaccination leads to a rapid, transient decline in HBsAg titer, which may be attributed to a decrease in the frequency of NKG2A+ NK cells.

Figure: (abstract: FRI-268).
Background and aims: Hepatitis C virus (HCV) infection is a major public health problem worldwide, with an estimated 170 million people chronically infected. This study aimed to identify patients with HCV infection through an analysis of the 1H NMR spectra of serum samples using multivariate statistical data reduction tools.

Method: The study was a retrospective analysis of 83 chronic hepatitis C patients consecutively treated. To generate an overview of the variations between serological HCV samples and normal controls, an exploratory principal component analysis (PCA) model was created to compare the 800 MHz 1H NMR profiled metabolite concentrations.

Results: The PC1 vs. PC2 scores scatter plot indicated an unsupervised separation trend between HCV and normal controls. A partial least squares discriminant analysis (PLS-DA) model was subsequently constructed, and the corresponding score plot confirmed a conclusive separation between the serum values between the HCV patient and the normal controls. The metabolites were ranked by their contribution to distinguish the HCV from the controls. 10-fold cross-validation was used to assess the statistical robustness of the analysis, and Q2 and R2 values were calculated. Based on the VIP values and p values, 16 serum metabolites were selected for further study as potential biomarkers related to HCV. Compared with the normal control group, the serum contents of several metabolites such as 3-hydroxybutyrate, betaine, carnitine, fucose, glycerol, isopropanol, lysine, mannose, methanol, methionine, and ornithine significantly increased in HCV group, whereas the contents of creatinine, glutamine, proline, serine, and valine decreased significantly. Based on the area under the curve ROC, metabolites were found to have an area under the curve (AUC) greater than 0.8. Carnitine can play a role in the transport of fatty acids into the mitochondria for energy production. Proline, serine, and valine are non-essential amino acids that play a role in energy metabolism disruption in chronic hepatitis C virus infection.

Conclusion: The new infection model with the cell line HepG2-hNTCP-sec+ was reproducible in several scale-sizes and protocol settings without influencing the HCV biomarker kinetics and might be basis for further studies e.g. regarding new surrogate markers for cccDNA.

Background and aims: New reliable HBV infection models are needed, since in existing models a low biomarker secretion in vitro often impedes biomarker analysis. The previously reported clone HepG2-hNTCP-sec+ promises to support the viral life cycle of HBV fully and stably for prolonged periods of time. The aim of the study was an extensive characterization of the biomarker pattern in vitro during an infection of up to 28 days.

Method: HepG2-hNTCP-sec+ cells (kindly provided by M. Windisch) were seeded and infected with cell culture derived HBV (cccHBV), obtained from HepAD38 cells, at different multiplicities of infection (MOI, copies per cell) ranging from 50 to 10 000. Supernatant was collected after varying intervals of time from every day, every 2 days, every 3 days to every 7 days for a period of 7–28 days. To increase the volume of supernatant for extensive biomarker analysis the infection model was upscaled from an initial 384-well format to a 24-well format. HBV biomarkers (HBV DNA, HBV RNA, HBsAg composition) were measured using our published and validated in-house assays.

Results: After upsampling of the infection model cells were seeded and successfully infected with cccHBV in 96-, 48- and 24-well at MOIs >500. Maximum levels of HBsAg were measured in 24-well (MOI 10 000) at supernatant collection every 3 days with a peak concentration of 404.73 ng/ml at 6 dpi. HBsAg levels were significantly lower (136.46 ng/ml), when intensively washed after infection, compared to the standard protocol. However, the composition of HBsAg was not affected by changed washing or collection protocols. In 24-well (MOI 10000, medium change every 2 days) levels of MHBs and LHBs were 0.79 ng/ml (16.96% of total HBsAg) and 0.31 ng/ml (6.49%) at day 0 and increased to 20.23 ng/ml (13.15%) and 17.48 ng/ml (11.52%) after 6 dpi. In comparison, changing medium every 3 days showed concentrations of MHBs at 3.06 ng/ml (11.72%) and LHBs at 3.28 ng/ml (12.6%) at day 0 and 34, 9 ng/ml (8.57%) and 53, 42 ng/ml (13.08%) after 6 dpi, respectively. Long-term infection revealed a stable HBsAg composition despite a gradual decline of HBsAg to 2.61 ng/ml after 28 dpi. Depending on the protocol, HBV DNA and RNA showed an increase after 2–4 dpi and remained stable during the course of infection.

Conclusion: The new infection model with the cell line HepG2-hNTCP-sec+ showed concentrations of MHBs at 3.06 ng/ml (11.72%) and LHBs at 3.28 ng/ml (12.6%) at day 0 and 34, 9 ng/ml (8.57%) and 53, 42 ng/ml (13.08%) after 6 dpi, respectively. Long-term infection revealed a stable HBsAg composition despite a gradual decline of HBsAg to 2.61 ng/ml after 28 dpi. Depending on the protocol, HBV DNA and RNA showed an increase after 2–4 dpi and remained stable during the course of infection.

Background and aims: Very few studies have compared intraindividual viral evolution between two groups of CHB patients needed, since in existing models a low biomarker secretion in vitro often impedes biomarker analysis. The previously reported clone HepG2-hNTCP-sec+ promises to support the viral life cycle of HBV fully and stably for prolonged periods of time. The aim of the study was an extensive characterization of the biomarker pattern in vitro during an infection of up to 28 days. The new infection model with the cell line HepG2-hNTCP-sec+ was reproducible in several scale-sizes and protocol settings without influencing the HBV biomarker kinetics and might be basis for further studies e.g. regarding new surrogate markers for cccDNA.

Background and aims: Treatment of chronic hepatitis B (CHB), that is initiated based on factors associated with disease progression, such as viremia, HBeAg status, fibrosis/cirrhosis status and/or family history of hepatocellular carcinoma, is with a nucleoside analogue (NA), and often lifelong. The hepatitis B virus (HBV) genome is relatively short, however quite diverse and can accumulate mutations over time. The impact of viral diversity and evolution on disease progression is not well-established. The objective of this study was to compare intraindividual viral evolution between two groups of CHB
patients over time, using treatment initiation as a measure of disease progression and lack of immunological control.

Method: We included 25 CHB patients; 14 who did (treated group) and 11 who did not (non-treated group) initiate NA treatment during the study period, dating back to the establishment of the Danish Database for Hepatitis B and C (DANHEP) biobank in 2004 until 2019. For each patient we obtained three longitudinal plasma/serum samples taken before potential NA treatment initiation, from the DANHEP biobank. HBV DNA was extracted and amplified by PCR before full-length HBV genomes were obtained by deep sequencing. We analyzed the number of mutations that evolved during the study period and calculated the mutation rates using linear regression.

Results: There was no difference between the two groups regarding age, sex, country of origin, genotype and follow-up time (median 60 versus 57 months) but there was a significant difference in HBV DNA value (median 40,237 vs 19,028 IU/ml), HBeAg+ at baseline (n = 9 vs n = 0) and level of alanine aminotransferase (ALT) (median 43 vs 28 IU/ml). Four patients from the non-treated group were excluded from further analysis after quality control of the sequencing data. We found significantly lower mutation rates in the treated group compared to the non-treated (figure 1A). Regrouping the participants by HBeAg status showed a significantly lower mutation rate in the HBeAg+ group (figure 1B). Furthermore, log (HBV DNA) was significantly negatively correlated with mutation rates (Figure 1C).

Conclusion: CHB patients who initiate antiviral treatment have a significantly lower mutation rate prior to treatment initiation compared to patients without treatment indication. This suggests that HBV in individuals with poor immunological control mutates less frequently, which could be due to a lower immune selective pressure. High HBV DNA and HBeAg positivity are good correlates of lower mutation rates.

FRI-272
An in vivo duck hepatitis B virus model recapitulates key aspects of nucleic acid polymer treatment outcomes in chronic hepatitis B patients
Yannick Debing1, Hannah Vanrusselt1, Lars Degrauwe1,2, Daniel Apolónio Silva de Oliveira3, Christopher Kariuki3, Ebanja Joseph Ebwanga3, Shahbaz Bashir2, Wouter Merckx3, Santhosh Thatikonda4, Vikrant Gohil4, David Smith4, Pierre Raboisson1, Sam Montero1, Jin Hong5, Abel Acosta Sanchez2, Lawrence Blatt1, Julian Symons3, Tse-I Lin1, Leonid Beigelman4, Jan Paesuye2, 1Aligos Belgium BV, Belgium; 2KU Leuven, Host-Pathogen Interaction Lab, Belgium; 3KU Leuven, TransFARM, Belgium; 4Aligos Therapeutics, Inc., United States; 5Novalix, Belgium
Email: ydebing@aligos.com

Background and aims: Nucleic acid polymers (NAPs) are an attractive treatment modality for chronic hepatitis B (CHB), with REP2139 and REP2165 having shown efficacy in CHB patients. A significant proportion of patients achieve functional cure, whereas the others exhibit a moderate response or are non-responders. NAP efficacy has been difficult to recapitulate in animal models, with the duck hepatitis B virus (DHBV) model showing some promise but remaining underexplored for NAP efficacy testing. Here we report on an optimized in vivo DHBV duck model and explore several characteristics of NAP treatment in this model.

Method: Pekin ducks (Anas platyrhynchos domesticus) were intravenously injected with DHBV-containing serum shortly after hatching. After establishment of infection, animals were treated with entecavir, REP2139 and/or REP2165 and serum DHBV DNA and DHBV surface antigen (DHBsAg) levels were determined weekly. Animals were followed up for several weeks after end of treatment. NAP liver concentrations were determined by mass spectrometry.

Results: REP2139 was efficacious in reducing DHBV DNA and DHBsAg levels in approximately 50% of ducks, both when administered intraperitoneally or subcutaneously. Efficacy was only observed in experimentally infected ducks, not in endogenously infected ducks (vertical transmission). REP2165 showed a different activity profile with a more homogenous antiviral response followed by a faster rebound. Intrahepatic NAP concentrations did not correlate with efficacy. Entecavir pretreatment prior to REP2139 treatment add-on further improved response rates.

Conclusion: Subcutaneous administration of NAPs in the DHBV duck model provides a useful tool for in vivo evaluation of NAPs, recapitulating many aspects of this class of compound’s efficacy in CHB patients.
Viral hepatitis AE Clinical aspects

SAT-141
Hepatitis A hospitalisations in the United States and risk factors for inpatient mortality: a nationwide population study, 1998–2020

Paul Wasuwanich1, Joshua So1, Megan Hofmeister2, Saleem Kamili2, Songyos Rajborirug3, Wikrom Karnsakul4. 1University of Florida College of Medicine, Department of Medicine, Gainesville, United States; 2Centers for Disease Control and Prevention, Division of Viral Hepatitis, National Center for HIV, Viral Hepatitis, STD and TB Prevention, Atlanta, United States; 3Johns Hopkins Bloomberg School of Public Health, Baltimore, United States; 4The Johns Hopkins University School of Medicine, Division of Pediatric Gastroenterology, Hepatology, and Nutrition, Department of Pediatrics, Baltimore, United States

Email: p.wasuwanich@ufl.edu

Background and aims: Hepatitis A virus infections in the United States have been declining due to improvements in sanitation and the introduction of hepatitis A vaccines. However, recent widespread outbreaks associated with person-to-person transmission brought the disease back into the spotlight. We aim to describe the epidemiology of hepatitis A hospitalizations from 1998 to 2020 in the United States and investigate risk factors that increase inpatient mortality.

Method: We utilized the National Inpatient Sample database from the Healthcare Cost and Utilization Project which collects nationwide US hospitalization data. We identified hepatitis A-related hospitalizations using ICD-9 and ICD-10 diagnosis codes. Demographic and geographic data were extracted, as well as clinical data including death, coinfections, comorbidities, pregnancy status, and substance use. Data were analyzed by logistic and Poisson regression. Significance was defined as p < 0.01.

Results: We identified a total of 160,661 hepatitis A-related hospitalizations between 1998 and 2020, with the lowest hospitalization rate in 2015 (21.8 per 1,000,000 people), and the highest in 2019 (62.9 per 1,000,000 people). Hospitalization rates decreased overall during 1998–2015 (Incidence Rate Ratio [IRR] = 0.98; 95% CI = 0.98–0.98; p < 0.001) and increased during 2015–2020 (IRR = 1.25; 95% CI = 1.24–1.27; p < 0.001). The inpatient mortality rate ranged from 1.7% in 2005 to 3.8% in 2020. Most hospitalizations occurred among males (56.9%), non-Hispanic White persons (72.0%), and in the Southern region (51.2%). Age >55 years (OR = 2.81; 95% CI = 2.27–3.49; p < 0.001), alcoholic cirrhosis (OR = 4.00; 95% CI = 3.00–5.32; p < 0.001), autoimmune hepatitis (OR = 3.44; 95% CI = 1.48–8.00; p = 0.004), chronic kidney disease (OR = 2.56; 95% CI = 2.02–3.25; p < 0.001), heart failure (OR = 2.68; 95% CI = 2.11–3.40; p < 0.001), hepatorenal syndrome (OR = 18.32; 95% CI = 13.31–25.22; p < 0.001), and portal hypertension (OR = 3.95; 95% CI = 2.97–5.26; p < 0.001) increased the odds of inpatient mortality. Hepatitis C virus coinfection (OR = 0.67; 95% CI = 0.51–0.88; p = 0.004), tobacco use disorder (OR = 0.38; 95% CI = 0.30–0.49; p < 0.001), and intravenous drug use (OR = 0.38; 95% CI = 0.28–0.53; p < 0.001) were associated with decreased odds of inpatient mortality. Diabetes, obesity, hepatitis B virus coinfection, fatty liver disease, and solid organ transplantation were not associated with mortality (p > 0.01). None of the pregnant women hospitalized with hepatitis A died.

Conclusion: Hepatitis A hospitalizations declined from 1998 to 2015 and then increased rapidly from 2015 to 2020, coinciding with widespread outbreaks associated with person-to-person transmission. Concerningly, inpatient mortality rates also increased. Certain risk factors can be used to predict prognosis of patients hospitalized with hepatitis A.
SAT-142

High prevalence of HEV related to the progression and prognosis of patients with acute pancreatitis: a multicentre cross-sectional and cohort study in China

Jian Wu1,2, Ze Xiang2,3, Lan Huang4, Ce Gao4, Ling Tong5. 1The Affiliated Suzhou Hospital of Nanjing Medical University, Suzhou Municipal Hospital, Gusu School, Nanjing Medical University, Department of Clinical Laboratory, Suzhou, China; 2The Chinese Consortium for the Study of Hepatitis E (CCSHE), China; 3Zhejiang University School of Medicine, China; 4The Affiliated Suzhou Hospital of Nanjing Medical University, Suzhou Municipal Hospital, Gusu School, Nanjing Medical University, China; 5The First Affiliated Hospital, Zhejiang University School of Medicine, China

Email: wujianglinxing@163.com

Background and aims: The role of HEV infection in acute pancreatitis (AP) patients remains unclear.

Method: 1000 eligible patients with AP, 1000 healthy controls (HCs) and 300 patients with AHE were recruited from 8 hospitals in China from January 1, 2016 to May 31, 2021.

Results: The positive rates of anti-HEV IgG, anti-HEV IgM and HEV RNA in the AP group were all significantly higher than HCs group. With the increase of the severity of AP, the percentage of HEV infection also increased significantly. According to whether infected with HEV, 1000 AP patients were divided into patients without HEV infection (AP- group, n = 977) and those with HEV infection (AP+AHE group, n = 23). The percentage of patients with severe AP in the AP+AHE group was significantly higher than the AP- group, and the percentage of patients with mild AP in the AP+AHE group was significantly lower than that in the AP- group. In the AP+AHE group, 12 AP cases were potentially associated with HEV infection, the severity of whom were associated with high level of HEV titre. Moreover, HEV infection was one of the main independent risk factors and owned the high predictive power for the outcome of AP, suggesting that HEV infection was related to poorer outcome of AP. High level of HEV titre would prolong the hospital stay of AP patients, and HEV infection was associated with the higher risk of recurrent AP. In addition, AP+AHE patients receiving conservative treatment showed better prognosis. Among 300 AHE patients, 5 patients were diagnosed with AP. After excluding common AP causes, 2 patients with AP were considered to be potentially associated with HEV infection.

Conclusion: HEV infection plays an important role in the occurrence, development and prognosis of AP, which would have implications for management of AP patients complicated with AHE.

SAT-143

Hepatitis E virus infection before and after liver transplantation

Petra Dinjar Kujundžić1, Tatjana Vilibic-Cavlek2, Tomislav Kelava3, Adriana Vince4, Jelena Prpic4, Lorena Jemersic4, Ana Ostojic5, Anna Mrzljak5,6. 1Merkur Clinical Hospital, Croatia; 2Croatian Institute...
Viral hepatitis B and D Clinical aspects

WEDNESDAY 21 TO SATURDAY 24 JUNE

TOP-100

Long-term outcome of hepatitis delta in different regions worldwide: results of the hepatitis delta international network (HDIN)

Anika Wranke1, Emanoel Ceausur2, George Dalekos3, Mario Rizzetto4, Adela Turcanu5, Grazi Niro6, Onur Keskin7, George Sebastian Gherlan8, Minaa Abbas8, Patrick Ingiliz9, Marion Muche9, Maria Buti10, Peter Ferenci11, Thomas Vanwolleghem12, Markus Cornberg2, Zaigham Abbas8, Cihan Yurdaydin13, Petra Dörgel1, Heiner Wedemeyer1. 1Hannover Medical School, Gastroenterology, Hepatology and Endocrinology, Germany; 2Víctor Babes Clinical Hospital for Infectious and Tropical Diseases, Romania; 3University of Thessaly, Greece; 4University of Torino, Italy; 5State University of Medicine "Nicolae Testemitanu," Moldova; 6Divisione di Gastroenterologia, Ospedale Generale Regionale "Casa Sollievo della Sofferenza, Italy; 7Ankara University, Turkey; 8Ziauddin University Hospital Karachi, Pakistan; 9Centre for Infectiology Berlin (CIB), Germany; 10Charité, Berlin, Germany; 11Liver Unit, Valle d’Hebron University Hospital and Ciberdel del Instituto CarlosIII, Spain; 12Medical University of Vienna, Austria; 13Antwerp University Hospital, Belgium; 14Koc University Medical School, Turkey

Email: wedemeyer.heiner@mh-hannover.de

Background and aims: Chronic delta hepatitis represents a major global health burden. Clinical features of HDV infection vary largely between different regions world-wide. Moreover, treatment approaches may differ and depend on drugs approved and financial resources. However, factors determining disease progression are poorly defined. The Hepatitis Delta International Network (HDIN) was established in 2011 to compile a comprehensive database to facilitate clinical research on chronic hepatitis delta.

Method: The HDIN registry was developed by the HepNet Study-House of the German Liver Foundation in collaboration with researchers from Europe, Asia, North- and South America. A structured questionnaire specifically developed for hepatitis delta long-term follow-up was implemented. Here we report data of 547 patients from 13 centers in 10 countries with ongoing or past HDV infection included until December 2022.

Results: The majority of patients were male (n = 335, 61%) and the mean age was 41 years (range 1–79). Most patients were HBeAg-negative (87%). Patients were divided according to the country of birth into Eastern Mediterranean (EM; 26%), Eastern Europe and Central Asia (EE; 38%), Central and Southern Europe (CE; 15%), South Asian (SAS (mainly Pakistan); 16%) and Africa (2%). The median follow-up varied from 9.1 (range 0.6–28) years (EM) to 3.2 (0.6–18) years (SAS) (p = 0.01). Liver cirrhosis at baseline was reported in 42% of cases, varying from 41% in EE to 49% in SAS. During follow-up 31% developed a liver-related end point (n = 168) after 3.2–4.5 years. Ascites was the most frequent decompensation (22%), followed by encephalopathy (8.8%) and variceal bleeding (7.1%). Hepatocellular carcinoma developed in 47 patients (8.6%) and 68 patients (12%) underwent liver transplantation. Sixty-four patients died (12%), 47% were HDV-related. Clinical liver-related end points developed more frequently in EM patients (42%), compared to 28% in EE patients, 26% in EM patients and 27% in SAS patients (p < 0.01). However SAS patients developed end points earlier (p < 0.01) and had the highest mortality (Kaplan Meier p < 0.01). Additionally, they had lowest Albumin levels and were younger (p < 0.01). Antiviral therapy during follow-up was administered to 350 patients (highest treatment uptake in EM and SAS patients, lowest in CE), including 225 patients being treated with IFNa (SAS 59%, EM 49%, EE 35%, CE 23%). Patients who received IFNa-based therapies developed clinical end points less frequently, which was significant in both chi-square and Kaplan-Meier analysis. End points occurred more frequently in patients with positive HDV RNA (at baseline or at end of follow-up) (p = 0.01).

Conclusion: The HDIN registry confirmed the particular severity of hepatitis delta. There is an urgent need to generate global data to determine the incidence, the differences in access to care and treatment and consecutively the liver related outcomes.
TOP-101
Identification of liver-associated gene signatures from serum exosomes in patients with chronic hepatitis B

Mario Cortese1, Liao Zhang2, David Pan2, Jeffrey Wallin1, Bryan Downie2. 1Gilead Sciences, Biomarkers, Foster City, United States; 2Gilead Sciences, CBEA, Foster City, United States

Email: mario.cortese@gilead.com

Background and aims: The invasive nature and high costs of liver biopsies pose significant challenges in HBV clinical studies. Serum-based exosome profiling may be an alternative method to profile liver gene expression differences associated with HBV treatment or cure. Here, we generated RNA sequencing data derived from isolated exosomes (Exosome-seq) and peripheral blood to investigate the gene expression characteristics associated with response to pegylated interferon alpha-2a (PEG-IFN) treatment in patients with chronic hepatitis B (CHB).

Method: Clinical study GS-US-174–0149 evaluated PEG-IFN alone or in combination with tenofovir disoproxil fumarate (ClinicalTrials.gov Identifier: NCT01277601). Exosome-seq data was generated from baseline and on-treatment (week 4) samples for study subjects with (n = 14) and without (n = 26) hepatitis B surface antigen (HBsAg) loss at week 48. Additionally, RNA-seq data was obtained from whole blood samples collected at baseline and week 48 from a total of n = 22 CHB patients (n = 13 with and n = 9 without HBsAg loss) in the study. Biological pathway scores were generated using the ssGSEA methodology. Treatment-induced transcriptional signatures were determined using voom-limma or mixed effects models between the two response groups (HBsAg loss vs. no HBsAg loss). Liver specific genes were determined by comparing count-per-million (CPM) expression profiles of liver tissues compared to non-liver tissues using a Wilcoxon-ranked sum test in the Genotype-Tissue Expression (GTEx) dataset.

Results: Exosome profiling revealed broad transcriptional changes 4 weeks following the start of treatment with PEG-IFN. These changes included immune signatures associated with IFN signaling and T cell activation, similarly to those observed in whole blood. Additionally, an increase in liver-specific genes was observed in exosome-seq following PEG-IFN treatment, suggesting that exosome profiling may provide insight into the cellular response of hepatocytes and liver-resident cells elicited by PEG-IFN. Genes encoding markers of liver inflammation (ALB, complement activation (CFHR2, CFHR5), enzymes involved in metabolic pathways (UGT1A3, UGT1A4, HAO1), and coagulation factors (F9, F13B) were among the most enriched liver-specific genes during treatment with PEG-IFN. Despite a large transcriptional overlap, 570 genes demonstrated trending differences after 4 weeks in transcriptional profile (nominal p < 0.05) between Week 48 clinical responders (HBsAg loss) and non-responders. Finally, associations were observed between exosome-derived liver-specific genes and clinical characteristics of HBV disease status, such as HBsAg loss.

Conclusion: Serum-based Exosome-seq revealed liver-associated signatures of response to PEG-IFN treatment in CHB patients. These findings suggest that transcriptional profiling of exosomes has potential as a non-invasive method to profile liver-derived immune responses in HBV clinical studies.

TOP-103
HDV full genome sequencing and sensitive HBV genotyping from a large cohort of HBV/HDV co-infected patients

Savrina Manhas1, Simin Xu1, Silvia Chang1, Thomas Aeschbacher1, Roberto Mateo2, Ross Martin1, Yang Liu1, Stephanie Narguet4, Dzhahal Abdurakhmanov3, Pietro Lampertico4, Dmitry Manuilov1, John F. Flaherty1, Hongmei Mo1, Evguenia S Svarovskaia1, Tarik Asselah2. 1Gilead Sciences, Inc., United States; 2Université de Paris-
**Background and aims:** Hepatitis Delta virus (HDV) is a 1.7 kb RNA virus that requires Hepatitis B virus (HBV) envelope proteins for hepatocyte entry and virion release. HDV causes the most severe form of viral hepatitis. Evolutionary analysis of nucleotide sequence diversity groups HDV into eight major genotypes (HDV-1 to HDV-8) and HBV into eight major genotypes (GTA to GTH). Most HDV and HBV genotypes have distinct geographical distributions; however, to date, limited HDV and HBV sequencing data is available from HDV/HBV co-infected patients.

**Method:** HDV and HBV sequencing were attempted for 391 HDV/HBV co-infected patients from 15 countries of birth. For HDV sequencing, full genome (FG) amplification followed by next generation sequencing (NGS) or total RNA sequencing of plasma was used. HDV consensus sequences from NGS were used to determine genotype based on BLAST analyses against a diverse set of HDV sequences representing all HDV genotypes. For HBV sequencing, FG amplification or an ultrasensitive assay using both HBV RNA and DNA amplification of five small fragments across large hepatitis B surface antigen followed by NGS was performed. HBV consensus sequences from NGS were used to determine HBV genotypes based on BLAST analyses against an HBV reference sequence library. If amplification was unsuccessful, HBV genotype was determined using an enzyme immunoassay.

**Results:** The majority of patients were from Eastern Europe (n = 264), Western Europe (n = 71) and West Africa (n = 43). HDV and HBV sequencing were successful for 331 (85%) and 277 (71%) of 391 patients, respectively, while paired HBV/HDV genotypes were determined for 341 (87%) patients. Regarding individual genotypes, HBV GTD and HDV-1 were the most prevalent with 320 (82%) and 327 (84%) of 391 patients, respectively. Paired HBV/HDV genotypes were determined for 331 (85%) and 277 (71%) of 391 patients across 15 countries were determined here with HBV/HDV genotypes D/1 being most prevalent. Phylogenetic analyses showed new HDV-1 subtypes that have not been previously reported. To date, this is the largest published dataset of paired HBV/HDV clinical sequences and genotype determinations.

**Conclusion:** Sequencing and genotyping of HDV and HBV from 391 patients across 15 countries were determined here with HBV/HDV genotypes D/1 being most prevalent. Phylogenetic analyses showed new HDV-1 subtypes that have not been previously reported. To date, this is the largest published dataset of paired HBV/HDV clinical sequences and genotype determinations.

**TOP-106**

**The intrahepatic activity of Hepatitis Delta virus is sustained by an abundant production of HBs transcripts, mainly derived from integrated HBV-DNA, and is not strictly related to the extent of HBV reservoir**

Romina Salpini1, Stefano D’Anna1, Lorenzo Piermatteo1,2, Elisabetta Teri1, Andrea Di Lorenzo3, Giulia Torre3, Vincenzo Malagnino3, Marco Iannetta3, Francesca Ceccherini Silberstein1, Caterina Pasquazzi1,3, Simonia Francioso1, Flavia Ferretti1,2, Ilaria Lenci3, Vincenzo Malagnino3, Marco Iannetta3, Gian Paolo Caviglia7, Valentina Svicher1,2.

1University of Rome Tor Vergata, Experimental Medicine, Italy; 2University of Rome Tor Vergata, Department of Biotechnology, Italy; 3Tor Vergata University Hospital, Infectious Diseases Unit, Italy; 4Sant’Andrea Hospital, Italy; 5University of Padua, Italy; 6Tor Vergata University Hospital, Hepatology Unit, Italy; 7University of Turin, Department of Medical Sciences, Italy

Email: rsalpini@yahoo.it

**Background and aims:** HDV exploits HBV surface glycoproteins (HBsAg) for viral morphogenesis and de novo entry into hepatocytes. The interplay between the two viruses is poorly understood and has been mainly evaluated in peripheral blood. We investigated HBV and HDV replicative activity and interplay by analysing a well-defined set of liver biopsies from patients with chronic HBV/HDV co-infection.

**Method:** Liver tissue was analysed from 22 patients (63.6% NUC-treated; 95% HBcAg negative). Intrahepatic levels of covalently closed circular DNA (cccDNA), pregenomic HBV RNA (pgRNA), total HBV-DNA (iHBV-DNA) and HDV-RNA were quantified by highly sensitive droplet digital PCR (ddPCR). ddPCR assays were also set up to quantify total HBs transcripts and to distinguish HBV transcripts deriving from cccDNA and from integrated HBV-DNA (iDNA-derived HBs) according to Grudda, 2022.

**Results:** Patients had median (IQR) serum HBsAg, HBV-DNA and HDV-RNA levels of 14,460 (8,868–20,551) IU/ml, 34 (23–65) IU/ml, and 7.3 (3.7–7.7) log10 IU/ml, respectively. Median (IQR) ALT was 75
Background and aims: Recent phase I clinical trial revealed chronic hepatitis B (CHB) patients receiving 0.3 mg/kg/dose Nivolumab, a PD1 inhibitor, had mean HBV surface antigen (HBsAg) decline of 0.30 log10 IU/ml on week 12 and 4.5% HBsAg loss by 6 months follow-up. Whether HBsAg reduction magnitude and HBsAg loss rate will be increased in CHB patients receiving higher dose of PD1 inhibitor remained unknown. We aim to investigate this issue by comparing the HBsAg kinetics between CHB patients with hepatocellular carcinoma (HCC) receiving anti-cancer treatment with either PD1 inhibitor (ICI) or tyrosine kinase inhibitor (TKI).

Method: CHB patients with HCC receiving either [Nivolumab (2–3 mg/kg/dose) or Atezolizumab (1200 mg/dose) plus Bevacizumab (5–10 mg/kg/dose), as ICI group] or [Sorafenib (400–800 mg/day), as TKI group] at least 4 weeks during 2012 to 2023 were retrospectively recruited. All patients were followed for at least 3 months after receiving anti-cancer therapy. Propensity score matching (PSM) was done to adjust baseline characteristics differences (including age, gender, ALT, BCLC stage, HBV DNA level, and nucleotide analogues coadministration status) between two groups at a 1:1 ratio. Serial HBsAg levels at 3 months before study entry, at the start of ICI or TKI treatment, and 3 months after treatment were assayed. HBsAg decline and HBsAg loss rate were compared between both groups.

Results: After PSM, there were 36 patients in each group. The median duration of ICI or TKI treatment was 3.32 months and 4.93 months, respectively. Characteristics at study entry were comparable between both groups. The HBsAg reduction magnitude [median: 0.10 vs 0.03 log10 (IU/ml/year), p = 0.514], proportion of rapid HBsAg decline (>0.5 log10 IU/ml/year) 8/34 vs 11/34, p = 0.418] and HBsAg loss rate (2/36 vs 0/36, p = 0.493) after ICI or TKI treatment were all comparable. The HBsAg reduction magnitude and HBsAg loss rate were compared between both groups.

Conclusion: CHB patients with HCC receiving anti-cancer dosage of immunotherapy failed to achieve greater HBsAg reduction magnitude nor higher HBsAg loss probability than those receiving TKI. Immunootherapy alone, even with higher dose, may not be potent enough to achieve functional cure.

TOP-112
Programmed cell death protein 1/ligand 1 inhibitor versus tyrosine kinase inhibitor in the efficacy of HBsAg reduction in chronic hepatitis B patients with hepatocellular carcinoma
Te-Wei Tseng1, Wei-Teng1,2, Po-Ting Lin1,2, Rachel Wen-Juei Jeng1,2, Chun-yen Lin1,2. 1Linkou Chang Gung Memorial Hospital, Department of Hepatogastroenterology, Taoyuan City, Taiwan; 2Chang Gung University, College of Medicine, Taiwan
Email: rachel.jeng@gmail.com

Table (abstract: TOP-112).

<table>
<thead>
<tr>
<th></th>
<th>TKI</th>
<th>ICI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>34</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>60(46–81)</td>
<td>61(26–80)</td>
<td>0.629</td>
</tr>
<tr>
<td>Sex (male)</td>
<td>31</td>
<td>24</td>
<td>0.062</td>
</tr>
<tr>
<td>ALT (U/L)</td>
<td>42(16–124)</td>
<td>37(15–245)</td>
<td>0.594</td>
</tr>
<tr>
<td>BCLC stage</td>
<td></td>
<td></td>
<td>0.829</td>
</tr>
<tr>
<td>A/B</td>
<td>8</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>26</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Anti-cancer therapy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atezolizumab/Bevacizumab</td>
<td>18</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Sorafenib</td>
<td>34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anti-cancer treatment duration (m)</td>
<td>4.9(1.6–37.0)</td>
<td>3.3(1.0–51.0)</td>
<td>0.052</td>
</tr>
<tr>
<td>Baseline HBV DNA level, log10IU/ml #</td>
<td>1.62(0.735)</td>
<td>0.0 (0.583)</td>
<td>0.027</td>
</tr>
<tr>
<td>NUC</td>
<td>33</td>
<td>36</td>
<td>0.239</td>
</tr>
<tr>
<td>NUC duration (m)</td>
<td>10.43</td>
<td>19.25</td>
<td>0.267</td>
</tr>
<tr>
<td>HBeAg</td>
<td>4</td>
<td>6</td>
<td>0.509</td>
</tr>
<tr>
<td>Baseline HBsAg, IU/ml #</td>
<td>675.65</td>
<td>479.5</td>
<td>0.336</td>
</tr>
<tr>
<td>Post-treatment HBsAg decline $</td>
<td>0.10</td>
<td>–0.03</td>
<td>0.514</td>
</tr>
<tr>
<td>HBsAg decline &gt;0.5 $</td>
<td>11</td>
<td>8</td>
<td>0.418</td>
</tr>
<tr>
<td>HBsAg decline &gt;1 $</td>
<td>5</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>HBsAg clearance (0.05 $</td>
<td>0</td>
<td>2</td>
<td>0.493</td>
</tr>
</tbody>
</table>

#median (range);
$\log_{10} (IU/ml/year);
$IU; m: month
POSTER PRESENTATIONS

**WEDNESDAY 21 JUNE**

**WED-113**

The performance of the cobas® HBV RNA assay for use on the cobas® 5800/6800/8800 Systems (RUO) against genomic variants and transcript heterogeneity

Thomas Meister1, Victoria Innocent1, Debra Liggert1, Dax Javier1, Alan Blair1, Zih-Hua Chen1, Abdellali Kelil1, Sneha Nishtala1, Caroline Scholtes2, Barbara Testoni2, Marie-Laure Lissonnier2, Massimo Leveroto3, Fabien Zouloun3, Marinhtha Heil1, Aaron Hamilton1, 1Roche Molecular Systems, United States; 2INSERM, France; 3Italy

**Background and aims:** Circulating HBV RNA has emerged as a novel biomarker reflecting cccDNA presence and transcriptional activity, and is being explored for use as a PCR diagnostic target in monitoring viral clearance and informing treatment decisions. The cobas® HBV RNA assay for use on the cobas® 5800/6800/8800 Systems (RUO) is a quantitative test targeting the 3' poly-A junction of HBV RNA. This allows differentiation from other nucleic acids including products of integrated viral DNA. In this study, HBV genomic polymorphisms and transcript variants were characterized, and the impact on assay performance was assessed.

**Method:** HBV sequence and transcript diversity were assessed with an *in silico* analysis and an HBV RNA sequencing workflow. For genomic analysis, NCBI and in-house databases were analyzed with a custom algorithm. For assessing HBV RNA sequences, a panel of HBeAg± samples from genotypes A-E were collected at the Hospices Civils de Lyon. The cobas HBV RNA RUO assay performance was assessed with varying concentrations of *in vitro* transcribed (IVT) RNAs.

**Results:** Inspection of the polyadenylation cleavage site revealed the most common polymorphism was an A/T at the penultimate nucleotide. Rare genomic variants were present in 4% of the public database. The next six most reported variants had 0.1–1% frequency. A panel of HBeAg± samples were sequenced. The penultimate A/T variations were observed but none of the rare variants. Analysis of viral RNA revealed that heterogeneity at the HBV poly-A start site varied in a genotype dependent manner. The major variant found alongside the standard poly-A junction was a −2 poly-A start site, which occurs at higher frequencies (30–50%) in genotypes A, D, and E, likely related to the T>A polymorphism at the penultimate nucleotide commonly observed in these genotypes. In contrast, total poly-A alternative start sites in genotypes B and C ranged from 2 to 25%. When the cobas HBV RNA RUO assay was tested with IVT mixtures, the assay performance against the −2 transcript variant was equivalent to the canonical transcript. The next six most reported genomic variants (0.1–1% frequency) were experimentally tested with *in vitro* transcript templates. Additional primers were assessed to mitigate rare mismatches that may affect quantitation of the assay.

**Conclusion:** The HBV polyadenylation cleavage site was assessed for genomic and transcriptional variation. The major genomic variation was an A/T polymorphism at the penultimate nucleotide of the cleavage site. Alternative poly-A start sites were identified within patient samples, with the major variant being a −2 poly-A start. The detected levels of poly-A heterogeneity had minimal impact on the cobas HBV RNA RUO assay. The assay design was improved with additional primers matching rare genomic mismatches. This diagnostic assay will fulfill a critical unmet need for monitoring chronic HBV infection.

**WED-114**

Next generation core inhibitors ABI-H3733 and ABI-4334 have significantly improved potency and target coverage for both antiviral and cccDNA formation activities compared to first-generation core inhibitors

Nuruddin Unchwaniwala1, Katie Zomorodi1, Michael Shen1, Ran Yan1, Xuman Tang1, Xiang Xu1, Michel Perron1, William E. Delaney1, Kathryn M. Kitrinos1, 1Assembly Biosciences, United States

**Background and aims:** Core inhibitors (CIs) are a novel class of HBV antivirals with the potential to improve cure rates. CIs have multiple mechanisms of action (MOA), including (1) inhibition of pgRNA encapsidation which prevents formation of new viral particles (antiviral activity), and (2) disruption of incoming capsids which prevents de novo formation of cccDNA (cccDNA activity). CIs typically have greater potency against MOA1 (antiviral) than MOA2 (cccDNA). However, we believe that sufficient target coverage for both MOAs is needed for optimal clinical activity. Assembly Bio has two next generation CI candidates in Phase 1 clinical studies: ABI-H3733 (3733) and ABI-4334 (4334), which have improved potency against both MOAs compared to first-generation CIs including cobicistat (VBR). Here, we compare human plasma and liver concentrations for VBR, 3733, and 4334 relative to protein adjusted EC50s (paEC50) for each MOA.

**Method:** Plasma concentrations of VBR, 3733, and 4334 were measured in ongoing Phase 1a/b studies. Trough concentration (Cmin) values for 3733 and 4334 at 300 mg once daily (QD) were projected assuming dose proportional exposure using 3733 50 mg (Phase 1b) and 4334 30 mg (Phase 1a) cohort data, respectively. In vitro EC50 for antiviral activity (HBV DNA end point) and cccDNA activity (HBeAg end point) were measured in primary human hepatocytes (PHH) by branched DNA and ELISA, respectively. paEC50 were determined in HepA038 cells cultured in medium containing physiologic concentrations of human serum albumin and alpha acidic glycoprotein. Liver concentrations relative to plasma were estimated from nonclinical pharmacokinetic (PK) studies.

**Results:** The PK and antiviral properties of VBR, 3733, and 4334 are summarized in the Table. VBR achieved Cmin values 1.4- and 0.1-fold above antiviral and cccDNA paEC50, respectively, at the 300 mg QD clinical dose. Based on the projected Cmin values at 300 mg QD, 3733 and 4334 are predicted to have Cmin values >10-fold over paEC50 for antiviral activity and >10-fold over paEC50 for cccDNA activity, with 4334 having an additional 3 to 4 times greater target coverage compared to 3733. VBR, 3733, and 4334 are predicted to have enriched exposure in the liver by 18, 6, and 7-fold, respectively.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>VBR</th>
<th>3733</th>
<th>4334</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antiviral EC50 (nM)</td>
<td>281</td>
<td>8.8</td>
<td>0.5</td>
</tr>
<tr>
<td>CccDNA EC50 (nM)</td>
<td>3032</td>
<td>61</td>
<td>2.6</td>
</tr>
<tr>
<td>Protein adjustment (fold)</td>
<td>8</td>
<td>9.6</td>
<td>5.5</td>
</tr>
<tr>
<td>Plasma Cmin/paEC50 (antiviral)</td>
<td>1.4</td>
<td>127</td>
<td>360</td>
</tr>
<tr>
<td>Plasma Cmin/paEC50 (cccDNA)</td>
<td>0.1</td>
<td>18</td>
<td>69</td>
</tr>
<tr>
<td>Liver:plasma ratio</td>
<td>18</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

**Conclusion:** Next generation CIs 3733 and 4334 have significantly improved coverage for both antiviral and cccDNA formation activities compared to first-generation CIs. 3733 and 4334 are currently completing Phase 1b and Phase 1a studies, respectively.
A retrospective observational cohort study of liver-related events among individuals with hepatitis B virus infection with and without hepatitis delta virus infection

Laura Telep1, Amanda Singer1, Ben Da1, Ankita Kaushik1, Chong Kim1, Fang Xia1, Anand Chokkalingam1, Tatjana Kushner2. 1Gilead Sciences, Inc., Foster City, United States; 2Icahn School of Medicine at Mount Sinai, Division of Liver Diseases, New York, United States

Email: laura.telep@gilead.com

Background and aims: Hepatitis delta virus (HDV) is considered the most severe form of viral hepatitis infection. Among commercially insured patients, there are limited mixed data regarding rates of liver-related events in individuals infected with HDV vs. individuals with HBV mono-infection. The goal of this study is to characterize patients with HDV infection in United States (US) administrative claims data and assess the incidence of liver-related events in this population compared to individuals with HBV mono-infection.

Method: This was a retrospective observational cohort study using data from the IQVIA PharMetrics Plus™ database which contains adjudicated medical and pharmacy claims from commercially insured individuals in the US. All included individuals were age 18+ years at cohort entry with no pauses in enrollment >1 month prior to index or during follow-up. Index date for each cohort (HDV and HBV mono-infected) occurred between January 2007 and September 2021 at either first inpatient, or the first of two outpatient diagnosis codes at least 30 days apart with a 365-day baseline period and follow-up for ≥1 day. Four liver-related events were investigated (cirrhosis/fibrosis, hepatocellular carcinoma (HCC), liver decompensation, or liver transplant) using previously validated definitions. In each analysis, patients with baseline evidence of the outcome or coinfection with hepatitis C virus (HCV) or human immunodeficiency virus (HIV), were excluded. A unique propensity score (PS) model was constructed using baseline demographic and clinical characteristics including the other three outcomes, nucleotide (s)ide analogue (NA) and interferon (IFN) treatment history. Variables with standardized mean differences (SMD) between the exposure groups that were within 0.1 after weighting were considered balanced. Hazard ratios (HR) comparing risk of liver-related events in those with HBV mono-infection vs. HDV infection were estimated using Cox proportional hazards methods after PS weighting.

Results: During the study period, 46,474 individuals with HBV mono-infection and 1,805 with HDV infection were identified. Individuals with HDV were more likely to be older at cohort entry, male, and take NA or IFN treatment than those with HBV mono-infection (Table 1). In addition, baseline prevalence of diabetes, hypertension, hyperlipidemia, and liver-related conditions including HCV coinfection and end stage liver disease (ESLD) was higher in those infected with HDV. After PS weighting, there were no variables with |SMD| >0.1, and individuals infected with HDV had a higher risk for each clinical outcome than those mono-infected with HBV (cirrhosis [HR: 1.44, CI: 1.22–1.70]; liver decompensation [HR: 1.58, CI: 1.34–1.88]; HCC [HR: 1.41, CI: 1.06–1.88]; liver transplant [HR: 2.08, CI: 1.35–3.21]).

Conclusion: In this real-world study of commercially insured individuals with HBV infection in the US, those diagnosed with HDV infection had a higher prevalence of metabolic comorbidities, HCV coinfection, and ESLD at baseline, and an increased risk of liver-related outcomes before and after PS weighting compared to those with HBV mono-infection.
Novel serum biomarkers for risk stratification in chronic hepatitis B: what do they bring to the table?

Louise Downs1,2, Marion Delphin3, Tingyan Wang4,5, Cori Campbell4, Sheila Lumley2,4, Elizabeth Widdowson6,7, Catherine De Lara8, Sue Wareing9, Polly Fengou2, Kosh Agarwal10, Geoffrey Dusheiko6,7, Jacqueline Martin8, Azim Ansari4, Ivana Carey6, Monique Andersson2,4, Eleanor Barnes4, Philippa Matthews3,7.

1University of Oxford, Nuffield Department of Medicine, Oxford, United Kingdom; 2Oxford University Hospitals, Department of Infectious Diseases and Microbiology, Oxford, United Kingdom; 3The Francis Crick Institute, London, United Kingdom; 4University of Oxford, Nuffield Department of Medicine, Oxford, United Kingdom; 5University of Oxford, NIHR Oxford Biomedical Research Centre, Oxford, United Kingdom; 6Kings College London, Institute of Liver Studies, London, United Kingdom; 7University College London, London, United Kingdom; 8Oxford University Hospitals, Department of Gastroenterology, Oxford, United Kingdom.

Email: louise.downs@exeter.ox.ac.uk

Background and aims: Chronic hepatitis B infection (CHB) has diverse clinical phenotypes. Hepatitis B core related antigen (HBcrAg) and pre-genomic RNA (pgRNA) are novel serum biomarkers that provide a proxy signal for cccDNA transcription. We aimed to (i) explore the role of HBcrAg and pgRNA as markers of treatment eligibility in treatment naive patients, and (ii) determine any associations with tissue or immunological phenotypes in patients on nucleoside analogue (NA) treatment.

Method: Serum samples (n = 137) were obtained from adults with CHB at Oxford University Hospitals, UK, including those on and off NA therapy (n = 95 and n = 42 respectively), and HBeAg positive and negative (n = 17 and n = 120 respectively) (Oxford Research Ethics Committee A, reference 09/H0604/20). HBV DNA, Quantitative HBcrAg and HBV pgRNA were measured along with a panel of immune biomarkers. Patient metadata were recorded from the Electronic Health Record (EHR). In untreated patients, we calculated the sensitivity and specificity of previously defined HBcrAg thresholds (>5.3, >4.8 and >3.6 log10 IU/ml) to predict HBV DNA levels relevant to treatment decisions (>200, 000, >20, 000 and >2000 IU/ml). We compared this with the predictive value of HBeAg status. For patients on NA therapy, we examined the relationship between HBcrAg, pgRNA, ALT, and a panel of ten host immunological markers to reflect liver inflammation and immune phenotype.

Results: (i) In the untreated population, HBcrAg ≥5.3 log10 IU/ml was a highly sensitive and specific predictor of HBV DNA >200 000 IU/ml (both 100%). However HBcrAg performed poorly at lower thresholds (e.g. HBcrAg ≥4.8 log10 IU/ml had a sensitivity and specificity of 67% and 98% for predicting HBV VL >20 000 IU/ml). HBcrAg was marginally better at predicting both HBV DNA of >200 000 IU/ml and >20 000 IU/ml than HBeAg (HBeAg sens/spec = 100% and 97% for HBV DNA >200 000 IU/ml and 62% and 96% for VL >20 000 IU/ml). In the untreated population with HBV DNA <200 000, the correlation between HBV DNA and HBcrAg is lost, demonstrating a poor correlation between peripheral DNA levels and hepatic reservoir. (ii) In the treated population, mean treatment duration was 24 months at the time of sample collection (range 0–84 months, IQR = 31.5). Median serum HBV DNA levels were below the limit of quantification but HBcrAg and pgRNA were persistent (median 3.6 log10 IU/ml, and 1.7 log10IU/ml respectively). Neither of these biomarkers correlated with ALT (p = 0.4 and 0.8 respectively), or with any of a panel of host immunological biomarkers (p > 0.2 in all cases).

Conclusion: In settings where HBV DNA quantification is not available, HBcrAg could support treatment decisions, particularly in pregnancy to prevent MTCT (based on WHO thresholds). However, HBcrAg tests are not yet widely available, have cost implications, and may be only marginally better than existing HBeAg testing. In patients on NA therapy, HBcrAg or pgRNA represent quantifiable serum markers of the HBV cccDNA pool and transcriptional activity years after HBV DNA is undetectable in serum. This offers new opportunities for disease stratification. Further longitudinal work in larger cohorts will help determine the use of HBcrAg and pgRNA in prediction of long-term disease outcomes.

WED-117

POSTER PRESENTATIONS

WED-118

Long-term outcomes of untreated chronic hepatitis B patients with persistent HBsAg <100 IU/ml

Rachel Wen-Juei Jeng1,2, Mei-Hung Pan3, Chien-Jen Chen3, Hwai-I Yang3.

1Linkou Chang Gung Memorial Hospital, Gastroenterology and Hepatology, Taoyuan, Taiwan; 2Chang Gung University, College of Medicine, Taoyuan, Taiwan; 3Academia Sinica, Genomic Research Center, Taipei, Taiwan.

Email: hiyang@gate.sinica.edu.tw
Background and aims: Chronic hepatitis B patients (CHB) with HBsAg seroclearance had the most favorable outcomes. However, long-term outcomes of CHB patients who had persistent HBsAg <100 IU/ml in natural history remained unknown. This study aimed to investigate HCC incidence and liver-related mortality of CHB patients with persistent HBsAg <100 IU/ml and to compare with the other population without HBV nor HCV infection (non-HBV).

Method: From the REVEAL cohort, non-cirrhotic CHB subjects with at least two HBsAg assessments were enrolled into the analysis (N = 2708). Subjects with anti-HCV seropositivity, unavailable baseline HBsAg levels or lack of follow-up data, and cirrhosis at study entry were excluded. CHB subjects were categorized into 3 groups by at least two consecutive assessments of HBsAg with a median (Q1–Q3) interval of 1.49 (1.13–3.95) years: persistent HBsAg <100 IU/ml, drop from >100 to persistent <100 IU/ml, and persistent >100 IU/ml. Non-HBV subjects (N = 18960) without cirrhosis at study entry were used for comparison. Propensity score matching (PSM) was performed in a 1:3 ratio between CHB and non-HBV subjects to adjust for characteristics differences including age, gender, levels of ALT, TG, cholesterol, uric acid, smoking, alcohol drinking and DM history. Outcomes including incident HCC and liver-related death were ascertained by data linkage to the national cancer registry and national death database by the end of 2018.

Results: There were 2441 CHB subjects and 7323 non-HBV subjects in the PSM matched cohort, the characteristics were comparable except that the CHB subjects have higher baseline ALT (11 vs. 10 U/L, P < 0.0001) and BMI (median: 23.7 vs. 23.6, P = 0.0349). During a median follow-up of 26.7 years, the annual incidence of HCC and liver-related death were lowest in non-HBV subjects (0.09% and 0.09%), followed by patients with persistent HBsAg <100 IU/ml (0.2% and 0.1%) and highest in persistent >100 IU/ml (0.4% and 0.3%). Multivariate Cox regression analysis revealed CHB patients with persistent HBsAg <100 IU/ml did not have a significantly higher risk of HCC or liver-related death than non-HBV (adjusted hazard ratio (aHR): 1.486, P = 0.1426 and aHR: 1.675, P = 0.0699, respectively). However, a significantly increased relative risk of HCC and liver-related death could be observed for patients with HBsAg drop from >100 to persistent <100 (aHR: 3.775, P = 0.0001 and 2.097, P = 0.0365, respectively) and persistent >100 IU/ml (aHR: 9.619, P = 0.0001 and 9.819, P < 0.0001, respectively), when compared with non-HBV.

Conclusion: CHB subjects with persistent HBsAg <100 IU/ml have comparable HCC and liver-related death risk as non-HBV subjects, which may be a good end point for clinical use.

WED-119
HBcrAg-based risk score predicts HCC better than HBV DNA-based risk scores in HBsAg-negative grey zone patients
Tai-Chung Tseng1, Tetsuya Hosaka2, Chun-Jen Liu1, Fumitaka Suzuki2, Chun-Ming Hong2, Hiromitsu Kumada2, Tung-Hung Su1, Hung-Chih Yang3, Chen-Hua Liu1, Pei-Jer Chen3, Jia-Horng Kao3.
1National Taiwan University Hospital, Internal Medicine, Taipei, Taiwan;
2Toranomon Hospital, Tokyo, Japan; 3National Taiwan University Hospital, Internal Medicine, Taipei, Taiwan
Email: kaojh@ntu.edu.tw

Background and aims: Risk scores have been designed to predict the risk of hepatocellular carcinoma (HCC) in treatment-naïve chronic hepatitis B (CHB) patients. Little is known about their prediction accuracy in hepatitis B e antigen (HBeAg)-negative patients in grey zone (GZ). We aimed to develop a hepatitis B core-related antigen (HBcrAg)-based HCC risk score and explore whether it outperforms other risk scores in GZ patients.

Method: Two retrospective cohorts of HBeAg-negative patients with AASLD-defined GZ were established for derivation and validation (Taiwanese N = 911, Japanese N = 806). All of them were non-cirrhotic at baseline and remained treatment-free during the follow-up. The primary end point was HCC development.

Results: In a median follow-up period of 15.5 years, 85 patients developed HCC in the derivation cohort. We found that age, sex, ALT, platelet count, and HBcrAg, but not HBV DNA levels, were independent predictors and a 20-point GZ-HCC score was developed accordingly. The predicted risk was well calibrated with Kaplan-Meier observed HCC risk. The 10-year and 15-year AUROC was 0.86 (95% CI: 0.80–0.90) and 0.83 (95% CI: 0.78–0.89), respectively, which outperformed other HBV DNA-based HCC risk scores, including REACH-B and GAG-HCC scores (AUROC ranging from 0.63–0.74). There was a consistent finding in the validation cohort that the AUROC of GZ-HCC score was 0.92 (95% CI: 0.88–0.97) and 0.90 (95% CI: 0.83–0.97) at 10-year and 15-year of follow-up, respectively, while the AUROC ranged from 0.66–0.80 in HBV DNA-based risk scores. The better performance was also validated in EASL- and APASL-defined GZ patients. Finally, the low-risk and high-risk GZ patients (stratified by score of 8) had HCC risk close to inactive CHB and immune-active CHB patients, respectively, in both cohorts.

Conclusion: The HBcrAg-based GZ-HCC score predicts HCC better than other HBV DNA-based risk scores in HBeAg-negative GZ patients, which helps optimize their clinical management.
WED-120
Extrahepatic malignancies and antiviral drugs for chronic hepatitis B: a nationwide cohort study
Moon Haeng Hur1, Donghyeon Lee1,2, Jeonghoon Lee1, Misook Kim3, Joayom Park1, Hyunjoo Shin1, Sungwon Chung1, Heejin Cho1, Min Kyung Park1, Heejoon Jang2, Yun Bin Lee1, Su Jong Yu1, Won Kim2, Yong Jin Jung2, Yoon Jun Kim1, Jung-Hwan Yoon1. 1Seoul National University College of Medicine, Department of Internal Medicine and Liver Research Institute, Seoul, Korea, Rep. of South; 2Seoul Metropolitan Government Seoul National University Boramae Medical Center, Department of Internal Medicine, Seoul, Korea, Rep. of South; 3Seoul National University Hospital, Medical Research Collaborating Center, Seoul, Korea, Rep. of South
Email: pindra@empal.com
Background and aims: Many previous studies comparing tenofovir disoproxil fumarate (TDF) and entecavir (ETV) reported that TDF is superior, or at least comparable, to ETV in terms of hepatocellular carcinoma prevention in patients with chronic hepatitis B (CHB). In addition, our recent study suggested that CHB is associated with an increased risk of extrahepatic malignancy (EHM), which normalized with antiviral treatment. We aimed to compare the risk of EHM as well as intrahepatic malignancy (IHM) associated with ETV versus TDF.
Method: Based on claims data of the National Health Insurance Service of Korea, this nationwide cohort study included treatment-naive CHB patients who initiated antiviral therapy either with ETV (ETV group: n = 24,287) or with TDF (TDF group: n = 29,199) between 2012 and 2014. The primary outcome was the development of any primary EHM. Secondary outcomes were the development of the 10 most prevalent EHM in Korea and overall IHM.
Results: During median follow-up of 5.9 years, 822 (3.4%) and 706 (2.9%) patients in the ETV and TDF groups, respectively, developed EHM. EHM incidence rate differed significantly between within 3 years and beyond 3 years in both groups (both P < 0.01, Davies test). During the first 3 years, there was no difference in EHM risk between groups in the propensity score-matched cohort (subdistribution hazard ratio [SHR] = 1.01, 95% confidence interval [CI] = 0.88–1.17, P = 0.84). After year 3, however, TDF was associated with a significantly lower EHM incidence, compared to ETV (SHR = 0.70, 95% CI = 0.60–0.81, P < 0.01; Figure). Various sensitivity and subgroup analyses reproduced these results. The TDF group showed a significantly lower incidence of stomach cancer (SHR = 0.57), breast cancer (SHR = 0.53), and non-Hodgkin lymphoma (SHR = 0.34) than the ETV group after 3 years. Regarding the incidence of IHM, the superiority of TDF over ETV was maintained both before year 3 (SHR = 0.88, 95% CI = 0.81–0.95, P < 0.01) and after year 3 (SHR = 0.68, 95% CI = 0.62–0.75, P < 0.01), with the latter being more prominent.
Conclusion: TDF was associated with about 30% lower risk of EHM as well as IHM than ETV in CHB patients after 3 years of antiviral therapy.

WED-121
Prediction of hepatocellular carcinoma in chronic hepatitis B patients following HBsAg seroclearance: Lage score
Jonggi Choi1, Eunju Kim2, Won-Mook Choi1, Danhi Lee1, Kang Mo Kim1, Ju Hyun Shim1, Young-Suk Lim1, Han Chu Lee1. 1Asan Medical Center, Department of Gastroenterology, Korea, Rep. of South; 2Chung-Ang University Gwangmyeong Hospital, Korea, Rep. of South
Email: jkchoi0803@gmail.com
Background and aims: Risk of hepatocellular carcinoma (HCC) decreases but remains after HBsAg seroclearance in patients with chronic hepatitis B (CHB). Previous studies focused on predicting the development of HCC in CHB patients without HBsAg seroclearance. The aim of this study was to determine the risk factors for HCC development and develop a prediction model to stratify the risk of HCC after HBsAg seroclearance.

Figure: (abstract: WED-120).
Method: We analyzed 2,421 CHB patients with HBsAg seroclearance at Asan Medical Center in Seoul, Republic of Korea, between 1997 and 2022. HBsAg seroclearance was defined as the HBsAg negativity at least two consecutive tests, 6 months apart, regardless of anti-HBs positivity. The primary outcome was HCC development following HBsAg seroclearance. Cox model was used to determine the factors associated with HCC development. Points were assigned to each risk factor based on the Cox model. Median follow-up period was 5.8 years.

Results: The mean age was 54.6 years, and 64.5% of the patients were male. At the time of HBsAg seroclearance, 414 (17.1%) of patients had liver cirrhosis (LC). During the 17,039 person-years (PYs), 69 of 2,421 patients developed HCC, with an annual incidence of 0.41%/100 PYs. At 5, 10, and 15 years, the cumulative incidence of HCC was 1.7%, 4.3%, and 6.8%, respectively. LC [L] (adjusted hazard ration [AHR]: 6.2), age [A] over 60 years (AHR: 3.9), and male gender [GE] (9.2) were independently associated with an increased risk of HCC in multivariable analysis. Risk scores were assigned to age ≥60 years (2 points), 50≤age <60 (1 point), LC (2 points), male sex (3 points). Low risk (0–2), intermediate risk (3–4), and high risk (5–7) were categorized based on the sum of each point. In the low (n = 753), intermediate (n = 986), and high risk groups (n = 682), the incidence of HCC was 0.04, 0.28, and 1.18/100PYs, respectively. Time-dependent AUROCs of the LAGE score for predicting HCC development at 5-, 10-, and 15-years were 0.808, 0.856, and 0.879, respectively.

Conclusion: LC (L), older age (A), and male gender (GE) at the time of HBsAg seroclearance were highly associated factors with HCC development after HBsAg seroclearance. LAGE score may easily be applicable in real world and aid in stratifying the risk of HCC after HBsAg seroclearance in CHB patients.

WED-122
Eight weeks or less of tenofovir alafenamide to prevent the perinatal hepatitis B transmission: a multicenter, prospective, randomized study
Qing-Lei Zeng1, Xiao-Ping Dong2, Hongxu Zhang3, Wei Li4, Ji-Yuan Zhang5, Zu-Jiang Yu6.1The First Affiliated Hospital of Zhengzhou University, Department of Infectious Diseases and Hepatology, Zhengzhou, China; 2Sanmenxia Central Hospital, Department of Infectious Diseases, China; 3Luohe Central Hospital, Department of Infectious Diseases, China; 4Henan Provincial People’s Hospital, Department of Infectious Diseases, China; 5The Fifth Medical Center of Chinese PLA General Hospital, National Clinical Research Center for Infectious Diseases, Treatment and Research Center for Infectious Diseases, China; 6The First Affiliated Hospital of Zhengzhou University, Department of Infectious Diseases and Hepatology, China

Email: zengqinglei2009@163.com

Background and aims: Four weeks of tenofovir alafenamide fumarate (TAF) therapy can lead to 3–4 logs IU/ml of hepatitis B virus (HBV) DNA decrease in clinical practice; meanwhile, young immune tolerant pregnant women commonly have 7–8 logs IU/ml of HBV DNA levels, there was no infant’s breakthrough infection reported when the maternal HBV DNA level was below 5.3 logs IU/ml (200 000 IU/ml) after timely standard immunoprophylaxis for the newborns; additionally, the very (gestational weeks [GW] 28–31), moderate (GW 32–33), and late (GW 34–36) preterm rates of singleton pregnancies are 0.6%, 0.7%, 4.3% in China. This study aimed to investigate the feasibility as well as the safety and efficacy of 8 weeks or less of TAF therapy (from GW 33 to delivery date) to prevent mother-to-child transmission of HBV (HBV-MTCT).

Method: In this multicenter, prospective, randomized study, pregnant women with HBV DNA levels ranged from >5.3 logs to <9 logs IU/ml who received TAF from GW 33 to delivery date (group 1) or postpartum month 1 (group 2) were 1:1 enrolled randomly and followed until postpartum month 6, respectively. All infants received standard immunoprophylaxis for the newborns; additionally, the very (gestational weeks [GW] 28–31), moderate (GW 32–33), and late (GW 34–36) preterm rates of singleton pregnancies are 0.6%, 0.7%, 4.3% in China. This study aimed to investigate the feasibility as well as the safety and efficacy of 8 weeks or less of TAF therapy (from GW 33 to delivery date) to prevent mother-to-child transmission of HBV (HBV-MTCT).

Results: In total, 96 and 93 mothers were enrolled, and 96 and 93 infants were born, in groups 1 and 2, respectively (Figure). TAF was well tolerated during a mean treatment duration of 6.5 and 10.3 weeks in groups 1 and 2, respectively. The most common maternal adverse event was nausea (12.5% vs 14.0%), followed by anorexia (7.3% vs 8.6%) and fatigue (6.3% vs 6.5%) in groups 1 and 2, respectively. Only few mothers had abnormal alanine aminotransferase levels at delivery (>1[1.0%] vs 0[0%]) and at postpartum months 3 (3[3.1%] vs 3 [3.2%]) and 6 (8[8.3%] vs 7[7.5%]), respectively, and no one had alanine aminotransferase levels higher than 100 U/ml. No infants had birth defects in either group. The infants’ physical and neurological development at birth and at 7 months were comparable and
normal in the two groups. The HBsAg positive rate was 0% at 7 months in all 189 infants.

**Figure:**

**Conclusion:** Eight weeks or less of TAF regimen during late pregnancy (from GW 33 to delivery date) to prevent HBV-MTCT are generally safe for both mothers and infants and obtained 0% of HBV-MTCT rate. Future large-scale validation studies are warranted.

**WED-123**

**HBsAg seroclearance decreases risk of hepatocellular carcinoma but not hepatic decompensation in nucleos (t)ide analogue-treated cirrhotic patients with complete hepatitis B virus suppression: a territory-wide cohort study**

Terry Cheuk-Fung Yip, Vicki Wing-Ki Hui, Vincent Wai-Sun Wong, Tsz Tai Yam, Che To Lai, Yan Liang, Yee-Kit Tse, Henry LY Chan, Grace Lai-Hung Wong. The Chinese University of Hong Kong (CUHK), Department of Medicine and Therapeutics, Hong Kong; Union Hospital, Department of Internal Medicine, Hong Kong

Email: wonglaihung@cuhk.edu.hk

**Background and aims:** We compared the incidence of hepatocellular carcinoma (HCC) and first and further hepatic decompensation in nucleos (t)ide analogue (NA)-treated chronic hepatitis B (CHB) patients with cirrhosis who achieved complete viral suppression alone or hepatitis B surface antigen (HBsAg) seroclearance.

**Method:** A retrospective cohort study was performed using data from the Clinical Data Analysis and Reporting System, an electronic healthcare database managed by the Hospital Authority, Hong Kong. All adult monoinfected CHB patients with cirrhosis who received entecavir or tenofovir between 1 January 2005 and 30 September 2020 were identified. Baseline date was the start of entecavir or tenofovir treatment. Patients with HCC before or within the first 6 months of baseline, other cancers or liver transplantation before baseline, liver transplantation before HBsAg loss, without hepatitis B virus DNA measurement, and without complete viral suppression were excluded. 1-year landmark analyses were performed; patients with clinical outcome or follow-up ended within 1 year were excluded. The primary outcome was HCC. The secondary outcome was first and further hepatic decompensation, defined as any new occurrence of ascites, spontaneous bacterial peritonitis, variceal bleeding, hepatic encephalopathy, hepatorenal syndrome, liver transplantation, and/or liver-related death.

**Results:** Of 5,149 patients (mean age 60.1 ± 12.6 years, 66.3% male, 8.0% decompensated cirrhosis) included in the 1-year landmark analysis, 161 (3.1%) achieved HBsAg seroclearance. At a median (25th-75th percentile) follow-up of 4.1 (2.5–5.0) years, 456 (9.1%) and 5

Figure: (abstract: WED-123).
(3.1%) patients with complete viral suppression and HBsAg loss developed HCC respectively; 334/4777 (7.0%) and 10/153 (6.5%) patients with complete viral suppression and HBsAg loss developed further hepatic decompensation (Figure). In multivariable analysis, HBsAg seroclearance was associated with a lower risk of HCC (adjusted subdistribution hazard ratio [aSHR] 0.37, 95% confidence interval [CI] 0.15–0.91, p = 0.030) but not first and further hepatic decompensation (aSHR 1.01, 95% CI 0.52–1.95, p = 0.988) than complete viral suppression, after adjusting for age, gender, compensated cirrhosis, diabetes, platelets, albumin, total bilirubin, alanine aminotransferase, international normalised ratio, hepatitis B e antigen status, and use of other NAs. Similar results on HCC were observed in using cause-specific (CS) hazard model (adjusted CS hazard ratio [95% CI] 0.40 [0.16–0.96]), patients with compensated cirrhosis (aSHR 0.36 [0.13–0.98]), and 2-year landmark analysis (aSHR 0.37 [0.14–1.04]).

**Conclusion:** HBsAg seroclearance is associated with a lower risk of HCC but not first and further hepatic decompensation in a territory-wide cohort of NA-treated CHB cirrhotic patients with complete viral suppression.

**WED-124**

**Influence of viral load and fibrotic burden on hepatocellular carcinoma risk at phase change to immune-active phase in chronic hepatitis B**

Ho Soo Chun1, Minjong Lee1, Hye Ah Lee2, Jihye Kim3, Han Ah Lee1, Hwi Young Kim1, Eileen Yoon4, Dae Won Jun4, Sang Hoon Ahn5, Seung Up Kim5, Yoon Jun Kim3. 1Department of Internal Medicine, Ewha Womans University College of Medicine, Korea, Rep. of South; 2Clinical Trial Center, Ewha Womans University Seoul Hospital, Korea, Rep. of South; 3Department of Internal Medicine and Liver Research Institute, Seoul National University College of Medicine, Korea, Rep. of South; 4Department of Internal Medicine, Hanyang University College of Medicine, Korea, Rep. of South; 5Department of Internal Medicine, Yonsei University College of Medicine, Korea, Rep. of South

**Email:** ksukorea@yuhs.ac

**Background and aims:** Recent studies reported that moderate hepatitis B virus (HBV) DNA levels are significantly associated with hepatocellular carcinoma (HCC) risk in hepatitis B e antigen (HBeAg)-positive, non-cirrhotic patients with chronic hepatitis B (CHB). We assessed the association of baseline viral load and fibrotic burden with the risk of HCC development in CHB patients entering the immune-active (IA) phase.

**Method:** This multicenter cohort study recruited 3,589 HBeAg-positive, non-cirrhotic CHB patients who started antiviral treatment with entecavir or tenofovir disoproxil fumarate at IA phase transitioned from immune-tolerant (IT) phase in twenty-three tertiary university-affiliated hospitals of South Korea (2012–2020). Significant liver fibrosis was defined as fibrosis-4 index (FIB-4) >3.25. Multivariable analysis using the Cox proportional hazards model was performed.

**Results:** Sixty (1.7%) patients developed HCC (median follow-up, 5.4 years). Patients who developed HCC were significantly older and showed a significantly higher proportion of diabetes, lower platelet counts, and higher FIB-4 levels than those who did not (n = 3,525, 98.3%) (all p < 0.05). The HCC risk was highest at moderate HBV DNA levels (5.00–7.99 log10 IU/ml) and significant liver fibrosis. In

Table. (abstract: WED-124): Predictors of HCC development

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Multivariable</th>
<th></th>
<th>Multivariable using FIB-4</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>aHR 95% CI</td>
<td>P</td>
<td>aHR 95% CI</td>
<td>P</td>
</tr>
<tr>
<td>Demographic variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age, years</td>
<td>1.04</td>
<td>1.02–1.07</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Male gender</td>
<td>3.58</td>
<td>1.79–7.17</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>2.63</td>
<td>1.45–4.77</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Antiviral agents</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ETV</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TDF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laboratory variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Platelet count, 109/L</td>
<td>0.99</td>
<td>0.98–0.99</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Aspartate aminotransferase, IU/L</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alanine aminotransferase, IU/L</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total bilirubin, mg/dL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serum albumin, g/dL</td>
<td>0.92</td>
<td>0.57–1.14</td>
<td>0.725</td>
<td>0.88 0.53–1.47</td>
</tr>
<tr>
<td>Serum creatinine, mg/dL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIB-4 index</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1.45</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.45–3.25</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;3.25</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HBV DNA levels, log10 IU/ml</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥8.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.00–7.99</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.00–6.99</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.00–5.99</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;5.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HBV DNA levels, log10 IU/ml</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥8.00</td>
<td>1 (reference)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.00–7.99</td>
<td>2.55</td>
<td>1.32–4.91</td>
<td>0.005</td>
<td>2.68 1.40–5.13</td>
</tr>
<tr>
<td>&lt;5.00</td>
<td>1.25</td>
<td>0.50–3.13</td>
<td>0.629</td>
<td>1.77 0.71–4.40</td>
</tr>
</tbody>
</table>
multivariable analysis, moderate HBV DNA levels was independently associated with the increased risk of HCC development (adjusted hazard ratio [aHR] = 2.55, 95% confidence interval [CI] = 1.32–4.91, p = 0.005). After adjustment for FIB-4 levels, similar result was maintained (moderate HBV DNA levels: aHR = 2.68, 95% CI = 1.40–5.13; FIB-4 >3.25: aHR = 7.63, 95% CI = 3.05–19.09; all p < 0.05).

**Conclusion:** Moderate HBV DNA levels and significant liver fibrosis at the time of phase change from IT to IA phase was significantly associated with the risk of HCC development during potent antiviral therapy in patients with CHB.

**WED-125**

IP10 and anti-HBc can predict virological relapse and HBsAg loss for chronic hepatitis B patients after nucleos(t)ide analogue discontinuation

Yandi Xie¹, Minghui Li², Xiaojian Ou¹, Sujun Zheng², Yinjie Gao³, Xiaoyuan Xu⁴, Ying Yang⁵, Anlin Ma⁶, JIA Li⁷, Yuemin Nan⁸, Huanwei Zheng⁹,¹¹, Juan Liu¹², Lai Wei¹³, Bo Feng¹. ¹Peking University People’s Hospital, Peking University Hepatology Institute, China; ²Department of Hepatology Division Beijing Ditan Hospital, Capital Medical University, China; ³Liver Research Center, Beijing Friendship Hospital, China

**Figure:** (abstract: WED-125): Cumulative incidences of virological relapse (VR) and HBsAg loss stratified by end of treatment (EOT) IP10 and anti-HBc. (A)-(C), Cumulative incidences of VR in patients by EOT IP10, anti-HBc or combined two parameters. (D)-(F), Cumulative incidences of HBsAg loss in patients by EOT IP10, anti-HBc or combined two parameters.
Background and aims: To assess predictive ability of serum interferon-inducible protein 10 (IP10) and hepatitis B core antibody (anti-HBc) levels for virological relapse (VR) and hepatitis B surface antigen (HBsAg) loss after nucleos (t)ide analogue (Nuc) with sustained HBsAg level <100 versus <50 IU/ml for 24 weeks from end-of-treatment (EOT). The study aimed to investigate the off-Nuc events incidence in HBsAg negative CHB patients who had achieved sustained qHBsAg <100 and <50 IU/ml.

Method: HBeAg-negative CHB patients who stopped Entecavir (ETV) or Tenofovir (TDF) after consecutive undetectable HBV DNA ≥ 1 year were enrolled. Virological relapse (VR) was defined as HBV DNA ≥ 2000 IU/ml. Clinical relapse (CR) and hepatitis flare were defined as alanine aminotransferase (ALT) levels ≥ 2× ULN and ≥ 5× ULN with VR. Sustained remission (SR) defined as ALT<2X and HBV DNA level <100 IU/ml. Partial cure is defined as sustained low or undetectable HBV DNA level with low HBsAg level. It has not been well studied that if the long-term durability be different between HBeAg negative chronic hepatitis B (CHB) patients who stop nucleos (t)ide analogue (Nuc) with sustained HBsAg level <100 versus <50 IU/ml for 24 weeks from end of treatment (EOT). The study aimed to investigate the off-Nuc events incidence in HBsAg negative CHB patients who had achieved sustained qHBsAg <100 and <50 IU/ml.

Results: Among 1320 patients, 238 patients (18%) achieved qHBsAg at EOT <100 IU/ml with mean age of 57 year-old, 87% were male and 37% had liver cirrhosis. Of 238 EOT <100 IU/ml patients, 144 achieved EOT HBsAg <50 IU/ml. Among 238 patients who qHBsAg at EOT 6 months being unavailable, 183 patients and 114 patients had achieved SR and sustained EOT <100 and <50 IU/ml by EOT week 24, respectively. The 2-year cumulative incidence of VR, CR, hepatitis flare and retreatment showed comparably low in patients with sustained qHBsAg <100 IU/ml and those with sustained qHBsAg <50 IU/ml [VR: 46% vs 37%, CR: 22% (annual incidence, IR:6%) vs. 19% (IR:5%), figure A, flare: 11% vs. 10%, retreatment: 19% vs. 19%, all p > 0.1]. Patients who achieved sustained EOT HBsAg <100 or <50 IU/ml had comparably high 5-year cumulative HBsAg loss incidences [35% (IR:8%) vs. 44% (IR:10%), figure B].

Conclusion: HBeAg negative CHB patients who achieved SR and qHBsAg <100 IU/ml longer than 6 months from EOT showed similarly good off-Nuc durability and high probability for subsequent functional cure opposed to those with sustained qHBsAg <50 IU/ml.
WED-127
Improved prediction for liver fibrosis of Fibrosis-4 using machine learning in patients with chronic hepatitis B
Zhiyi Zhang1, Jian Wang2,3, Shaoqiu Zhang2, Yifan Pan4, Li Zhu5, Yiguang Li6, Weimao Ding7, Jie Li1,2,3,4, Yuanwang Qiu6, Rui Huang1,2,3,4, Chao Wu1,2,3,4, Chuanwu Zhu5. 1Department of Infectious Diseases, Nanjing Drum Tower Hospital Clinical College of Traditional Chinese and Western Medicine, Nanjing University of Chinese Medicine, Nanjing, Jiangsu, China; 2Department of Infectious Diseases, Nanjing Drum Tower Hospital, The Affiliated Hospital of Nanjing University Medical School, Nanjing, Jiangsu, China; 3Institute of Viruses and Infectious Diseases, Nanjing University, Nanjing, Jiangsu, China; 4Department of Infectious Diseases, Nanjing Drum Tower Hospital Clinical College of Nanjing Medical University, Nanjing, China; 5Department of Infectious Diseases, The Affiliated Infectious Diseases Hospital of Soochow University, Suzhou, Jiangsu, China; 6Department of Infectious Diseases, The Fifth People's Hospital of Wuxi, Wuxi, Jiangsu, China; 7Department of Hepatology, Huai’an No. 4 People’s Hospital, Huai’an, Jiangsu, China
Email: zhuchw@126.com

Figure: (abstract: WED-127): Boxplots of AUPR and AUROC on testing sets for five different methods (A) and ROC curves of GB and FIB-4 in fibrosis detection (B).

S1068 Journal of Hepatology 2023 vol. 78(S1) | S100–S1212

Virology and Infectious Diseases, Nanjing University, Nanjing, Jiangsu, China; 4Department of Infectious Diseases, Nanjing Drum Tower Hospital Clinical College of Nanjing Medical University, Nanjing, China; 5Department of Infectious Diseases, The Affiliated Infectious Diseases Hospital of Soochow University, Suzhou, Jiangsu, China; 6Department of Infectious Diseases, The Fifth People's Hospital of Wuxi, Wuxi, Jiangsu, China; 7Department of Hepatology, Huai'an No. 4 People's Hospital, Huai'an, Jiangsu, China
Email: zhuchw@126.com
Background and aims: Fibrosis-4 (FIB-4) index is widely used for predicting liver fibrosis and cirrhosis in patients with chronic hepatitis B (CHB). However, the predictive value of FIB-4 for liver fibrosis and cirrhosis is moderate in CHB. Using cutting-edge machine learning approaches, we aimed to reconstruct FIB-4 for improved prediction of liver fibrosis and cirrhosis.

Method: We included 1231 CHB patients who underwent liver biopsies from four hospitals in this study. To compare the performance of machine learning methods with the FIB-4 index, a discovery set of 957 patients from three hospitals was used. We randomly divided the set into training (70%) and testing (30%) sets 100 times to determine the final model and was externally validated in an independent cohort (n = 274), with comparisons to FIB-4 in terms of the area under the receiver-operating-characteristic curve (AUROC).

Results: In predicting significant fibrosis, advanced fibrosis, and cirrhosis, the AUROC of gradient boosting (GB) outperformed other methods and the FIB-4 index (p < 0.001). In the validation set, GB performed better than the FIB-4 index for the classification between significant and non-significant fibrosis (AUROC of 0.664 vs. 0.626, p = 0.09), significantly greater than the FIB-4 index for the classification between non-advanced and advanced fibrosis (AUROC of 0.716 vs. 0.667, P = 0.04) and non-cirrhosis and cirrhosis (AUROC of 0.780 vs 0.727, p = 0.01).

Conclusion: By using the same parameters as FIB-4, the novel GB-based model showed consistent improvements in predicting liver fibrosis and cirrhosis compared to FIB-4 in CHB patients.

WED-128
Passive transfer of hepatitis B core antibody after intravenous immunoglobulin administration in adult patients: a retrospective review
Sital Shah1, Sophie Mungai1, Shelley Jones1. 1King’s College Hospital, London, United Kingdom
Email: sitalshah@nhs.net

Background and aims: After intravenous administration of human normal immunoglobulin (HNilg), patients often test positive for the presence of hepatitis B core antibody (HBCAb). As baseline testing is not common, it is unclear if this is genuine hepatitis B (HBV) exposure or passive transfer during the IV administration of HNilg. Consequently, when patients test positive for HBCAb during screening prior to commencing immunosuppressive therapy, an antiviral to prevent HBV reactivation is commonly prescribed irrespective of true exposure or not. The objective of this study is to highlight the importance of HBCAb testing prior to commencing HNilg infusion, to prevent wrong diagnosis of HBV exposure and incorrect therapeutic decisions.

Method: A retrospective, single center study was carried out at Kings College Hospital, London. Electronic prescription records, dispensing systems and a national HNilg database was used to obtain demographic, clinical information and HNilg specific data of patients receiving long term (>3 months) HNilg treatment during 2011–2021.

Results: Of 493 patients identified, only 71 (14%) received HBCAb testing prior to immunoglobulin administration. 2 were seropositive before infusion, 38 (55%) remained core antibody negative post-infusion, and 31 (45%) became core antibody positive. Those positive for HBCAb, were all hepatitis B surface antigen negative. Because of uncertainly and poor knowledge around baseline testing, all received antiviral treatment consisting of either tenofovir (10%), entecavir (13%) or lamivudine (77%), prior to being initiated on immunosuppressive therapy. After the initial positive test, only 5 (16%) were re-tested either twice or three times afterwards, where all remained positive. The average number of days between their positive HBCAb test and last infusion was 21 days. The average number of doses between baseline and seropositivity was 5 doses. The most common HNilg used was Privigen/Hizentra with 30 patients (38%) for both seronegative and seropositive patients. Many patients changed to subcutaneous immunoglobulin (SCIg) administration of HNilg during the Covid-19 pandemic, which included Hizentra and Cuvitru. Only 2 (6%) patients on SCIg became seropositive.

Conclusion: Passive transfer of hepatitis B core antibody is common after HNilg infusions. Hepatitis B core antibody screening should be considered standard practice for each human normal immunoglobulin administration, effectively improving therapeutic decisions by preventing wrong diagnosis of hepatitis B exposure and therefore preventing unnecessary anti-viral use.

WED-129
Secular trends of newly diagnosed chronic hepatitis B in 2000–2022: a territory-wide study
Grace Lai-Hung Wong1, Vicki Wing-Ki Hui1, Terry Cheuk-Fung Yip1, Yee-Kit Tse1, Che To Lai1, Vincent Wai-Sun Wong1. 1The Chinese University of Hong Kong, Medical Data Analytic Centre (MDAC) and Department of Medicine and Therapeutics, Hong Kong
Email: wonglaihung@cuhk.edu.hk

Background and aims: The World Health Organization (WHO) proposed targets for the reduction of chronic viral hepatitis incidence and mortality of 90% and 65% respectively by 2030. A comprehensive review of the disease burden of chronic viral hepatitis would provide pivotal data to guide strategies to achieve the goals set by WHO. We aimed to estimate the disease burden of newly diagnosed chronic hepatitis B in 2000 to 2022.

Method: This was a territory-wide retrospective cohort study of all patients with chronic hepatitis B who have been under the care at primary, secondary and tertiary medical centres in Hong Kong. Comprehensive virologic parameters related to chronic hepatitis B from the Hospital Authority were analysed. The number of patients with chronic hepatitis B first diagnosed were evaluated according to calendar year.

Results: Between 1 January 2000 and 31 December 2022, 2,120,008 people patients were tested for chronic hepatitis B, of whom 251,987 (11.88%) tested positive. Annually 6623 to 15,075 people were first patients with chronic hepatitis B who have been under the care at primary, secondary and tertiary medical centres in Hong Kong. Comprehensive virologic parameters related to chronic hepatitis B from the Hospital Authority were analysed. The number of patients with chronic hepatitis B first diagnosed were evaluated according to calendar year.

Conclusion: Newly diagnosed chronic hepatitis B patients were tested positive. Annually 6623 to 15,075 people were first diagnosed with chronic hepatitis B; the number of new diagnosis peaked in 2009 then gradually dropped similarly in both genders (Figure A). The drop was more prominent in young adults aged below 30 years old and 50 years old or above, whereas the number of new diagnoses remained high in adults aged 30–49 (Figure B).

POSTER PRESENTATIONS
Patients with chronic hepatitis delta virus coinfections have higher risk of disease progression than chronic hepatitis B virus monoinfection-results from a Spanish national hospital database

Background and aims: Patients with chronic hepatitis delta (CHD) infection are at greater risk of developing liver complications than those with chronic hepatitis B (CHB) monoinfection. This retrospective study compares the rate of disease progression among adult patients with CHD infection vs CHB monoinfection in a national hospital database in Spain.

Method: The study population included patients aged ≥18 years having ≥1 ICD-9/10-CM diagnosis code for HDV or HBV in the Spanish National Health System's Hospital Discharge Records Database ( Conjunto Mínimo Básico de Datos) from 1 Jan 2000 to 31 Dec 2019 (study period). HDV-infected and HBV-monoinfected patients were identified from 1 Jan 2001 to 31 Dec 2018 (identification period) with their first diagnosis defined as the diagnosis date, having ≥12 months of continuous enrollment before and after the diagnosis date. Baseline (BL) characteristics including demographics, comorbidities, region, and payer channel were assessed over the entire duration.
prior to diagnosis date. HDV-infected and HBV mono-infected patients were propensity score matched (1:5) on BL demographic and clinical characteristics. Multivariable cox proportional hazard regression was performed to assess the differences in risk of compensated cirrhosis (CC), decompensated cirrhosis (DCC), hepatocellular carcinoma (HCC), liver transplantation (LT), and death between the HDV-infected and HBV-mono-infected patients, adjusting for demographics, comorbidities, region, and payer channel.

**Results:** The study reported 12,317 patients diagnosed with HDV or HBV, of whom 756 matched patients met the inclusion criteria—126 HDV infected and 630 HBV mono-infected. Among HDV-infected vs HBV-mono-infected patients, mean (SD) age was 41.7 (11.8) vs 41.2 (9.9), p = 0.581, and the male to female ratio (roughly 9:1) was similar between cohorts. HDV-infected patients were more likely to transition from noncirrhotic disease (NCD) to CC (HR = 1.89; 95% CI, 1.56, 2.29), CC to DCC (HR = 2.44; 95% CI, 1.74, 4.33), DCC to HCC (HR = 2.80; 95% CI, 1.11, 4.66), HCC to LT (HR = 1.83; 95% CI, 1.18, 3.91), and DCC to death (HR = 5.04; 95% CI, 2.40, 32.44) compared to HBV-mono-infected patients.

**Conclusion:** In a Spanish national hospital database, HDV-infected patients had significantly greater risk of progressing to greater liver disease severity than HBV-mono-infected patients. These findings underscore the need for early screening, diagnosis, and eventual treatment of HDV to mitigate future disease progression.

**WED-131**
Dynamic monitoring of HBsAg-specific B cells in CHB patients and its clinical significance in predicting interferon therapy efficacy

Yu Geng1, Yawen Wan1, Shengxia Yin1, Jie Li1, Chao Wu1

1Zhejiang Drum Tower Hospital, Department of Infectious Diseases, NanJing Shi, China

**Background and aims:** The guidelines for the treatment of chronic hepatitis B virus (CHB) patients currently recommend two categories of antiviral drugs: nucleoside analogs and interferons. In comparison to nucleoside analogs, interferons have a higher rate of HBsAg and HBeAg clearance, but their medical compliance, cost, and side effects may hinder clinical application. As a result, the identification of reliable predictive biomarkers to maximize benefits is essential. In HBV infection, the damage and recovery of surface antigen (HBsAg) specific B cells is linked to HBsAg serological conversion. However, current understanding of HBsAg specific B cell immunity is limited, and there are no specific and sensitive methods to detect HBsAg specific B cells. This study presents a method for single-cell level detection of HBsAg specific B cells using an optimized ELISPOT (Enzyme-Linked ImmunoSpot) method. This approach can explore the HBsAg specific B cell responses during different stages of chronic HBV infection and the effect of these responses on the efficacy of interferon treatment in CHB patients.

**Method:** This study included 142 CHB patients at various stages of immunity, 90 of whom were untreated (21 HBeAg positive patients in the chronic hepatitis stage, 5 HBeAg negative patients in the chronic hepatitis stage, 9 HBeAg positive patients in the chronic infection stage, and 55 HBeAg negative patients in the chronic infection stage). 52 patients received antiviral therapy. Peripheral blood lymphocytes were stimulated over a 5-day period, and the frequency of peripheral blood HBsAg-specific B cells was monitored using ELISPOT. The correlation between serum HBsAb levels and peripheral blood HBsAg-specific B cells was analyzed, and preliminary observations of the dynamic changes of HBsAg-specific B cells before and after interferon treatment were made.

**Results:** In the chronic hepatitis phase, 6 patients (28.6%) who were HBeAg positive showed positive results in ELISPOT, indicating the presence of peripheral blood HBsAg-specific B cells, while no (0%) HBeAg negative patients in the chronic hepatitis phase showed positive results. Among patients in the chronic infection phase, 3 (30%) who were HBeAg positive and 14 (25.5%) who were HBeAg negative showed positive results in ELISPOT. The number of peripheral blood-secreting HBsAb-specific B cells was significantly higher in the HBeAg-positive chronic hepatitis group than in the HBeAg-negative chronic infection group (p < 0.05). The proportion of "functional cure" in the ELISPOT-positive group was higher after interferon treatment compared to the baseline state (50% in positive group vs. 17.2% in negative group, P < 0.05). After interferon treatment, 10 (52.6%) patients showed an increase in HBsAg-specific B cells, with 4 (21.1%) patients achieving "functional cure." Meanwhile, 4 (21.1%) patients with decreased HBsAg-specific B cells and 5 (26.3%) patients with no change in HBsAg-specific B cells did not achieve "functional cure."

**Conclusion:** In CHB patients in varying immune states, peripheral blood contains HBsAb-secreting B cells that exhibit differing proportions. The peripheral blood’s presence of HBsAb-secreting B cells before interferon treatment may be a significant immunological indicator for forecasting interferon therapy efficacy.
findings further emphasize the relevance of the genetic and sex predisposition in personalized management of HBV infections and potentially for new TL7-directed treatment strategies.

**WED-133**

**Higher levels of three HBsAg forms (Large, Middle and Small HBsAg) are associated with HDV replication and with the degree of disease and liver damage**

Leonardo Duca, Antonella Olivero, Lorenzo Piermatteo, Stefano D’Anna, Giulia Torre, Elisabetta Teti, Andrea Di Lorenzo, Vincenzo Malagrinò, Marco Iannetta, Leonardo Baiocchi, Simona Francioso, Ilaria Lenci, Francesca Ceccherini Silberstein, Michele Milella, Annalisa Saracino, Alessia Ciancio, Loredana Sarmati, Mario Rizzetto, Gian Paolo Caviglia, Valentina Svicher, Romina Salpini.

*University of Rome "Tor Vergata", Experimental Medicine, Rome, Italy; University of Turin, Vergata*, Biology, Rome, Italy; *University of Rome "Tor Vergata", Department of Systems Medicine, Infectious Disease Clinic, Italy; *Policlinico Tor Vergata, Hepatology Unit, Italy; *University of Bari "Aldo Moro", Italy*

Email: duca.leonardo@hotmail.it

**Background and aims:** HBV surface proteins (HBsAg) enable the morphogenesis of HDV progeny and entry into hepatocytes. Total HBsAg is composed by 3 different forms: Large-HBs (L-HBs), Middle-HBs (M-HBs), and Small-HBs (S-HBs). Here, we investigate the still unexplored levels of the different HBs forms in the setting of HDV coinfection and their correlation with ALT and the status of cirrhosis.

**Method:** This study includes 160 plasma samples from patients with HDV-HBV chronic infection classified as high-replicating HDV (HDV-RNA >3 log IU/ml, N = 130) and low-replicating HDV (HDV-RNA<3 log IU/ml, N = 30). Total HBsAg is measured by COBAS HBsAgII assays (Roche Diagnostics) while ad-hoc designed ELISAs are used to quantify L-HBs, M-HBs, S-HBs (Beackle Inc).

**Results:** Patients have a median (IQR) serum HDV-RNA and total HBsAg of 5.1 (3.4–6.1) log IU/ml and 5716 (1372–10 887) IU/ml, respectively. ALT >40 U/L is observed in 76.9% (median [IQR]: 87 [67–136] U/L) and 63.8% is cirrhotic. The median (IQR) levels of HBs-S, HBs-M and HBs-L are 3.984 (637–6993), 1.147 (141–2293) and 2.3 (0.2–6.5) ng/ml, respectively. Notably, significantly higher levels of all the 3 HBs forms are observed in patients with high-replicating HDV compared to low-replicating HDV (median [IQR] levels: 4638 [1560–6993] vs 2299 and 2.3 ng/ml; P < 0.001 for all). A positive correlation is also revealed for the 3 HBs forms with HDV-RNA levels (Rho = 0.42, 0.46 and 0.39 for S-, M- and L-HBs, respectively; P < 0.001 for all).

In low-replicating HDV patients, 51.9% has altered transaminases (median [IQR]: 78 [61–117] U/L). Notably, in this set of patients, M-HBs >200 ng/ml is the best cut-off predicting altered ALT >40 U/L (75% of patients with M-HBs>200 ng/ml vs 37.5% of those with M-HBs<200 ng/ml, PPV = 75%, NPV = 82.8%; P = 0.049), supporting the role of M-HBs in reflecting cytoplasmic activity even in the setting of a low HDV replication.

Serum HDV-RNA levels were comparable between cirrhotic and non-cirrhotic patients (median [IQR]: 5.1 [4.1–5.9] vs 4.2 [1.2–5.7] log IU/ml; P = 0.11). Nevertheless, a higher ratio of L-HBs/M-HBs (reflecting unbalanced release towards L-HBs) is observed in cirrhotic vs non-cirrhotic patients (median [IQR] % ratio of L-HBs/M-HBs: 0.41 [0.16–1.45] vs 0.18 [0.06–0.45]; P = 0.05). In particular, a % ratio of L-HBs/M-HBs >0.5 correlates with the status of cirrhosis (83.3% vs without L-HBs/M-HBs >0.5 is cirrhotic; P = 0.037).

**Conclusion:** In chronic HDV coinfection, higher levels of the 3 HBs forms support an enhanced burden of HDV replication and their composition correlates with the degree of cytolysis/active activity and liver damage. Thus, the quantification of 3 HBs forms can provide an added value in identifying patients with a more advanced disease, in which treatment should be prioritized.

**WED-134**

**Hepatitis delta treatment utilization in the United States: an analysis of commercially insured adults with hepatitis delta virus infection**


*Stanford University School of Medicine, Stanford, United States; *VA Palo Alto Healthcare System, Palo Alto, United States; *Hepatitis B Foundation, Doylestown, United States; *Yale University School of Medicine, New Haven, United States; *Gilead Sciences, Inc., HEOR-Global Value and Access, Foster City, United States; *Gilead Sciences, Inc., RWE-Epidemiology, Foster City, United States; *NYU Grossman School of Medicine, New York, United States*

Email: rwong123@stanford.edu

**Background and aims:** Hepatitis delta virus (HDV) infection is associated with more rapid liver disease progression than hepatitis B (HBV) infection alone. Compared with HBV monoinfection, if left untreated, HDV is associated with earlier onset of liver-related complications, such as cirrhosis, liver failure, and liver cancer. While pegylated-interferon (Peg-IFN) is used off-label as a treatment option for HDV, treatment utilization for HDV coinfected patients in the US are not well understood. This study aims to describe HDV treatment utilization among a large population-based cohort of commercially insured adults with HDV in the US.

**Method:** Adult patients with ≥ 1 HDV or HBV diagnosis (ICD-9/10-CM) were identified retrospectively from 1 Jan 2013 to 31 Dec 2021 (study period) using the IQVIA PharMetrics Plus database covering ∼210 million patients from primarily commercial payers. HDV patients were identified from 1 Jan 2013 to 31 Dec 2020 (identification period) and defined as those who had ≥ 1 inpatient or ≥ 2 outpatient claims within 30 days apart with an ICD-9/10-CM diagnosis code (070.12, 070.13, 070.31, 070.33, 070.42, 070.52, B160, B170, B161, B180) for HDV during the identification period (earliest date of diagnosis considered index date), ≥ 1 claim of HBV diagnosis during BL (12-month period prior to index date), and no claims with HDV diagnosis during BL. Continuous enrollment for ≥ 12 months before and after the index date was required, and patients aged ≥18 years at index with commercial health plans were included. Utilization of antiviral therapies including pegylated interferon, interferon alfa, interferon alfa N3, interferon gamma, tenofovir disoproxil fumarate, tenofovir alafenamide, entecavir, adefovir, telbivudine, and lamivudine were assessed over the entire post-index period (follow-up).

**Results:** Among 6,002 patients with HDV identified during the identification period, 440 met inclusion criteria. Only five patients (1.1%) received treatment with pegylated interferon (Peg-IFN) within the follow-up period. Fewer than 40% of patients with concurrent HDV infection (n = 175; 39.8%) were receiving HDV-specific antiviral therapy, including tenofovir disoproxil fumarate (91; 20.7%), entecavir (65; 14.8%), tenofovir alafenamide (46; 10.5%), adefovir (7; 1.6%), and lamivudine (2; <0.5%). The majority of patients with HDV were not on any interferon or HBV-related treatments (263; 59.8%).

**Conclusion:** In a large US national, primarily commercial, healthcare claims database, fewer than 40% of patients with HDV were treated with HBV-specific antiviral therapies, and very few patients (1.1%) were treated with Peg-IFN, the current off label standard of care for HDV infection. Greater awareness of the importance of timely...
initiation of antiviral therapy for patients with combined HBV/HDV infection is urgently needed.

**WED-135**

Comparison of HCC incidence between entecavir and tenofovir in a chronic hepatitis B cohort with balanced censoring

Jang Han Jung1, Eileen Yoon2, Dae Won Jun3, Hyunwoo Oh4, Hyo Young Lee5, Sung Eun Kim6, Sung-Eun Kim7,8, Soung Won Jeong9, Gi-Ae Kim10, Jihyun An11, Joo Hyun Sohn9, Won Sohn9, Yong Kyun Cho12, Sang Bong Ahn13,14, Dongtan Sacred Heart Hospital of Hallym University Medical Center, Korea, Rep. of South; 1Hallym University, College of Medicine, Department of Internal Medicine, Korea, Rep. of South; 2Hallym University Sacred Heart Hospital, Hallym University College of Medicine, Korea, Rep. of South; 3Hallym University Sacred Heart Hospital, Department of Internal Medicine, Korea, Rep. of South; 4Hallym University Sacred Heart Hospital, Hallym University College of Medicine, Korea, Rep. of South; 5Hallym University Sacred Heart Hospital, Department of Internal Medicine, Korea, Rep. of South; 6Hallym University Sacred Heart Hospital, Hallym University College of Medicine, Korea, Rep. of South; 7Kangdong Sacred Heart Hospital, Hallym University College of Medicine, Korea, Rep. of South; 8Kangdong Sacred Heart Hospital, Hallym University College of Medicine, Korea, Rep. of South; 9Kangbuk Samsung Hospital, Sungkyunkwan University School of Medicine, Korea, Rep. of South; 10Eulji university college of medicine, Korea, Rep. of South

**Background and aims:** The risk of hepatocellular carcinoma (HCC) in patients treated with either entecavir or tenofovir disoproxil fumarate (tenofovir DF) for chronic hepatitis B (CHB) has not been elucidated. Distinct characteristics of patients tend to be treated with tenofovir DF, shorter observation periods for tenofovir DF, and imbalanced rate of censoring between the two drugs have led to contradictory results. Minimizing and balancing the censored data, we aimed to compare the risk of HCC in treatment-naïve patients who were treated with either entecavir or tenofovir DF over the same follow-up duration.

**Method:** The de-identified data of 9-centered cohort were linked to the record of HCC development in the National Health Insurance Service. To prove the robustness of this analysis, variable subgroup analyses were done on the propensity-score matched with inverse probability of treatment weighting.

**Results:** We treated 1698 patients (male, 65.3%; mean age, 47.2 ± 11.5 years) with either entecavir (n = 845) or tenofovir DF (n = 853). The mean follow-up duration was 8.7 (IQR 7.9–10.3) years for entecavir and 7.4 years (IQR 6.7–8.4) for tenofovir DF. Sixty-nine and sixty-five patients developed HCC in entecavir group (8.2%) and tenofovir DF group (7.6%), respectively (p = 0.562). Similarly, the incidence of HCC did not differ between the groups (p = 0.268) in 751-pair propensity score-matched patients.

**Conclusion:** In a retrospective review of 1698 treatment-naïve patients with CHB, there was no difference in the HCC incidence between the two groups treated with either entecavir or tenofovir DF, over 7-years for both the medications.

**WED-136**

Serum CXCL16 serves as the predictor for liver inflammation functioning through a NKT cell-depend way in chronic hepatitis B patients

Yawen Wan1, Shengxia Yin2, Ming Li3, Minxin Mao4, Jiacheng Liu2, Xin Tong2, Jian Wang2, Jie Li2, Chao Wu1,2, 1Department of Infectious Diseases, Nanjing Drum Tower Hospital Clinical College of Xuzhou Medical University, Xuzhou Medical University, Xuzhou, China; 2Department of Infectious Diseases, Nanjing Drum Tower Hospital, The Affiliated Hospital of Nanjing University Medical School, Nanjing, China; 3Department of Infectious Diseases, Nanjing Drum Tower Hospital Clinical College of Traditional Chinese and Western Medicine, Nanjing University of Chinese Medicine, Nanjing, China

**Email:** dr.wu@nju.edu.cn

**Background and aims:** Significant liver inflammation is an important indication for initiating antiviral therapy in chronic hepatitis B (CHB) patients. Liver biopsy has always been regarded as the golden standard for assessing the liver inflammation, while its invasive nature limited the application. The level of alanine aminotransferase (ALT) is currently the most commonly used serum indicator. However, the severity of liver inflammation is not always consistent with ALT levels. Therefore, we aimed to find more effective and non-invasive markers for predicting liver inflammation.

**Method:** We conducted a cross-sectional study that retrospectively included 120 CHB patients who had undergone liver biopsy and 31 volunteers as health control. Liver inflammation was staged by Scheuer’s classification. The expression level of CXC motif chemokine ligand 16 (CXCL16) in peripheral blood of patients with CHB was determined by ELISA and the relationship between CXCL16 and liver inflammation was further analyzed. In addition, the mechanism of CXCL16 affecting liver inflammation was explored by using a mouse model infected with hepatitis B virus (HBV).

**Results:** We found that the serum level of CXCL16 in CHB patients was much higher than that in healthy subjects. Furthermore, serum CXCL16 was severe significantly higher in severe inflammation group (G ≥ 3, n = 26) than in non-severe inflammation group (G < 3, n = 96) [(median, IQR), 0.42 (0.24–0.71) ng/ml VS 1.01 (0.25–2.09) ng/ml, P < 0.001]. We combined CXCL16 with platelet, ALT and albumin to build a model, which is more effective in predicting severe inflammation than ALT (ROC: 0.92 VS 0.81, P = 0.015). Additionally, by using HBV infected mice model, we found a decreased level of liver inflammation after CXCL16 blockage. A failure of liver infiltration and decreased inflammatory function of natural killer T (NKT) and natural killer (NK) cells were discovered.

**Conclusion:** CXCL16 could be developed as a promising non-invasive liver inflammation marker for patients with chronic HBV infection. And it could accelerate the hepatic inflammation by a NKT and NK cell depend way.
Figure: (abstract: WED-136).
Distinct virologic trajectories in chronic hepatitis B patients identify heterogeneity in response to nucleotide analogue therapy

Tingyan Wang1,2, Cori Campbell1,2, Gail Roadknight1,3, Stephanie Little1,3, Alexander Stockdale4,5, Stacy Todd5, Karl McIntyre6, Andrew Frankland6, Jakub Jaworski7, Afzal Chaudhry7, Ben Glampson8,9, Luca Mercuri8,9, Dimitri Papadimitriou8,9, Christopher R. Jones5,10, Kinga Varnai1,3, Theresa Noble1,3, Hizni Salih1,11, Cai Davis12,13, Ashley Heinson12,13, Michael George12,13, Florina Borca12,13, Josune Olza12, Louise English14, Luis Romão14, David Ramlakhan14, Eleni Nastouli15,16, Salim Khakoo17, Will Gelson18, Graham Cooke8,9,19, Kerrie Woods1,11,20, Philippa Matthews2,3,21,22,23, Eleanor Barnes2,3.

1NIHR Oxford Biomedical Research Centre, United Kingdom; 2University of Oxford, Nuffield Department of Medicine, United Kingdom; 3Oxford University Hospitals NHS Foundation Trust, NIHR Health Informatics Collaborative, United Kingdom; 4Institute of Infection, Veterinary and Ecological Sciences, University of Liverpool, United Kingdom; 5Liverpool University Hospitals NHS Foundation Trust, Tropical Infectious Diseases Unit, Royal Liverpool Hospital, United Kingdom; 6Liverpool University Hospitals NHS Foundation Trust, Liverpool Clinical Laboratories, United Kingdom; 7Cambridge University Hospitals NHS Foundation Trust, United Kingdom; 8Imperial College Healthcare NHS Trust, NIHR Health Informatics Collaborative, United Kingdom; 9NIHR Imperial Biomedical

Figure: (abstract: WED-137): Individual trajectories of HBV DNA viral load (VL) and their patterns (‘classes 1–5’) for chronic hepatitis B patients on treatment. The five VL patterns were identified using latent class mixed model. Dots represent the real values of VL, and solid lines with shading area represent the predicted VL trajectory patterns with 95% confidence intervals.

Journal of Hepatology 2023 vol. 78(S1) | S100–S1212

Figure: (abstract: WED-137): Individual trajectories of HBV DNA viral load (VL) and their patterns (‘classes 1–5’) for chronic hepatitis B patients on treatment. The five VL patterns were identified using latent class mixed model. Dots represent the real values of VL, and solid lines with shading area represent the predicted VL trajectory patterns with 95% confidence intervals.
Background and aims: The longitudinal patterns of HBV DNA viral load (VL) of chronic hepatitis B (CHB) patients on treatment are not well characterised in the UK population. However, understanding the phenotypes of treatment responses is crucial for patient stratification for better care.

Method: We studied a cohort of 8,028 CHB patients from 6 large teaching hospitals in England with longitudinal follow-up, established by the National Institute for Health Research (NIHR) Health Informatics Collaborative (HIC) from electronic patient record systems. We included adults who had two or more VL measurements with >6 months of follow-up on VL for analysis. We applied latent class mixed models to investigate the patterns of VL trajectories since the earliest treatment date recorded (defined as baseline). Repeated and various number of measurements at different time points for patients were considered in the approach, by including fixed effects, and random effects and slope for individuals. The number of VL classes was determined by the Bayesian information criteria, the Akaike information criteria, the discrimination, the odds of correct classification, the relative entropy, and the interpretability of the model. We performed multinomial logistic regressions to assess the determinants of VL trajectories at baseline.

Results: We identified 740 patients on nucleos/tide analogue (NA) treatment with longitudinal VL data, with a median follow-up duration of 3.3 years (interquartile range [IQR], 1.6–5.2 years). The total number of VL measurements was 4,642 (median [IQR], 5 [3–8] measurements per patient). Five mutually exclusive patterns of VL trajectories were identified (Figure), i.e., class 1 (N = 557, 75.3%)—VL long term suppressed, class 2 (N = 53, 7.2%)-persistent viremia with moderate VL, class 3 (N = 74, 10.0%)-VL suppressed as expected, class 4 (N = 24, 3.2%)-VL non-suppressing with high VL, and class 5 (N = 32, 4.3%)-VL slowly suppressed. Univariable analysis showed that baseline age, sex, ethnicity, HBeAg status, ALT, albumin, urea, and treatment regimens, were associated with the VL classes identified. After multivariable analysis, the following independent determinants (all p <0.05) measured at baseline were identified (the reference was class 1): i) age, sex, Mixed or Other ethnicity, albumin, ALT for class 2, ii) sex, HBeAg status, ALT, urea for class 3, iii) age, HBeAg status for class 4, and iv) age, HBeAg status, ALT, combination treatment drugs of entecavir and tenofovir disoproxil for class 5.

Conclusion: There is heterogeneity in virologic response to antiviral treatment with NA agents, and complete virologic suppression for CHB patients on current standard antiviral treatment can be slow. Some of this variability is statistically associated with demographics and laboratory parameters. Enhanced understanding of treatment response can be used to inform better risk-stratification, improved patient-centric clinical care, and as a foundation to understand the impact of novel therapies as these become available.

WED-138

Utilizing machine learning-based predictive models to identify early virological recurrence in Chinese chronic hepatitis B patients following entecavir withdrawal

Xiaoke Li1,2, Mei Qiu1, Yi Huang3, Huangming Xiao2, Hening Chen1, Bingjiu Lu4, Yuyong Jiang1, Fuli Long4, Hui Lin2, Jinyu He10, Mingxiang Zhang4, Qiak Wu12, Li Wang2, Xiaoning Zhu4, Man Gong2, Jianguang Sun2, Xuehua Sun1, Fengxia Sun2, Wei Lu10, Weihua Xu2, Hongbo Du13, Yong’an Ye1,2, Dongzhimen Hospital, Beijing University of Chinese Medicine, Hepatology, Beijing, China; 2Beijing University of Chinese Medicine, Liver Diseases Academy of Traditional Chinese Medicine, Beijing, China; 3Shenzhen Traditional Chinese Medicine Hospital, Hepatology, China; 4Chongqing Traditional Chinese Medicine Hospital, China; 5The Second Affiliated Hospital of Guangzhou University of Chinese Medicine, China; 6Liouning Hospital of Traditional Chinese Medicine, China; 7Beijing Ditan Hospital, China; 8The First Affiliated Hospital of Guangxi University of Chinese Medicine, China; 9Mengchao Hepatobiliary Hospital of Fujian Medical University, China; 10Shanxi Hospital of Traditional Chinese Medicine, China; 11The Sixth People’s Hospital of Shenyang, China; 12The Third People’s Hospital of Shenzhen, China; 13Public Health Clinical Center of Chengdu, China; 14Affiliated Traditional Chinese Medicine hospital of Southwest Medical University, China; 15The Fifth Medical Center of People’s Liberation Army of China, China; 16Shandong Hospital of Traditional Chinese Medicine, China; 17Shuguang Hospital Affiliated to Shanghai University of Traditional Chinese Medicine, China; 18Beijing Chinese Medicine Hospital, China; 19The Second People’s Hospital of Tianjin, China; 20The Second Hospital of Shandong University, China; Email: yeoyongan@vip.163.com

Background and aims: Although guidelines recommend that chronic hepatitis B (CHB) patients may discontinue nucleos (t)ide analogues (NAs) after consolidation therapy, virological relapses are common. Early virological recurrence (EVR) generally signaling disease flare. However, biomarkers assessing risks of off-treatment virological recurrence are limited. With machine learning techniques, this study aimed to investigate the role of novel biomarkers including hepatitis B virus pregenome RNA (HBV RNA), hepatitis B core-related antigens (HBcAg), and large surface antigens of HBV (L-HBsAg) in combination with traditional serum assessments such as tests of HBV serological markers, liver enzymes at the end of treatment (EOT) in predicting the risk of EVR in CHB patients within 24 weeks after entecavir (ETV) withdrawal. The study was conducted as part of National Science and Technology Major Project of China, No.2018ZX10725505.

Method: This study was based on data from a prospective multicenter trial in China. In the trial, CHB patients were given a consolidation treatment with ETV for 96 weeks followed by an off-treatment observation for 24 weeks, during which numbers of EVR (defined as serum HBV DNA >10 IU/ml) were counted. With the serological markers collected at the EOT, we developed predictive models to assess the risk of EVR. Multivariable analyses were performed using penalized logistic regression by the LASSO method. Random forest (RF), artificial neural networks (ANNs), and support vector machine (SVM) were used to construct prediction models based on traditional indicators (TI) and novel serum biomarkers, respectively. Area under the curve (AUC) and calibration plots were used to assess the discrimination and calibration.

Results: A total of 420 patients were enrolled in the current study and 172 (40.95%) patients experienced EVR within 24 weeks after ETV withdrawal. LASSO regression revealed that eight variables (levels of
A Flow chart of the clinical research

- consolidation therapy with ETV

Primary data
- The level of several markers in EOT and data of relapse in stepping point of discontinuation

Data preprocessing

Data partitioning
- Train set 85%
- Validation set 15%

LASSO Regression

Prediction models

B LASSO regression coefficients and cross-validation

C 27 marker coefficients obtained according to the selected best penalty parameter ($\lambda$)

D ROC curves of Random Forest in validation cohort

E ROC curves of Support Vector Machine in validation cohort

F ROC curves of Artificial Neural Networks in validation cohort

G Calibration curves based on all indicators in validation cohort

Abbreviations:
- ALT: alanine transaminase
- ANNs: artificial neural networks
- AST: aspartate transaminase
- AFP: alpha-fetoprotein
- BUN: blood urea nitrogen
- CL: confidence interval
- CR: creatinine
- DHIL: direct bilirubin
- ETV: entecavir
- EVR: early virological response
- EOT: end of treatment
- GGT: gamma-glutamyltransferase
- HBcAg: hepatitis B e antigen
- HBcAb: hepatitis B core antibody
- HBsAg: hepatitis B surface antigen
- HBsAb: hepatitis B surface antibody
- HBeAg: hepatitis B e antigen
- HBeAb: hepatitis B e antibody
- HGB: hemoglobin
- NE: neutrophil
- HBV RNA: hepatitis B virus RNA
- HIV RNA: human immunodeficiency virus RNA
- L-HBsAg: large surface antigens of HBV
- PCT: platelet count
- RBC: red blood cell
- RF: random forest
- SVM: support vector machine
- TBL: total bilirubin
- TR: traditional indicators
- TP: total proteins
- WBC: white blood cell

Figure: (abstract: WED-138).
Background and aims: Accurate statistics on the change in cause of death and mortality in patients with chronic hepatitis B (CHB) are lacking. We investigated the extrahepatic disease-related mortality and its change.

Method: Data of patients who had been newly diagnosed as CHB between 2007 and 2010 (cohort 1, n = 223,424) and between 2012 and 2015 (cohort 2, n = 177,966) from the Korea National Health Insurance Service was used. Mortality and cause of death were obtained from the Statistics Korea. Cause of death were classified as liver-related (hepatic decompensation or HCC) or extrahepatic disease-related (cardiovascular-related, cerebrovascular related, or cancers except HCC).

Results: In cohort 1, death rate was 13.9% yielding overall mortality of 1541/100 000 person-years during 10 years of follow-up. Ten-year overall mortality was 9,234/100 000 person-years in patients with cirrhosis, and 861/100 000 person-years in patients without cirrhosis. Liver-related death in patients with cirrhosis and those without comprised 75.4% and 30.0% of total cause of death, respectively. Most common causes of death in patients with cirrhosis were HCC (62.4%) and liver decompensation (13.0%), whereas those in patients without cirrhosis were cancers except HCC (27.2%) and HCC (22.7%). When 5-year mortality was compared (cohort 1 vs. cohort 2), overall and other mortalities decreased in cohort 2, however, mortality related to cancers except HCC increased (361/100 000 person-years→398/100 000 person-years). Proportion of cancers except HCC as a cause of death has increased (16.7% in cohort→22.4% in cohort 2).

Conclusion: In CHB patients without cirrhosis, extrahepatic disease-related mortality overwhelms liver-related mortality. Compared with the past, the mortality rate and proportion due to cancers except HCC are increasing in the recent cohort.
Background and aims: The metabolism disorder of serum phosphate is not uncommon in chronic liver diseases. This study investigated the prevalence of hypophosphatemia and the association between hypophosphatemia and liver fibrosis in treatment-naïve patients with chronic hepatitis B (CHB).

Method: Consecutive treatment-naïve CHB patients were included from three medical institutions between January 2015 and April 2022. Significant liver fibrosis and cirrhosis were identified by the aspartate transaminase (AST) to platelet ratio index (APRI), the fibrosis index based on 4 factors (FIB-4), or ultrasonography. Propensity score matching (PSM) and inverse probability weighting (IPW) measures were conducted to balance variables between patients with and without significant fibrosis or cirrhosis.

Results: Of 6,956 patients with CHB, the median age was 41.0 years and male gender accounted for 58.6%. The overall prevalence of hypophosphatemia was 2.7% in treatment-naïve patients with CHB. Patients with significant liver fibrosis and cirrhosis had higher proportions of hypophosphatemia than patients without significant liver fibrosis (4.4% vs. 1.9%, P < 0.001) and cirrhosis (4.3% vs. 2.2%, P < 0.001). Age ≥50, male sex, and the presence of significant liver fibrosis (OR 1.817, 95% CI 1.291–2.558, P = 0.001) and cirrhosis (OR 2.279, 95% CI 1.116–2.279, P = 0.010) were independent risk factors of hypophosphatemia. After adjusting for age and sex by PSM and IPW, the prevalence of hypophosphatemia remained higher in patients with significant liver fibrosis and cirrhosis.

Conclusion: The proportion of hypophosphatemia was low in treatment-naïve patients with CHB. Hypophosphatemia was related to more severe liver disease, including significant liver fibrosis and cirrhosis. Close monitoring for hypophosphatemia is warranted in patients with CHB who have significant liver fibrosis or cirrhosis.
patients observed during this time (p < 0.001). The proportion of individuals classified as treatment indicated was largely stable. At 1-, 2-, and 5-years of study follow-up, 64 (46.4%), 69 (50.0%), and 75 (54.3%) of treatment indicated had initiated CHB treatment, respectively, as had 46 (10.2%), 59 (13.1%), and 85 (18.9%) of grey area individuals.

Conclusion: The lack of sufficient data to fully characterize treatment eligibility among individuals with CHB is worrisome, especially given that about half of those with treatment eligible CHB are untreated. Although it improved over the course of our study, this proportion has remained over 40%, even in more recent years. The results from this real-world study argue for continued improvement in CHB-related laboratory testing to help clinicians make appropriate treatment decisions for individuals with CHB, especially among those in the grey area who may transition into having active disease.

**WED-142**

**Effects of tenofovir alafenamide fumarate on serum lipids in patients with chronic hepatitis B**

Yilin Liu¹, Jian Wang²,³, Zhiyi Zhang¹, Yao Zhang¹, Weimao Ding⁴, Chuanwu Zhu⁵, Rui Huang¹,²,³, Chao Wu¹,²,³, Jie Li¹,²,³. ¹Department of Infectious Diseases, Nanjing Drum Tower Hospital Clinical College of Traditional Chinese and Western Medicine, Nanjing University of Chinese Medicine, Nanjing, Jiangsu, China; ²Department of Infectious Diseases, Nanjing Drum Tower Hospital, The Affiliated Hospital of Nanjing University Medical School, Nanjing, Jiangsu, China; ³Institute of Viruses and Infectious Diseases, Nanjing University, Nanjing, Jiangsu, China; ⁴Department of Hepatology, Hua’ian No. 4 People’s Hospital, Hua’ian, Jiangsu, China; ⁵Department of Infectious Diseases, The Affiliated Infectious Diseases Hospital of Soochow University, Suzhou, Jiangsu, China

Email: lijier@sina.com

**Background and aims:** To evaluate the effect of tenofovir alafenamide fumarate (TAF) on lipid metabolism in patients with chronic hepatitis B (CHB).

**Method:** A total of 298 patients with CHB received antiviral treatment were included between January 2016 to December 2021, including 143 patients treated with TAF and 155 patients treated with tenofovir disoproxil fumarate (TDF). Logistic regression was used to analyze the risk factors for lipid elevation after 24 weeks of antiviral therapy.

**Results:** Compared to baseline, patients in TAF group had significantly increased total cholesterol (TC) levels (4.22 mmol/l vs. 4.48 mmol/l, p = 0.009) after 24 weeks of antiviral treatment, while triglyceride (TG) levels did not change significantly (1.01 mmol/l vs. 0.98 mmol/l, p = 0.710). Both TG and TC levels decreased significantly from baseline to 24 weeks in TDF group (p < 0.001). After propensity score matching on gender, age, BMI, the presence of fatty liver, alanine transaminase (ALT), TG, TC, and HBeAg status at baseline, there was a significant difference in the change of TG and TC levels at 24 weeks of treatment between the TAF and TDF groups (p < 0.001). The levels of TG (1.00 mmol/L vs. 0.76 mmol/L, p = 0.001) and TC (4.36 mmol/L vs. 3.67 mmol/L, p < 0.001) in TAF group were

---

**Figure:** (abstract: WED-141): Treatment eligibility for individuals with CHB, by year of entry into cohort patients.
significantly higher than in TDF group. Multivariate logistic regression analysis indicated that TAF treatment (OR = 3.646, 95% CI: 2.011–6.642, p < 0.001) and ALT level (OR = 1.002, 95% CI: 1.002–1.003, p = 0.014) were independent factors for over 10% increase of TC levels after 24 weeks of antiviral treatment. **Conclusion:** TAF treatment was associated with increased TC levels in patients with CHB, while had no significant effect on TG levels.

**WED-143**

Novel serum markers of cccDNA transcriptional activity-HBcrAg and pre-genomic RNA and CXCL10 pro-inflammatory chemokine levels can reduce uncertainty of HBeAg-negative chronic hepatitis B phases

Ivana Carey1, Mark Anderson2, James Lok1, Christiana Moigboi1, Bo Wang3, Gavin Cloherty2, Geoffrey Dusheiko1, Kosh Agarwal1.

1King’s College Hospital, Institute of Liver Studies, London, United Kingdom; 2Abbott Diagnostics, Department of Infectious Diseases, Chicago, United States

**Email:** ivana.kraslova@kcl.ac.uk

**Background and aims:** Two phases of HBeAg-negative chronic hepatitis B are typically determined by HBV DNA and serum ALT concentrations. ‘Infection’ phase patients have HBV DNA levels <2000 IU/ml and normal ALT (monitoring is recommended), whereas patients in the ‘hepatitis’ phase have HBV DNA >20000 IU/ml, elevated ALT and moderate-severe liver inflammation on histology, requiring treatment. However up to one third of HBeAg-negative patients fall within a ‘grey zone’ (HBV DNA 2000–20000 IU/ml and normal ALT) between relatively inactive infection and active disease. Further categorisation of this “grey zone” cohort is required to improve prognostication and treatment indications. Unlike HBsAg, serum levels of hepatitis B core-related antigens (HBcrAg) and pre-genomic HBV RNA (pgRNA) are obligatorily derived from cccDNA, and hence reflect cccDNA transcriptional activity. Thus, these newer markers might be helpful in separating patients with HBeAg-negative infection from patients with more active disease and reduce the number of indeterminate ‘grey zone’ patients. As HBV disease activity is driven by the interaction of the virus with the host immune system response, serum levels of the pro-inflammatory chemokine CXCL10 could also help in refining ‘grey zone’ patients. We aimed to compare serum levels of serological, virological and immunological markers in HBeAg negative patients and to determine whether these markers could help in refining HBeAg-negative phases of disease based on HBV DNA and ALT levels (infection, versus grey zone and hepatitis).

**Methods:** Serum samples from a cross-sectional cohort of 447 HBeAg-negative patients (median age 38 yrs, 170 males) were tested for routine diagnostic markers: HBV DNA (Roche TaqMan, IU/ml), quantitative HBsAg (Abbott ARCHITECT, IU/ml), biochemical (ALT and AST, IU/L) and haematological (INR and platelets counts) and further tests were performed for novel biomarkers-HBcrAg (CLEIA Fujirebio, log10U/ml), pgRNA (Abbott Diagnostics dual-target real-time-PCR assay, LLoQ = 0.48 log10U/ml) and CXCL10 serum levels by ELISA [pg/ml]. FIB-4 and APRI scores were calculated and compared with fibrosis results. The patients were divided into 3 groups based on HBV DNA levels: ‘infection’ (<2000 IU/ml), ‘grey zone’ (2000–20 000 IU/ml) and ‘hepatitis’ (>20 000 IU/ml) phases. The results were compared by AUC-ROC, univariate and multivariate regression analysis.

**Results:** The levels of all the tested biomarkers were lower in ‘infection’ phase patients (n = 293) than in ‘grey zone’ (n = 121) and ‘hepatitis’ (n = 31) phase patients (Table) by univariate analysis. However, only levels of HBcrAg, pg RNA and CXCL10 differed significantly between groups by multivariate and AUC-ROC analysis (Figure). The proportion of patients with undetectable HBcrAg (<3 log10U/ml) and pgRNA (<0.4 log10U/ml) was highest in ‘infection’ phase patients than ‘grey zone’ and ‘hepatitis’ phase patients (HBcrAg: 64% vs. 25% vs. 6%; pgRNA: 75% vs. 24% vs. 8%, all <0.01).

**Conclusion:** Novel serum biomarkers of cccDNA transcriptional activity-HBcrAg and pre-genomic HBV RNA as well as serum CXCL10 levels (<150 pg/ml) can refine active versus inactive HBeAg-negative phases. If larger studies validating these markers confirm their prognostic significance, the finding of undetectable HBcrAg and HBV RNA (by current assay sensitivities) and low CXCL10 levels may qualify a prime group for whom monitoring is appropriate and reduce the uncertainty of ‘grey zone’ patients.

**WED-144**

HDV genotypes have an impact on pegylated interferon therapy response and long-term liver disease related outcomes

Ivana Carey1, Natalie Bolton1, Mark Anderson2, James Lok1, Christiana Moigboi1, Gavin Cloherty4, Geoffrey Dusheiko1, Kosh Agarwal1. 1King’s College Hospital, Institute of Liver Studies, London, United Kingdom; 2Abbott Diagnostics, Department of Infectious Diseases, Chicago, United States

**Email:** ivana.kraslova@kcl.ac.uk

**Background and aims:** Although chronic hepatitis delta (HDV) represents the most severe form of chronic viral hepatitis with accelerated rates of advanced liver fibrosis and hepatocellular carcinoma, it is a diverse disease due to differences between HDV genotypes and their impact on the disease outcome. The long-term follow-up (>5 years) data comparing differences of the outcomes between HDV genotypes are lacking. HDV requires HBsAg for propagation. HBsAg originates from both cccDNA and integrated HBV DNA encoded transcripts. Pre-genomic HBV RNA (pg RNA) and HBcrAg are markers of cccDNA transcriptional activity and there are no data comparing these markers according to HDV genotypes. We aimed to investigate whether different virological (HBV DNA, HDV RNA, HDV genotypes and pg RNA) and serological (HBeAg, HBsAg and HBcrAg) markers at diagnosis are able to predict long-term (>5 years) outcomes (morbidity, mortality, response to pegylated interferon (Peg-IFN) and HBsAg loss) in single centre cohort of HDV RNA positive patients.

**Methods:** Serum samples of 83 HDV RNA positive patients (median age 38 yrs, 55 males) at diagnosis were tested for the following markers: HBV DNA (Roche TaqMan, IU/ml), HBeAg status and
POSTER PRESENTATIONS

quantitative HBsAg (Abbott ARCHITECT, IU/ml), HBcAgR (CLEIA Fujirebio, log_{10} U/ml), pg RNA (Abbott Diagnostics dual-target real-time PCR assay, LLOD = 0.48 log_{10} U/ml), HDV RNA (in-house real-time PCR, LLOQ = 640 copies/ml) and HDV genotypes by the direct sequencing. All patients had clinical follow-up for at least 5 years (median 6.8 years, range 5.3–17.5). Fifty-three (64%) patients underwent at least 24 weeks of therapy with Peg-INF (>3 years follow-up results after completing therapy). The liver related complications (cirrhosis, decompensation, variceal bleeding, HCC), liver transplantation, mortality and peg-IFN response including HBsAg loss were recorded and compared between patients according to HDV genotypes.

Results: In our cohort-52 (63%) patients had genotype 1 infection vs. 31 (37%) patients infected with genotype 5. There was no difference in patients’ age (38.4 vs 38.2 years, p = 0.89) between genotypes. At diagnosis–cirrhosis was more frequent in genotype 1 than genotype 5 patients (80% vs. 23%, p < 0.01) and genotype 1 patients (n = 36) had poorer response to Peg-IFN therapy than genotype 5 (n = 23) patients (7% vs. 61%, p < 0.01) and less likely achieved HBsAg loss (2% vs. 16%, p < 0.01). Only virological markers (HDV RNA and pg RNA) were higher in genotype 1 vs. genotype 5 patients and other markers (HBV DNA, HBeAg status, HBsAg and ALT levels) were similar at diagnosis between genotypes (Table). While there was no difference between numbers of patients who developed HCC between genotypes (4% vs. 6%, p = 0.621), genotype 1 patients were more likely to have liver related complications–decompensation (32% vs. 10%, p = 0.02), variceal bleeding (6% vs. 3%, p = 0.04) or required liver transplantation (23% vs. 3%, p = 0.003) than genotype 5 patients. The mortality was similar between genotypes (8% vs. 6%, p = 0.646).

WED-145
Systematic screening for hepatitis B at emergency department and linkage to care in Barcelona, Spain
Juan Carlos Ruíz-Cobo1, Jordi Llaneras2, Ariadna Rando-Segura3, Ana Barreira4, Francisco Rodríguez-Frias5, Adriana Palom5, Anna Feliz-Prius6, Mar Riveiro Barciela1, Rafael Esteban1, Maria Buti1,4, Vall d’Hebron University Hospital, Hepatology, Barcelona, Spain; 4Vall d’Hebron University Hospital, Microbiology, Barcelona, Spain; 5Vall d’Hebron University Hospital, Pathology, Barcelona, Spain; Email: mbuti@vhebron.net

Background and aims: Spain is considered a low endemicity country for hepatitis B virus (HBV) infection. This is based on a prevalence of HBsAg of 0.22% in the general population attended in primary care centers. Our aim is to perform a screening program for HBV at emergency department where population not attending primary care centers are represented and analyze the barriers to linkage to care of patients with HBV infection.

Method: We implemented FOCUS program for HBV screening at the emergency department of an academic hospital of an area of 450,000 inhabitants. Adults of >16 years old without HBsAg testing in the previous three months who required a phlebotomy for any purpose were screened. Linkage to care was offered to all patients with a positive result.

Results: We screened 20,941 patients between February 2020 and December 2022, detecting 128 (0.61%) HBsAg positive individuals. The majority were men (67.2%), median age of 61.4 years (IQR 28.8), 98.4% were HBeAg negative and 14% patients had cirrhosis. Anti-HDV was positive in 5 (3.9%) patients and 2 of them had detectable HDV-RNA. Only 12.5% had a risk factor for HBV infection screening following Spanish recommendations. At the time of screening 80 (62.5%) patients were not linked to care or lost to follow-up including 51 (63.8%) who were unaware of HBV and 5 patients with cirrhosis. Of them 63 patients were selected for linkage to care, the reason to not be suitable for linkage were low life expectancy or lack of contact information. Among these patients, 54 (85.7%) were successfully linked to care and 43 had HBeAg-negative chronic infection, 8 HBeAg-negative chronic hepatitis and 3 HBeAg-positive chronic hepatitis.

Figure:

Conclusion: The prevalence of HBV in the emergency department is almost three times higher than observed in general population, showing that this strategy allows to identify and link to care a high number of patients without risk factors. In addition, coinfection with HDV is reported in 3.9% of HBsAg positive cases.

WED-146
Epidemiological and clinical profile of HDV infected people in care in Italy: interim analysis from the ongoing PITER cohort
Loreta Kondili1, Maria Elena Tosti1, Maria Giovanna Quaranta1, Alessia Ciancio2, Vincenzo Messina3, Giuseppina Brancaccio4, Maurizia Brunetto4, Marco Capasso5, Valerio Rosato6, Irene Cacciola6, Luisa Pasulo9, Teresa Santantonio10, Carmine Coppola11, Elisa Biliotti12, Francesco Barbaro12, Marco Massari13, Nicola Coppola14, Alberto Ferrarese15, Francesco Paolo Russo4, Vito Di Marco16, Aldo Marrone14, Simona Schivazappa17.

Method: We implemented FOCUS program for HBV screening at the emergency department of an academic hospital of an area of 450,000 inhabitants. Adults of >16 years old without HBsAg testing in the previous three months who required a phlebotomy for any purpose were screened. Linkage to care was offered to all patients with a positive result.

Results: We screened 20,941 patients between February 2020 and December 2022, detecting 128 (0.61%) HBsAg positive individuals. The majority were men (67.2%), median age of 61.4 years (IQR 28.8), 98.4% were HBeAg negative and 14% patients had cirrhosis. Anti-HDV was positive in 5 (3.9%) patients and 2 of them had detectable HDV-RNA. Only 12.5% had a risk factor for HBV infection screening following Spanish recommendations. At the time of screening 80 (62.5%) patients were not linked to care or lost to follow-up including 51 (63.8%) who were unaware of HBV and 5 patients with cirrhosis. Of them 63 patients were selected for linkage to care, the reason to not be suitable for linkage were low life expectancy or lack of contact information. Among these patients, 54 (85.7%) were successfully linked to care and 43 had HBeAg-negative chronic infection, 8 HBeAg-negative chronic hepatitis and 3 HBeAg-positive chronic hepatitis.

Figure:

Conclusion: The prevalence of HBV in the emergency department is almost three times higher than observed in general population, showing that this strategy allows to identify and link to care a high number of patients without risk factors. In addition, coinfection with HDV is reported in 3.9% of HBsAg positive cases.
Method: Data from consecutive HBsAg positive patients enrolled from 2019 up to October 2022 by 50 Clinical centers were evaluated.

Results: Of 4729 patients of whom 1010 (21%) were non-Italian natives, the anti-HDV prevalence was 9.3% (343 of 3679 anti-HDV tested patients); 8.3% (median age 57.5; IQR 53–64) Italian, 13.0% (median age 43 years IQR 43–53 years) non-Italian natives (p < 0.001); 22% (1050) have never been tested for HDV infection (23% in Italians and 1.8% in non-Italians, p < 0.001), diabetes in 6.1% (7.5% in non-Italian patients); metabolic syndrome in 23.9%. Overall, 52.8% of patients have no complications and/or HCC development in 37.5%. Liver disease was present in 70% (57.5% in Italian and 75.5% in non-Italians; p = 0.001); 22% (1050) have never been tested for HDV infection (23% in Italians and 1.8% in non-Italians, p < 0.001), diabetes in 6.1% (7.5% in non-Italians). Of anti-HDV positive patients, 212 (62%) were tested for HDV RNA, of whom 140 (66%) were HDV RNA positive. Of anti-HDV positive patients, transaminase levels were altered in 63%, cirrhosis was present in 70% (57.5% in Italian and 75.5% in non-Italians; p = 0.001), of whom portal hypertension signs in 55%, cirrhosis complications and/or HCC development in 37.5%. Liver disease progression cofactors were present as follows: alcohol use 35.6% (similar in Italians and non-Italians), HCV infection in 11.1% (15.5% in Italian and 1.8% in non-Italian; p < 0.001), diabetes in 6.1% (7.5% in Italians and 1.9 in non-Italian p < 0.001), other features of potential metabolic syndrome in 23.9%. Overall, 52.8% of patients have no comorbidities, 40.8% has 1–2, 6.4% more than 2 comorbidities.

Conclusion: The updated picture of patients in care in Italy confirms the older Italian cohort and significantly younger non-Italian cohort of patients in care with HDV infection, both with significant proportion of liver cirrhosis. The dysmetabolic comorbidities are more represented in Italians, but the overall comorbidity profile is similar between two cohorts.
lower PAGE-B scores (0–17), TDF displayed a significantly reduced risk of HCC occurrence than ETV (HR = 0.58, p = 0.043), which was maintained even after the 1:1 PSM adjustment (HR = 0.56, p = 0.048).

**Conclusion:** Duration of antiviral treatment and hierarchical risk scores have impact on outcome analysis to compare ETV vs TDF. TDF intervention, when compared to ETV, elicits favorable outcomes by reducing the occurrence of HCC in patients with lower PAGE-B scores.

**WED-148**

**Significant disparities in risk of cirrhosis and hepatocellular carcinoma among non-cirrhotic, treatment naïve, e-antigen negative hepatitis B patients with low levels of serum alanine aminotransferase**

Zeyuan Yang1, Ramsey C. Cheung2, Robert Wong2. 1VA Palo Alto Health Care System, Palo Alto, United States; 2Stanford University School of Medicine, VA Palo Alto Healthcare System, Palo Alto, United States

**Email:** rwong123@stanford.edu

**Background and aims:** The benefit of antiviral therapy in patients with e-antigen (eAg) negative chronic hepatitis B (CHB) with low levels of alanine aminotransferase (ALT) remains unclear given the reported low risk of cirrhosis or hepatocellular carcinoma (HCC). However, it is not clear whether significant heterogeneity in cirrhosis or HCC risk exists, such that certain subsets of this population may benefit from early initiation of antiviral therapy. We evaluated long-term risks of cirrhosis or HCC among non-cirrhotic, treatment-naïve eAg-negative CHB patients with ALT <70 U/L.

**Method:** Using data from the U.S. National Veterans Affairs database from 2010 to 2022, Veterans with treatment-naïve, e-antigen (eAg) negative CHB with baseline ALT <70 U/L and minimum 12 months of follow-up were identified. Patients with concurrent HIV, hepatitis C, or hepatitis delta infections were excluded. Patients with cirrhosis or HCC at baseline or within 6 months of study entry were excluded. Incidence of cirrhosis or HCC (per 100 person-years) was stratified by patient demographics, clinical characteristics, and baseline HBV DNA (<2000 IU/ml (Low-DNA), 2000–10^5 IU/ml (Intermediate-DNA), and >10^5 IU/ml (High-DNA). Patients were censored at development of cirrhosis or HCC, death, initiation of antiviral therapy, or end of follow-up period. Comparisons of cirrhosis or HCC incidence between groups utilized the z-statistic using standard equations.

**Results:** Among 1,531 Veterans with treatment-naïve, eAg negative CHB and ALT <70 U/L (91.4% men, 45% African American, 33% non-Hispanic white, 19% Asian, 4% Hispanic, mean age 55 ± 12, 26.6% with diabetes), 77% had Low-DNA, 15% had Intermediate-DNA, and 7% had High-DNA. Overall incidence of cirrhosis was 0.84 per 100 person-years (95% CI 0.67–1.00) and incidence of HCC was 0.21 per 100 person-years (95% CI 0.12–0.29). No significant difference in long-term risk of cirrhosis or HCC was observed by baseline HBV DNA. When stratified by race/ethnicity, the highest risk of cirrhosis was observed in non-Hispanic whites (1.11 per 100 person-years) and the lowest risk was observed in Asians (0.05 per 100 person-years). Older age, presence of concurrent diabetes, and higher FIB-4 score at baseline were associated with higher risk of cirrhosis and HCC (Figure).
Figure:

**Conclusion:** Among a large national cohort of treatment-naive eAg negative patients with non-cirrhotic CHB and baseline ALT <70 U/L, we observed significant heterogeneity in risks of cirrhosis or HCC. Better understanding which sub-populations are at highest risk of disease progression can help guide clinical decisions regarding earlier initiation of antiviral therapy in this group to improve long-term patient outcomes.

**WED-149**

**aMAP score and its combination with liver stiffness measurement accurately assess liver fibrosis in virologically suppressed CHB patients**

Rong Fan1, Guanlin Li2,3, Ning Yu1, Xiu-Juan Chang4, Tamoore Arshad5, Wen-Yue Liu6, Yan Chen1, Grace Lai-Hung Wong2,3, Yiyue Jiang1, Xieer Liang1, Yongpeng Chen1, Xiao-Zhi Jin7, Zheng Dong4, Howard Ho-Wai Leung6, Xiaodong Wang3, Zhen Zeng6, Terry Cheuk-Fung Yip2,3, Qiu Xie5, Deming Tan11, ShaoLi You4, Dong Ji4, Jun Zhao4, Arun Sanyal12, Jian Sun1, Ming-Hua Zheng2,9, Vincent Wai-Sun Wong2,3, Yongping Yang4, Jinlin Hou1, Guangdong Provincial Key Laboratory of Viral Hepatitis Research, Guangdong Provincial Clinical Research Center For Viral Hepatitis, Department of Infectious Diseases, Nanfang Hospital, Southern Medical University, Guangzhou, China; 2 Medical Data Analytics Center, Department of Medicine and Therapeutics, The Chinese University of Hong Kong, Hong Kong; 3 State Key Laboratory of Digestive Disease, Institute of Digestive Disease, The Chinese University of Hong Kong, Hong Kong; 4 Senior Department of Hepatology, Fifth Medical Center of Chinese PLA General Hospital, Beijing, China; 5 Department of Internal Medicine, Virginia Commonwealth University, Richmond, VA, United States; 6 Department of Endocrinology, the First Affiliated Hospital of Wenzhou Medical University, Wenzhou, China; 7 NAFLD Research Center, Department of Hepatology, the First Affiliated Hospital of Wenzhou Medical University, Wenzhou, China; 8 Department of Anatomical and Cellular Pathology, The Chinese University of Hong Kong, Hong Kong; 9 Key Laboratory of Diagnosis and Treatment for the Development of Chronic Liver Disease in Zhejiang Province, Wenzhou, China; 10 Department of Infectious Diseases, Ruijin Hospital, Shanghai Jiao Tong University School of Medicine, Shanghai, China; 11 Department of Infectious Diseases, Xiangya Hospital, Central South University, Changsha, China; 12 Division of Gastroenterology, Virginia Commonwealth University, Richmond, VA, United States

**Email:** jlhousmu@163.com

**Background and aims:** The changes in liver stiffness measurement (LSM) are unreliable to estimate regression of fibrosis during antiviral treatment.
treatment for chronic hepatitis B (CHB) patients. aMAP score [J Hepatol, 2020], as an accurate hepatocellular carcinoma risk score, may reflect the liver fibrosis stage. Here, we aimed to evaluate the performance of aMAP for diagnosing liver fibrosis in CHB patients with or without treatment.

**Method:** 2053 patients with liver biopsy from 2 real-world cohorts and 2 multi-centric randomized controlled trials in China were enrolled, among which 2053 CHB were included in the cross-sectional analysis, and 889 CHB patients with paired liver biopsies before and after 72- or 104-week treatment were included in the longitudinal analysis.

**Results:** In the cross-sectional analysis, the AUROCs of aMAP in diagnosing cirrhosis and advanced fibrosis were 0.788 and 0.757, which were significantly higher or comparable with those of fibrosis index based on four factors (FIB-4, 0.763, p = 0.010; 0.753, p = 0.694) and aspartate aminotransferase-platelet ratio (APRI, 0.607, p < 0.001; 0.613, p < 0.001), respectively. Lower and higher cut-off values for each non-invasive test were selected to obtain sensitivity and specificity of 90% or 95%, respectively. When applying these two cut-off values, aMAP had a trend toward better performance than FIB-4 and APRI with a numerically smaller uncertainty area (UA) and a higher diagnostic accuracy (DA) in diagnosing cirrhosis. The UA was 68.3% for aMAP with DA of 85.2% in cirrhosis detection (74.2%, 84.5% for FIB-4, and 79.0%, 78.0% for APRI, respectively). Moreover, compared with stepwise approaches using FIB-4 (or APRI) and LSM, the stepwise approach using aMAP and LSM also had the smallest UA and satisfactory DA in both cirrhosis (UA: 29.7%; DA: 82.3%) and advanced fibrosis (UA: 46.2%; DA: 79.8%) detection. In the longitudinal analysis, among patients with significant decline in LSM after anti-HBV treatment (defined as LSM at week 72 or 104 decreased ≥30% from baseline), the performance of LSM at week 72 (or 104) in diagnosing cirrhosis or advanced fibrosis was unsatisfactory, the AUROCs of which were significantly lower than those without significantly decline (cirrhosis: 0.748 vs. 0.830, p = 0.012; advanced fibrosis: 0.750 vs. 0.820, p = 0.024). We further established a novel model (aMAP-LSM model) comprising aMAP at baseline, LSM at week 72 (or 104) with or without aMAP at week 72 (or 104) by using logistic regression, which had satisfactory performance in diagnosing cirrhosis and advanced fibrosis after treatment (AUROC: 0.839 and 0.840, respectively), especially for those with significant decline in LSM after treatment (vs. LSM alone: 0.828 vs. 0.748, p < 0.001 [cirrhosis]; 0.825 vs. 0.750, p < 0.001 [advanced fibrosis]) (Figure).

**Conclusion:** aMAP score is a promising non-invasive tool for diagnosing fibrosis in CHB patients. The aMAP-LSM model could accurately estimate fibrosis stage for treated CHB patients.

**WED-150**

**Systematic review and meta-analysis: the proportion of chronic hepatitis B patients with different alanine transaminase upper limits and significant hepatic histology**

Yuhao Yao¹, Jiaxin Zhang¹-², Xu Cao¹, Xiaoke Li¹-², Xiaobin Zao¹-², Yong'an Ye¹-². ¹Dongzhimen Hospital, Beijing University of Chinese Medicine, China; ²Beijing University of Chinese Medicine, Liver Diseases Academy of Traditional Chinese Medicine, China

Email: yeyongan@vip.163.com

**Background and aims:** The proportion of chronic hepatitis B patients (CHB) patients without a history of oral anti-viral medications or interferon use with normal alanine transaminase (ALT) and hepatic histology has been the focus of current research. ALT is one of the most important indicators for initiating antiviral therapy, however, ALT levels alone may not accurately reflect hepatic histology. Furthermore, the current ALT upper limit of normal (ULN) recommended by global guidelines for initiating antiviral therapy varies, leading to controversy on the most appropriate ALT ULN. Thus, this review aims to systematically evaluate the proportion of CHB patients with different ALT upper limits and significant hepatic histology, to provide a reference for the clinical management of this population.

**Method:** The Medline and EMBASE databases were searched from inception up to November 2022 with the following terms: “Hepatitis B OR "Hepatitis B virus" OR "Hepatitis B, Chronic" OR "chronic hepatitis B" OR "CHB" OR hepatitis B" AND "Alanine Trans-aminase OR “alanine aminotransferase” OR ALT". Significant histology included ‘significant fibrosis’ and ‘significant inflammation’. ‘Significant fibrosis’ was defined as stage ≥2 (Metavir, Batts-Ludwig, HAI, Scheuer or Ishak staging systems) and ‘significant inflammation’ was defined as stage ≥2 (Metavir, Batts-Ludwig or Scheuer staging systems) or score ≥4 (Ishak or HAI scoring systems) in the meta-analysis, which was consistent across all studies. Studies with just one of the two outcomes were included in the meta-analysis. Estimation of pooled proportions was calculated using transformed proportions using Friedman-Tukey double arc sine transformation. The protocol was registered at PROSPERO (CRD42021265642, http://www.crd.york.ac.uk/PROSPERO).

**Results:** Twenty studies with 3,624 CHB patients with ALT ≤ULN were included. All patients had no history of prior antiviral or interferon therapy. Most of the patients had HBV DNA levels >2000–20 000 IU/ml. The pooled rates of significant fibrosis and significant inflammation in CHB patients with ALT ≤40 IU/L were 34.49% (95% CI: 24.31–45.44) and 21.57% (95% CI: 9.20–37.38), respectively. In studies in which ALT upper limits were set below 40IU/L, significant fibrosis and significant inflammation were observed in 25.61% (95% CI: 16.43–36.03) and 16.68% (95% CI: 6.05–31.21) CHB patients, respectively, without limiting the upper limits. Among studies evaluating CHB patients with ALT ≤30 IU/L (males) and 19 IU/L (females), significant fibrosis and significant inflammation were detected in 17% (95% CI: 9.47–26.19) and 14.76% (95% CI: 2.07–36.09), respectively. The comparison of the proportions of CHB patients with significant fibrosis and significant inflammation for different ALT ULN levels was shown in Figure H.

**Conclusion:** Among untreated CHB patients with normal ALT, a certain percentage of patients still have significant hepatic histology. Approximately one-third of CHB patients with ALT ≤40 IU/L may have significant hepatic fibrosis and one-fifth have significant hepatic inflammation. However, the lower the ALT ULN levels set, the lower the proportion of patients with significant histology. Those CHB patients with normal ALT but significant hepatic histology are of concern to clinicians, and further evaluation and treatment may be warranted. Moreover, our study may be helpful for further negotiation of ALT ULN for initiating antiviral therapy.
WED-151
Self-stigma in chronic hepatitis B: content and psychometric validation of a new patient-reported outcome instrument

Robert G. Gish1, Mondher Toumi2, Jack Wallace3, Chari Cohen1, Su Wang4,5, Chris Marshall6, Helen Kitchen6, Jake Macey6, Hannah Pegram6, Carrie Houts7, Rikki Mangrum7, Ashley F. Slagle8, Jeffrey Lazarus9,10, Patrick Kennedy11, Florian van Bömmel12, Maurizia Brunetto13, Qin Ning14, Hiroshi Yatsuhashi15,16, Markus Cornberg17, Qing Xie18, Dee Lee10, Angelina Villasis Keever20, Urbano Sbarigia21, Yasushi Takahashi22, John Jerzorwski23, Willem Talloen21, Michael Biermer21, Eric Chan20.

1Hepatitis B Foundation, Doylestown, United States; 2Aix-Marseille University, Jardin du Pharo, Marseille, France; 3Burnet Institute, Melbourne, Australia; 4Cooperman Barnabas Medical Center, Florham Park, United States; 5World Hepatitis Alliance, London, United Kingdom; 6Clarivate (formerly DRG Abacus), London, United Kingdom; 7Vector Psychometric Group, Chapel Hill, United States; 8Aspen Consulting, LLC, Steamboat Springs, United States; 9Barcelona Institute for Global Health (ISGlobal), Barcelona, Spain; 10CUNY Graduate School of Public Health and Health Policy (CUNY SPH), New York, United States; 11Barts and The London School of Medicine and Dentistry, London, United Kingdom; 12Division of

Figure: (abstract: WED-150).

WED-151
Self-stigma in chronic hepatitis B: content and psychometric validation of a new patient-reported outcome instrument

Hepatitis B Foundation, Doylestown, United States; Aix-Marseille University, Jardin du Pharo, Marseille, France; Burnet Institute, Melbourne, Australia; Cooperman Barnabas Medical Center, Florham Park, United States; World Hepatitis Alliance, London, United Kingdom; Clarivate (formerly DRG Abacus), London, United Kingdom; Vector Psychometric Group, Chapel Hill, United States; Aspen Consulting, LLC, Steamboat Springs, United States; Barcelona Institute for Global Health (ISGlobal), Barcelona, Spain; CUNY Graduate School of Public Health and Health Policy (CUNY SPH), New York, United States; Barts and The London School of Medicine and Dentistry, London, United Kingdom; Division of
Background and aims: An estimated 296 million people globally live with chronic hepatitis B (CHB). Stigma against people with CHB is common. Self-stigma (a type of stigma defined as self-induced, internalized negative belief, which affects feelings and function) may negatively impact diagnostics, treatment, and health-related quality of life of people with CHB. We conducted studies to demonstrate the content and psychometric validity of a new patient-reported outcome (PRO) instrument to assess self-stigma in people with CHB, as none currently exists.

Method: Qualitative cognitive debriefing interviews with people living with CHB were conducted to assess the content validity and conceptual coverage of the draft PRO instrument's comprehensiveness and participants' understanding and interpretation of the instructions, items, response scale, and recall period. Quantitative analyses included psychometric evaluation of the PRO instrument using data from the global phase 2b REEF-1 and REEF-2 trials in adults with CHB. The following analyses were conducted: internal consistency and test-retest reliability, known-group validity, exploratory and confirmatory factor analysis, item response theory (IRT), and differential item functioning (DIF).

Results: In the qualitative study, participants in China, Germany, Italy, Japan, and United States (N = 75) informed rephrasing and combining of items for clarity and conceptual overlap, and the addition of a self-stigma definition. Interviews confirmed understanding of the PRO items, instructions, and response scale as intended and confirmed them as relevant and comprehensive. Participants self-reported the frequency with which they experienced each aspect of self-stigma over the past 4 weeks (recall period) and found the response scale appropriate. Quantitative (psychometric) evaluation of responses from participants of REEF-1 (N = 470) and REEF-2 (N = 130) demonstrated that the items possessed good internal consistency (α = 0.92) and test-retest reliability (intraclass correlation coefficient [ICC]: summed scores = 0.81; ICC: IRT-based scores = 0.77). Exploratory factor analysis indicated a subset of 9 items that covered important content areas (felt inferior to others, expected others to think less of me, felt people were avoiding me, expected to be less successful in life, felt guilty, felt ashamed, avoided social situations, and avoided intimate relationships). The 9-item scale were supported by results from convergent and discriminant correlations and means of known groups analyses. The 9-item summed scores also detected change over time. DIF analyses indicated no group differences in item performance based on age (≤45 vs >45 years), sex, or race/ethnicity (Asian vs non-Asian). The test reliability function of the final 9-item scale indicated that average to high levels of self-stigma had good reliability (>0.70 at ~0.8 and higher) supporting the suitability of the instrument for future use in clinical trials.

Conclusion: These results support the content and psychometric validity of this new 9-item PRO instrument for use in clinical studies to assess self-stigma in people with CHB.

WED-152
Hepatitis flare appeared to be more severe with poorer outcome in chronic hepatitis B patients with recent COVID vaccination during the COVID pandemic

Jennifer Tai1, Yen-Chun Liu1,2, Rachel Wen-Juei Jeng1,2, Rong-Nan Chien1,2,3, Yun-Fan Liaw2,3,1 Chang Gung Memorial Hospital, Linkou Medical Center, Department of Gastroenterology and Hepatology, Taiwan;2 College of Medicine, Chang Gung University, Taiwan;3 Chang Gung Memorial Hospital, Linkou Medical Center, Liver research unit, Taiwan

Email: liveryfl@gmail.com

Background and aims: Immune-mediated hepatitis following COVID vaccination were reported recently. Further, COVID-19 infection has been reported as one of the possible trigger factors for HBV reactivation. This study aims to investigate the characteristics and severity between chronic hepatitis B (CHB) patients who developed severe flare with and without recent COVID vaccination during Nov 2020-Nov 2021.

Method: From the nucleos (t)ide analogues reimbursement application registry system during Nov 2020-Nov 2021 in Chang Gung Memorial Hospital, Linkou medical center, CHB patients with severe flare, defined as ALT ≥1000 U/L or ALT <1000 plus bilirubin ≥3.5 mg/dL and/or international normalized ratio (INR) ≥1.5, and/or hepatic decompensation, defined as ALT ≥5X ULN, bilirubin ≥2 mg/dL and INR ≥1.5, were recruited. Patients with sepsis, biliary tract infection, advanced liver tumor, alcoholism, acute hepatitis B infection and drug-induced liver injury were excluded. Patients’ characteristics along with liver biochemistry, viral markers at onset of hepatitis flare event, and the incidence of mortality or liver transplantation were compared between patients with and without history of recent (<6 months) COVID-19 vaccination.
peak INR (median: 3.2 vs 1.7, p = 0.015), AST (median: 1789 vs 808 U/L, p = 0.011), ALT levels (median: 2079 vs 1500 U/L, p = 0.018), more frequent peak ALT >3000 U/L (44.4% vs 7.1%, P = 0.008) and significantly higher rates of 30-day mortality or liver transplant (66.7% vs 21.4%, log rank test, P < 0.05).

**Conclusion:** Recent COVID-19 vaccination may exacerbate severe hepatitits flare, probably due to more vigorous immune response or immune mediated hepatitis following COVID-19 vaccination.

---

**WED-153**

**Increased baseline comorbidity burden among commercially insured patients with hepatitis delta virus infection vs hepatitis B virus monoinfection in the United States**

Robert G. Gish1, Robert Wong2,3, Chong Kim4, Gary Leung5,
Ira M Jacobson6, Joseph Lim1, Ankita Kaushik4. 1Hepatitis B Foundation, Doylestown, United States; 2Stanford University School of Medicine, Stanford, United States; 3VA Palo Alto Healthcare System, Palo Alto, United States; 4Gilead Sciences, Inc., HEOR-Global Value and Access, Foster City, United States; 5Gilead Sciences, Inc., RWE-Epidemiology, Foster City, United States; 6NYU Grossman School of Medicine, New York, United States; 7Yale University School of Medicine, New Haven, United States

Email: rgish@robertgish.com

**Background and aims:** Compared to hepatitis B virus (HBV) monoinfection, hepatitis D virus (HDV) is associated with more rapid progression to cirrhosis and liver-related complications. Baseline (BL) characteristics of adults with HBV with concurrent HDV infection were compared to those with HBV monoinfection among commercially insured US patients.

**Method:** Adults with ≥1 HDV or HBV diagnosis (ICD-9/10-CM) were identified retrospectively from 1 Jan 2013 to 31 Dec 2021 (study period) using the IQVIA PharMetrics Plus database covering ~210 million patients from primarily commercial payers. HDV and HBV- monoinfected patients were identified from 1 Jan 2014 to 31 Dec 2020 (identification period). Patients with HDV had ≥1 inpatient or ≥2 outpatient claims ≥30 days apart with an ICD-9/10-CM diagnosis code for HDV during the identification period (earliest date of diagnosis considered index date), ≥1 claim of HBV diagnosis during BL, and no claims with HDV diagnosis during BL (12-month period prior to index date). Patients with HBV monoinfection had ≥1 inpatient or ≥2 outpatient claims ≥30 days apart with a claim for HBV only, no claims with HBV diagnosis during BL, and no ICD codes for HDV diagnosis during study period. At least 12 months of continuous enrollment before and after the index date was required, and patients aged ≥18 years at index with commercial health plans were included. Patient characteristics were assessed over the 12-month BL period, and comparisons between HDV-infected vs HBV-monoinfected cohorts were made.

**Results:** Of the 186,376 patients diagnosed with HDV or HBV during the study period, 440 HDV and 22,136 HBV-monoinfected patients were included. The HDV cohort was significantly older, mean (SD) age 50.3 (10.50) vs 49.1 (11.72) years, p = .03; had a significantly greater proportion of males, 65.2% vs 55.2%, p <.0001; and had significantly higher mean (SD) Charlson Comorbidity Index scores, 1.97 (2.35) vs 0.91 (1.94), p < .0001 than the HBV-monoinfected cohort. Compared to HBV-monoinfected patients, at BL, HDV patients were more likely to have compensated cirrhosis (13% vs 2%), decompensated cirrhosis (12% vs 3%), hepatocellular carcinoma (5% vs 1%), and liver transplant (4% vs 1%); p < .0001 for all comparisons. Compared to HBV- monoinfected patients, at BL, HDV patients had significantly higher proportions of hypertension (33% vs 25%; p = .0001), obesity (8% vs 5%; p = .002), non-alcoholic steatohepatitis (7% vs 2%; p <.0001), HCV (6% vs 4%; p = .003), and HIV (5% vs 3%; p = .04).

**Conclusion:** Among a nationally representative cohort of commercially insured US patients, patients with HDV had a greater burden of advanced liver disease and complications and other comorbidities at BL compared to HBV-monoinfected patients. This study underscores the importance of early identification and linkage to treatment of patients with HDV to mitigate disease progression and improve patient outcomes.

---

**WED-154**

**Can we better characterize HBeAg-negative chronically infected hepatitis B patients using novel biomarkers?**

Thais Leonel Couto1, Sergio Rodríguez-Tajes2, Ariadna Rando-Segura2, Esther García-Praž3, Mireia García-López3, Sabela Lens1, Zoe Mariño1, David Tabernero2, María Francesca Cortese2, Francisco Rodríguez-Prias2, Maria Saez-Palma1, Sofía Pérez-del-Pulgar1, Xavier Forns1. 1Liver Unit, Hospital Clinic Barcelona. University of Barcelona. FCRB-IDIBAPS. CIBEREHD, ISCIII, Spain; 2Unitat de Patologia Hepàtica, Departament de Bioquímica i Microbiologia, Hospital Universitari Vall d’Hebron, CIBEREHD, ISCIII, Barcelona, Spain

Email: xforns@clinic.cat

**Background and aims:** The natural history of Hepatitis B virus (HBV) infection has different phases that are characterized according to the hepatitis B e antigen (HBeAg) status, HBV-DNA levels and transaminases. Patients with HBeAg-negative chronic infection can be quite heterogeneous, particularly in terms of hepatitis B surface antigen (HBsAg) levels with no apparent association with HBV-DNA levels. In recent years, new biomarkers such as the core-related antigen (HBcAg) and circulating HBV-RNA (cirB-RNA) have been used as surrogate markers of covalently closed circular DNA (cccDNA) transcriptional activity. Unfortunately, most of these studies focus on patients on nucleos (t)ide analogue (NA) treatment and in the chronic hepatitis phase. The aim of this study was to investigate whether HBcAg and cirB-RNA could help to better characterize the HBeAg-negative chronic infection phase.

**Method:** We retrospectively included 184 naive patients with normal ALT divided into 4 groups: HBSAg >10,000 IU/ml and HBV-DNA
2,000–20,000 IU/ml (Group 1, n = 20); HBsAg >10,000 IU/ml and DNA <2,000 IU/ml (Group 2, n = 48); HBsAg 10,000–100,000 IU/ml and DNA <2,000 IU/ml (Group 3, n = 69); HBsAg <100 IU/ml and DNA <2,000 IU/ml (Group 4, n = 52). HBV-DNA (LLQ <10 IU/ml), HBsAg (LLQ <0.13 IU/ml), HBcAg (LLQ <3 LogU/ml) and HBV-RNA (LLQ <10 cp/ml) were quantified in all of them at baseline and in 91 patients during follow-up.

Results: Groups were comparable in sex (55% female) and ethnicity (67% Caucasian); age (median 47 years) was greater in group 4 (54 years). The follow-up period after baseline assessment was similar between groups (2.6 years (1.6–3.9). The presence of HBcAg and cirB-RNA at baseline varied significantly between groups, ranging from 45% and 65%, respectively, in group 1, to less than 10% in group 4 (Figure). Most of the patients with follow-up remained in the same group (82%) and only 2 patients went from group 2 to group 1 (gray zone). Seventeen patients (18%) achieved functional cure (HBsAg loss) during follow-up (13 from group 4 and 4 from group 3). Neither baseline cirB-RNA detection nor HBcAg levels predicted change of group or functional cure. Indeed, 2 of the 17 (12%) patients who achieved functional cure had detectable cirB-RNA or HBcAg at baseline.

Conclusion: In the HBe-negative chronic infection phase, detection of serum HBcAg and cirB-RNA at baseline is not influenced by HBsAg levels, suggesting that it originates from integrated HBV genome. In contrast, HBcAg and cirB-RNA are frequently detected when HBV-DNA >2000 IU/ml (gray zone), demonstrating increased transcriptional activity of cccDNA. The absence of HBcAg and cirB-RNA do not predict loss of HBsAg (functional cure). Finally, most patients remain stable overtime and this may indicate that multiple serological marker determination to determine the phase of HBV infection are not required.

WED-155
An online web-based calculator accurately diagnoses immune tolerant phase in chronic HBV-infected patients
Chi Zhang1, Yiqi Liu1, Hui Liu2, Chen Shao3, Hong Zhao1, Gui-Qiang Wang1.
1Peking University First Hospital, Department of Infectious Disease, Center for Liver Disease, China; 2Beijing Youan Hospital, Capital Medical University, Department of Pathology, China; 3Email: john131212@126.com

Background and aims: There were different antiviral treatment strategies and prognoses between immune tolerant (IT) and non-IT in chronic hepatitis B (CHB) patients. However, existing non-invasive diagnostics were not precision. We aimed to explore new non-invasive markers to determine the phase of HBV infection at baseline.

Method: We included treatment-naive CHB patients with liver biopsy who serological met the diagnostic criteria of IT (HBEAg-positive, HBV DNA>50 IU/ml, normal ALT). This study included four parts: in step 1, we described the clinical characteristics of IT patients. In step 2, we evaluated the value of non-invasive markers recommended by the guidelines for the diagnosis of IT. In step 3, a new model for the diagnosis of IT with non-invasive markers were developed and validated. In step 4, to assess the risk of developing HCC using 15 HCC prediction models for IT and non-IT.

Results: According to the criteria for the diagnosis of IT by WHO 2015 guidelines, 196 patients were finally included in this study, of which 83 were liver biopsy-proven IT. In the IT group age, anti-HBc, ALT, AST and LSM were lower. While, HBV DNA and HBsAg were higher. The risk of non-IT increased 1.2-fold and 3.92-fold in patients aged 30–40 (95%CI 1.00–4.81, P = 0.049) and >40 years (95%CI 2.28–10.60, P < 0.001), respectively, compared to those aged<30 years. Compared to HBV DNA >8 lg IU/ml, the risk of non-IT was increased 4.33-fold and 9.96-fold in patients 7–8 lg IU/ml (p = 0.001) and <8 lg IU/ml (p <0.001), respectively. The accuracy of non-invasive marker combinations for the diagnosis of IT did not exceed 0.800, whether in accordance with EASL2017/APASL2015, AASLD2018 or CHINA2019 criteria (0.709, 0.658 and 0.765, respectively). Using univariate analysis, LASSO regression and multivariate analysis, we created a CALA model (qAnti-HBc, LSM, AST, ALP) to diagnosing IT. The AUROC of CALA model reached 0.890 and 0.892 in training and validation sets, respectively, which were significantly higher than APRI, FIB-4 and LSM. For clinical convenience, we have made CALA model in an online web-based calculator and QR code. We included 15 hepatitis B related HCC prediction models (REACH-B, mREACH-BI, mREACH-BII, GAG-HCC, CU-HCC, LSM-HCC, PAGE-B, mPAGE-B, MGM1-HCC, MGM2-HCC, CAMD, RWS-HCC, AASL-HCC, REAL-B, aMAP) by searching the PubMed database. The risk of HCC was significantly lower in biopsy-proven IT than in biopsy-proven non-IT population (all P < 0.01). Subsequently, the CALA model was used to differentiate IT and the same results were obtained as those confirmed by liver biopsy (all P < 0.01, except CU-HCC model P = 0.066).

Conclusion: Online web-based calculator of CALA model can accurately and conveniently diagnose IT. Patients with liver biopsy or CALA model-proven IT were at a lower risk of developing HCC.

WED-156
Hepatitis D screening in HBsAg positive individuals in Germany: insufficient implementation results in a large number of undiagnosed cases
Toni Herta1, Anna Joachim-Richter2, David Petroff3, Ingmar Wolffram4, Thomas Berg1, Jan Kramer1, Johannes Wiegand1, Olaf Bätz2.
1Division of Hepatology, Department of Medicine II, Leipzig University Medical Center, Leipzig, Germany, Germany; 2LADR Laboratory Group Dr. Kramer and Colleagues, Geesthacht, Germany; 3General Practitioner, Paderborn, Germany; 4Email: johannes.wiegand@medizin.uni-leipzig.de

Background and aims: Chronic hepatitis delta (CHD) is the most severe form of viral hepatitis and is caused by hepatitis delta virus (HDV) infection, which can only occur in hepatitis B antigen (HBsAg) positive individuals. Thus, current guidelines recommend an anti-HDV screening in all newly detected HBsAg positive cases. These recommendations received increasing attention after approval of the
HBV/HDV hepatocyte entry inhibitor bulevirtide as first licensed HDV treatment option in July 2020. We analyzed the implementation of HDV testing in the German health care system during the last 9 years.

**Method:** We retrospectively searched the database of 11 LADR laboratory sites throughout Germany for HBsAg positive patients detected between the years 2012 and 2021. Request of anti-HDV and HDV RNA testing, origin of laboratory request (primary care, hospital care, occupational medicine, and asylum center), and basic patient characteristics were recorded.

**Results:** 13,905 HBsAg positive cases were identified (median age 42 ± 15 years, 47% female). They originated from the primary care level, hospitals, occupational medicine, or an asylum center in 84%, 8%, 2%, 5% of cases, respectively. 2,792/13,905 (20%) of HBsAg positive individuals were tested for anti-HDV antibodies with 142/2,792 (5.1%) positive test results. 32% of these anti-HDV positive patients were female with a mean age of 42 ± 13 years. Anti-HDV testing was requested in 2,544/11,679 (22%) of HBsAg-positive individuals at the primary care level, in 218/1,134 (19%) of cases at hospitals, in 183/304 (6%) of cases at occupational medicine, and in 5/711 (1%) of asylum seekers. This observation likely results from differences in reimbursement policy. Testing of HDV RNA was requested in 57/142 (40%) of anti-HDV positive individuals with 26/57 (45%) positive test results. As 80% of HBsAg positive patients were not tested for anti-HDV, a rough estimate suggests that a factor four more patients could benefit from bulevirtide treatment compared to the current situation.

**Conclusion:** Anti-HDV screening in HBsAg positive individuals and subsequent HDV RNA testing in anti-HDV positive patients is poorly implemented in Germany. One possible solution would be anti-HDV and HDV RNA reflex testing at the laboratory level.

**WED-157**

HDV RNA levels <1000 IU/ml and total anti-HDV titers <1:1000 identify chronic hepatitis D subjects without active liver disease

Gabriele Ricco¹, Daniela Cavallone¹, Piero Colombatto¹, Filippo Oliveri², Barbara Coco¹, Veronica Romagnoli¹, Lidia Surace¹, Antonio Salvati¹, Ferruccio Bonino², Maurizia Brunetto¹,², ¹University Hospital of Pisa, Hepatology Unit, Italy; ²Institute of Biostucture and Bioimaging, National Research Council, Italy

Email: maurizia.brunetto@unipi.it

**Background and aims:** To optimize the management and treatment of chronic hepatitis delta (CHD) urges a better clinical/virologic characterization of the patients (pts). We quantified HDV/HBV markers to investigate their correlation with disease activity/stage and response to Interferon (IFN) treatment in a cohort of 146 pts.

**Method:** One hundred forty-six consecutive untreated anti HDV+ pts admitted at the University Hospital of Pisa were classified according to their baseline clinical, biochemical, histological and imaging data in: 1) Pts without liver disease (no-CHD) [ALT<40U/L; LS<6kPa]; 2) CHD without cirrhosis; 3) CHD with cirrhosis; 4) CHD with advanced cirrhosis [previous or ongoing decompensation/HCC/varices]. HDV and HBV makers (HBV DNA/HBsAg/HBcrAg/IgG anti HBc) were tested at baseline (BL) in the overall cohort and at end of therapy (EOT), 24 weeks after EOT (PT-FU) and end of follow-up (EOF) in 31 (21.2%) IFN-treated pts [median 12.4 (6.0–91.7) mos]. Undetectable HDV RNA at EOT, PT-FU and EOF by in house qualitative PCR defined the virologic response. HDV RNA was quantified by RoboGene 2.0 (Roboscreen Diagnostics, LOD 6 IU/ml). Total anti HDV titer was evaluated by 10-fold end point dilution of serum samples (LiaisonXLmurex Anti HDV, DiaSorin).

**Results:** Eleven (7.6%) subjects were classified as no-CHD: all were viremic, 10 (90.9%) had quantitative (qt) HDV RNA<1000 IU/ml [2.88 Log (0.82–4.14) and all had anti HDV titer<1:1000. Among 135 CHD pts, qtHDV RNA was higher in pts with cirrhosis [5.55 Log (0.70–7.73)] compared to those without [4.39 Log (0.70–6.75), p = 0.002], and among cirrhotics was lower in pts with advanced disease [4.81 Log (0.70–6.48), p = 0.008]. Anti HDV ≥1:1000 were present in 132 (97.8%) CHD pts. At multivariate analyses HDV RNA [OR = 1.81/6/p = 0.007], anti HDV [OR = 4.429/p = 0.012] and anti Hbc IgG [OR = 3.260/p = 0.041] associated with higher disease activity (ALT>100 U/L); Age [OR = 1.059/p = 0.032] and HDV RNA [OR = 1.643/p = 0.006] with cirrhosis. Among 31 IFN-treated pts, 16 (51.6%) were responders at EOT; 13 (41.9%) maintained a virologic response at PT-FU, 15 (48.4%) were non-responders. Data at EOF [median 4.6 (1.3–18) yrs] were available in 28: 14 (50%) pts maintained undetectable HDV RNA and normal ALT, all had HDV RNA <1000 IU/ml by qPCR [1.69 Log (0.70–2.34)]; <LOD in 2 (14%) and 13/14 (92.8%) had anti HDV <1:1000. Among the remaining 14 PCR positive pts, 12 (85.7%) had ALT>40 U/L, 12 (85.7%) had qHdV RNA >1000 IU/ml [4.66 Log (1.64–6.65)] and all had anti HDV ≥1:1000.

**Conclusion:** HDV RNA<1000 IU/ml and anti HDV titers <1:1000 identify with high diagnostic accuracy (Table) CHD patients without evidence of active liver disease. In CHD pts HDV viremia independently correlates with biochemical activity and stage of liver disease. Quantification of HDV markers qualifies as a useful tool for clinic-virological classification and treatment monitoring of CHD pts.

**WED-158**

Relationship of hepatitis D viral load, ALT levels, and liver stiffness in untreated patients with chronic hepatitis D

Soo Alemen¹, Pietro Lampertico¹,², Maurizia Brunetto¹,², Pavel Bogomolov³, Vladimir Chulanov³, Nina Mamonova³, Tatjana Stepanova³, Dmitry Manuilov⁴, Qi An³, Ben Da⁴, John F. Flaherty⁴, Renée-Claude Mercier⁵, Audrey Lai⁶, Stefan Zeuzem⁷, Markus Cornberg⁸, Heiner Wedemeyer⁹.

**Background and aims:** To optimize the management and treatment of chronic hepatitis delta (CHD) urges a better clinical/virologic characterization of the patients (pts). We quantified HDV/HBV markers to investigate their correlation with disease activity/stage and response to Interferon (IFN) treatment in a cohort of 146 pts.

**Method:** One hundred forty-six consecutive untreated anti HDV+ pts admitted at the University Hospital of Pisa were classified according to their baseline clinical, biochemical, histological and imaging data in: 1) Pts without liver disease (no-CHD) [ALT<40U/L; LS<6kPa]; 2) CHD without cirrhosis; 3) CHD with cirrhosis; 4) CHD with advanced cirrhosis [previous or ongoing decompensation/HCC/varices]. HDV and HBV markers (HBV DNA/HBsAg/HBcrAg/IgG anti HBc) were tested at baseline (BL) in the overall cohort and at end of therapy (EOT), 24 weeks after EOT (PT-FU) and end of follow-up (EOF) in 31 (21.2%) IFN-treated pts [median 12.4 (6.0–91.7) mos]. Undetectable HDV RNA at EOT, PT-FU and EOF by in house qualitative PCR defined the virologic response. HDV RNA was quantified by RoboGene 2.0 (Roboscreen Diagnostics, LOD 6 IU/ml). Total anti HDV titer was evaluated by 10-fold end point dilution of serum samples (LiaisonXLmurex Anti HDV, DiaSorin).

**Results:** Eleven (7.6%) subjects were classified as no-CHD: all were viremic, 10 (90.9%) had quantitative (qt) HDV RNA<1000 IU/ml [2.88 Log (0.82–4.14) and all had anti HDV titer<1:1000. Among 135 CHD pts, qtHDV RNA was higher in pts with cirrhosis [5.55 Log (0.70–7.73)] compared to those without [4.39 Log (0.70–6.75), p = 0.002], and among cirrhotics was lower in pts with advanced disease [4.81 Log (0.70–6.48), p = 0.008]. Anti HDV ≥1:1000 were present in 132 (97.8%) CHD pts. At multivariate analyses HDV RNA [OR = 1.81/6/p = 0.007], anti HDV [OR = 4.429/p = 0.012] and anti Hbc IgG [OR = 3.260/p = 0.041] associated with higher disease activity (ALT>100 U/L); Age [OR = 1.059/p = 0.032] and HDV RNA [OR = 1.643/p = 0.006] with cirrhosis. Among 31 IFN-treated pts, 16 (51.6%) were responders at EOT; 13 (41.9%) maintained a virologic response at PT-FU, 15 (48.4%) were non-responders. Data at EOF [median 4.6 (1.3–18) yrs] were available in 28: 14 (50%) pts maintained undetectable HDV RNA and normal ALT, all had HDV RNA <1000 IU/ml by qPCR [1.69 Log (0.70–2.34)]; <LOD in 2 (14%) and 13/14 (92.8%) had anti HDV <1:1000. Among the remaining 14 PCR positive pts, 12 (85.7%) had ALT>40 U/L, 12 (85.7%) had qHdV RNA >1000 IU/ml [4.66 Log (1.64–6.65)] and all had anti HDV ≥1:1000.

**Conclusion:** HDV RNA<1000 IU/ml and anti HDV titers <1:1000 identify with high diagnostic accuracy (Table) CHD patients without evidence of active liver disease. In CHD pts HDV viremia independently correlates with biochemical activity and stage of liver disease. Quantification of HDV markers qualifies as a useful tool for clinic-virological classification and treatment monitoring of CHD pts.
Background and aims: The clinical significance of hepatitis D virus (HDV) viral load level in chronic hepatitis D (CHD) is unclear. Unlike infection with hepatitis B virus (HBV), HDV may cause both immune-mediated liver injury as well as direct cytopathic damage to hepatocytes. This study aimed therefore to investigate whether HDV viral load is associated with alanine aminotransferase (ALT)
levels and liver stiffness (LS) by transient elastography, which are surrogate markers for hepatic inflammation and liver fibrosis.

**Method:** A cross-sectional analysis was conducted using pooled baseline data from 3 CHD trials: the phase 2 MYR203 (NCT02888106), phase 2 MYR204 (NCT03852433), and phase 3 MYR301 (NCT03852719) studies. Exclusion criteria included a Child-Pugh-Turcotte score B or C and ALT < or ≥10x upper limit of normal (ULN). Correlation between baseline HDV RNA and ALT levels was performed with Pearson's correlation and linear regression analysis. Subjects were further subclassified by ALT levels: <2 × ULN, 2–5 × ULN, >5 × ULN and LS value: <14 vs ≥14 kPa. Additional subgroup analyses were performed by baseline cirrhosis status. T-test was used to compare difference of HDV RNA between ALT subgroups. HDV RNA was quantified by Robogene 2.0 (LLOQ 50 IU/ml).

**Results:** 414 untreated CHD patients were included; the mean (SD) age was 40 (8.6) years, 64% male, 88% white, 35% with cirrhosis and 33% were on nucleos (t)ide analogues. Median (Q1, Q3) LS was 11.2 (8.1, 15.4) kPa, mean (SD) ALT-114 (118.6), and mean (SD) HDV RNA-5.3 (1.34) log IU/ml which was similar between those with LS <14 vs ≥14 kPa.

Patient distribution across ALT category was: <2 × ULN (N = 180, 43%), 2–5 × ULN (N = 188, 45%), and >5 × ULN (N = 46, 11%). Mean HDV RNA in the total cohort increased with higher ALT subgroup category: ALT <2 × ULN-HDV RNA mean (SD) 5.0 (1.5) log IU/mL, ALT 2–5 × ULN-HDV RNA 5.4 (1.2) log IU/mL, and ALT >5 × ULN-HDV RNA 5.8 (1.1) log IU/mL. Mean HDV RNA was higher among those with ALT ≥2–5 × ULN (p = 0.003) and >5 × ULN (p < 0.001) compared to those with ALT <2 × ULN. Mean HDV RNA among those without cirrhosis also increased with higher ALT category. A relationship was seen between the baseline HDV RNA level and ALT in the total cohort (p = 0.003, Figure 1a) and non-cirrhotic cohort (p = 0.040, Figure 1b). On further analysis by cirrhosis classification, the significant difference in HDV viral load between ALT subgroups remained only among those without cirrhosis (Figure 1c). Similar results were found using AST and HDV viral load. No correlation was seen with baseline HDV RNA level and baseline LS value, regardless of cirrhosis status.

**Conclusion:** In a large cohort of untreated HDV patients, higher baseline HDV viral load was significantly associated with increased ALT levels among those without cirrhosis. Whether this is associated with a higher rate of progression to cirrhosis and subsequent liver-related events requires further exploration.

**WED-159**

**B cell phenotype, Toll-Like receptor 9 expression and proinflammatory cytokines profile in patients with chronic hepatitis B with HBsAg loss or persistent**

Nour Nasser1,2, Issam Tout1, Stephanie Narguet3, Nathalie Giuly2, Boyer Nathalie2, Corinne Castelnau2, Valérie Paradis2, Pierre Tonnerre3, Vassili Soumelis3, Maria Chartouni1, Abdel Mansouri1,2, Tarik Asselah1,2, 1Université Paris Cité, Centre de Recherche sur l’Inflammation, Inserm U1149, CNRS ERL8252, F-75018 Paris, France; 2Assistance Publique-Hôpitaux de Paris (AP-HP), Department of Hepatology, Hôpital Beaujon, F-92110 Clichy, France; 3Université Paris Cité, Human Immunology, Pathophysiology and Immunotherapy (HIPI), team ATPV-Avenir, Inserm UMR 976, F-75010 Paris, France

Email: nour.nasser@inserm.fr

**Background and aims:** B cells, especially CD38hi plasma cells play a major role in mediating humoral immune responses to clear HBV infection. Hepatitis B s antigen (HBsAg) loss is associated with a better outcome in patients with chronic hepatitis B (CHB). Toll-like receptor 9 (TLR9) is a sensor of viral DNA motifs and activates B cells to generate effective immune responses against infection. We aimed to characterize the B cells phenotype, TLR9 expression and associated-inflammatory cytokines profile in peripheral blood mononuclear cells (PBMCs) and plasma from patients with CHB who lost HBsAg (HBsAg-) as compared to patients with persistent HBsAg (HBsAg+) and to healthy controls.

**Method:** HBsAg- patients and HBsAg+ patients (untreated and nucleoside analogues-treated) and healthy controls were included. PBMC and plasma were isolated from the whole patient’s blood. B cells phenotype and TLR9 expression were analysed using flow cytometry. Plasma levels of TNFα, IL-10 and IFNγ were analysed using ELISA.

**Results:** 14 HBsAg-, 40 untreated CHB, and 11 treated CHB with nucleoside analogues patients were recruited and compared to 15 healthy controls. The percent of CD19+, CD27+, CD38hi Plasma B cells was significantly higher in HBsAg+ patients compared to healthy controls (0.76 ± 0.11, n = 49 and 0.50 ± 0.12, n = 14, p < 0.001). However, the proportion of CD19+, CD27+, CD38hi Plasma B cells in HBsAg- patients was like that in healthy controls, whereas it significantly increases in HBsAg+ patients as compared to healthy controls (0.83 ± 0.107 n = 12 and 0.502 ± 0.12, p < 0.0001), indicating a restoration in the percentages of plasma B cells in HBsAg- patients. On the other hand, HBsAg+ patients have shown a significant increase in the percentage of atypical CD19+ CD10+ CD27- CD27- MBC cells when compared to healthy controls (5.68 ± 2.18, n = 38 and 3.13 ± 0.92, n = 14, p < 0.001) or to HBsAg- patients (5.68 ± 2.18 and 2.8 ± 0.91 n = 12, p < 0.0001). The relative TLR9 expression was significantly increased in HBsAg+ patients as compared to healthy controls (0.65 ± 0.15 n = 39 and 0.35 ± 0.11 n = 14, p < 0.0001) or to HBsAg- patients (0.35 ± 0.11 and 0.63 ± 0.19, p < 0.001 n = 14).

Also, plasma TNFα levels significantly increased in HBsAg+ patients compared to healthy controls (15.99 ± 2.83 pg/ml and 11.42 ± 1.67 pg/ml, P < 0.0001) but unchanged in HBsAg- group as compared to controls. However, a significant decrease in the levels of TNFα was observed in HBsAg- patients compared to HBsAg+ patients (15.59 ± 2.83 pg/ml and 12.07 ± 1.46 pg/ml, p < 0.05). Similarly, IL-10 levels increased in HBsAg+ patients in comparison to healthy controls (8.05 ± 1.67 pg/ml and 10.8 ± 2.9 pg/ml, p < 0.05), whereas significantly decreased (10.8 ± 2.9 pg/ml and 8.05 ± 1.67 pg/ml, p < 0.05) in HBsAg-patients compared to HBsAg+.

**Conclusion:** The normal redistribution of B cell subsets was disrupted in patients with persistent HBsAg while restored in patients who lost HBsAg. A restored cytokine environment in HBsAg- patients characterized by a decrease in TNFα and IL-10 plasma levels was observed in comparison to HBsAg+ patients. Finally, TLR9 expression was restored upon HBsAg loss. A study of B cell functionality in all groups of patients will be subsequently conducted to better correlate the B cell response to the HBsAg loss.

**WED-160**

**Healthcare resource use and costs associated with hepatitis delta virus infection compared to hepatitis B virus monoinfection among commercially insured patients in the US**

Robert Wong1,2, Robert G. Gish3, Chong Kim4, Gary Leung5, Ira M Jacobson6, Joseph Lim7, Ankita Kaushik1i, 1Stanford University School of Medicine, Stanford, United States; 2VA Palo Alto Healthcare System, Palo Alto, United States; 3Hepatitis B Foundation, Doylestown, United States; 4Gilead Sciences, Inc., HEOR-Global Value and Access, Foster City, United States; 5Gilead Sciences, Inc., RWE-Epidemiology, Foster City, United States; 6NYU Grossman School of Medicine, New York, United States; 7Yale University School of Medicine, New Haven, United States

Email: ankita.kaushik@gilead.com

**Background and aims:** Hepatitis delta virus (HDV) infection occurs in patients with underlying hepatitis B virus (HBV) infection and is associated with more rapid liver disease progression. This retrospective study compared baseline (BL) characteristics, healthcare resource use (HCRU), and costs among commercially insured adults in the US with HBV monoinfection and HDV infection.

**Method:** The study population included commercially insured adults with ≥1 inpatient or ≥2 outpatient claims ≥30 days apart with an
ICD-9/10-CM diagnosis code for HBV in the IQVIA PharMetrics Plus database between 1 Jan 2014 and 31 Dec 2020 (identification period). The HBV index date was the first claim for HBV during the identification period. Patients were required to have ≥12 months of continuous enrollment before and after the HBV index date. Patients with HBV had no HDV diagnosis during the study period. Patients with HBV had ≥1 inpatient or ≥2 outpatient claims ≥30 days apart with an HDV diagnosis on or after the HBV index date and ≥12 months of continuous enrollment before and after HDV diagnosis. Patients with HBV and HDV were matched for geographic region, BL comorbidities, age, sex, and follow-up time. BL characteristics were assessed over the 12-month pre-HBV index period. Mean per patient per year (PPPY) HCRU and costs were assessed over the entire pre- and post-HDV index periods. Descriptive statistics were summarized, and comparisons were made using Mann-Whitney U and chi-square tests.

**Results:** Of 152,576 commercial patients diagnosed with HBV and/or HDV during the study period, the matched cohorts for analysis included 325 with HBV monoinfection and 325 with HDV infection. There were no significant differences in BL characteristics or comorbidities between the matched cohorts. The mean PPPY numbers of inpatient visits (16 vs 0.7; p = 0.0001), outpatient visits (13.9 vs 7.8; p < 0.0001), and physician office visits (11.6 vs 9.3; p < 0.0001) were greater among patients with HBV infection than HBV monoinfection. Mean PPPY length of stay for inpatient visits was higher among patients with HDV infection than HBV monoinfection (4.6 days vs 1.9 days; p < 0.0001). Patients with HDV infection also had significantly greater total medical costs ($12,319 vs $7619; p < 0.0001). The greatest differences in HCRU and cost between patients with HDV infection and HBV monoinfection were from outpatient visits, for which patients with HDV had approximately 6 more visits and spent $3,094 more per year vs patients with HBV monoinfection. Mean PPPY length of stay for inpatient visits was higher among patients with HDV infection than HBV monoinfection (4.6 days vs 1.9 days; p < 0.0001). Patients with HDV infection also had significantly greater total medical costs ($12,319 vs $7619; p < 0.0001). The greatest differences in HCRU and cost between patients with HDV infection and HBV monoinfection were from outpatient visits, for which patients with HDV had approximately 6 more visits and spent $3,094 more per year vs patients with HBV monoinfection.

**Conclusion:** Among a large national US commercial healthcare claims database, patients with HBV infection cost $4,700 more in terms of total medical costs annually compared to matched patients with HBV monoinfection. These findings highlight the need for effective screening, diagnosis, and treatment of HDV, which may reduce the clinical and economic burden faced by patients with HDV.

**WED-161 Clinical characteristics and phase transition of chronic hepatitis B patients with HBeAg and anti-HBe coexistence**

Ruifei Xue1, Jian Wang2,3, Jie Zhan1, Zhiyi Zhang3, Suling Jiang1
1Department of Infectious Diseases, Nanjing Drum Tower Hospital Clinical College of Nanjing Medical University, Nanjing, Jiangsu, China; 2Department of Infectious Diseases, Nanjing Drum Tower Hospital Clinical College of Traditional Chinese and Western Medicine, Nanjing University of Chinese Medicine. Nanjing, Jiangsu, China; 3Department of Infectious Diseases, Nanjing Drum Tower Hospital Clinical College of Traditional Chinese and Western Medicine, Nanjing University of Chinese Medicine. Nanjing, Jiangsu, China

Background and aims: The clinical significant of coexistence of hepatitis B e antigen (HBeAg) and antibody against HBeAg (anti-HBe) remains unclear in patients with chronic hepatitis B (CHB). We aimed to explore the clinical characteristics and phase transition of patients with HBeAg/anti-HBe coexistence.

Method: Eight hundred and forty treatment-naïve HBeAg-positive CHB patients from two medical centers were respectively included. Using cox regression to analyze the associated factors of HBeAg clearance and seroconversion.

**Results:** Eighty-six (10.2%) patients were HBeAg/anti-HBe coexistence. Patients with anti-HBe had older age (39.0 vs. 34.0 years, P = 0.016) and higher FIB-4 value (1.5 vs. 1.0, P < 0.001) than patients without anti-HBe. During a median follow-up of 86.5 weeks, 158 (18.8%) and 118 (14.0%) patients achieved HBeAg clearance and HBeAg seroconversion, respectively. Surprisingly, as high as 39.5% of patients with HBeAg and anti-HBe coexistence transitioned to HBeAg positive and anti-HBe negative status. 4.7% of patients with HBeAg and anti-HBe coexistence transitioned to HBeAg negative and anti-HBe negative status. Patients with anti-HBe had higher cumulative HBeAg clearance and HBeAg seroconversion rate than those without anti-HBe (p < 0.001). HBeAg/anti-HBe coexistence was associated with higher HBeAg clearance (HR 2.960, 95%CI 1.828, 4.791, P < 0.001) and HBeAg seroconversion (HR 4.018, 95% CI 2.372, 6.805, P < 0.001).

**Conclusion:** HBeAg-positive CHB patients with anti-HBe had higher possibility of HBeAg clearance and seroconversion than those of patients without anti-HBe. The presence of coexistent HBeAg and anti-HBe is a predictor of HBeAg clearance and seroconversion. Close follow-up of patients with HBeAg and anti-HBe coexistence are needed to monitor phase transitions of patients.

**WED-162 Lower HBV DNA levels is associated more severe liver fibrosis in chronic hepatitis B with serological immune-tolerant phase**

Jian Wang2,3, Zhiyi Zhang3, Shaoqiu Zhang1, Yifan Pan4, Xiaomin Yan1, Weihua Wu1, Weimao Ding5, Chuanwu Zhu6, Jie Li1,2,3,4, Rui Huang1,2,3,4
1Department of Infectious Diseases, Nanjing Drum Tower Hospital Clinical College of Nanjing Medical University, Nanjing, Jiangsu, China; 2Department of Infectious Diseases, Nanjing Drum Tower Hospital, The Affiliated Hospital of Nanjing University Medical School, Nanjing, Jiangsu, China; 3Institute of Viruses and Infectious Diseases, Nanjing University, Nanjing, Jiangsu, China; 4Department of Infectious Diseases, Nanjing Drum Tower Hospital Clinical College of Traditional Chinese and Western Medicine, Nanjing University of Chinese Medicine. Nanjing, Jiangsu, China; 5Department of Hepatology, Hua’ian No. 4 People’s Hospital, Hua’ian, Jiangsu, China

Background and aims: The clinical significance of coexistence of hepatitis B e antigen (HBeAg) and antibody against HBeAg (anti-HBe) remains unclear in patients with chronic hepatitis B (CHB). We aimed to explore the clinical characteristics and phase transition of patients with HBeAg/anti-HBe coexistence.

Method: Eight hundred and forty treatment-naïve HBeAg-positive CHB patients from two medical centers were respectively included. Using cox regression to analyze the associated factors of HBeAg clearance and seroconversion.

**Results:** Eighty-six (10.2%) patients were HBeAg/anti-HBe coexistence. Patients with anti-HBe had older age (39.0 vs. 34.0 years, P = 0.016) and higher FIB-4 value (1.5 vs. 1.0, P < 0.001) than patients without anti-HBe. During a median follow-up of 86.5 weeks, 158 (18.8%) and 118 (14.0%) patients achieved HBeAg clearance and HBeAg seroconversion, respectively. Surprisingly, as high as 39.5% of patients with HBeAg and anti-HBe coexistence transitioned to HBeAg positive and anti-HBe negative status. 4.7% of patients with HBeAg and anti-HBe coexistence transitioned to HBeAg negative and anti-HBe negative status. Patients with anti-HBe had higher cumulative HBeAg clearance and HBeAg seroconversion rate than those without anti-HBe (p < 0.001). HBeAg/anti-HBe coexistence was associated with higher HBeAg clearance (HR 2.960, 95%CI 1.828, 4.791, P < 0.001) and HBeAg seroconversion (HR 4.018, 95% CI 2.372, 6.805, P < 0.001).

**Conclusion:** HBeAg-positive CHB patients with anti-HBe had higher possibility of HBeAg clearance and seroconversion than those of patients without anti-HBe. The presence of coexistent HBeAg and anti-HBe is a predictor of HBeAg clearance and seroconversion. Close follow-up of patients with HBeAg and anti-HBe coexistence are needed to monitor phase transitions of patients.
Background and aims: Patients with chronic hepatitis B (CHB) in serological immune-tolerant (IT) phase might have significant liver fibrosis. However, the association of hepatitis B virus (HBV) DNA levels and liver fibrosis in patients with serological IT phase of CHB remains unclear. This study aimed to compare the severity of liver fibrosis in serological IT patients with different HBV DNA levels.

Method: Six hundred and twenty-two consecutive treatment-naive serological IT patients with CHB, defined by criteria of positive serum hepatitis B e antigen, HBV-DNA ≥10^6 IU/ml and normal alanine aminotransferase (<35 IU/L for male or ≤25 IU/L for female), at three different medical centers were included between January 2015 and August 2022. Patients were divided into three groups according to the serum HBV DNA levels: low (6 log10 IU/ml ≤ HBV DNA < 7 log10 IU/ml), moderate (7 log10 IU/ml ≤ HBV DNA < 8 log10 IU/ml), and high (HBV DNA ≥8 log10 IU/ml). Significant liver fibrosis and cirrhosis were identified by aspartate transaminase (AST)-to-platelet ratio index (APRI), fibrosis-4 score (FIB-4), transient elastography, or liver biopsy.

Results: The median age of patients was 33.0 years and 57.9% patients were male. The proportion of patients with lower, moderate, and high HBV DNA levels were 18.8%, 52.1%, and 29.1%, respectively. Patients with low HBV DNA were older and had higher AST levels, while lower HBV DNA levels were 18.8%, 52.1%, and 29.1%, respectively. Patients with low HBV DNA levels had higher proportions of significant fibrosis (24.8%) compared to patients with moderate and high HBV DNA levels. Patients with low HBV DNA were higher in patients with high HBV DNA levels than other two groups. Patients with low HBV DNA had higher proportions of significant fibrosis (24.8%) compared to patients with moderate and high HBV DNA levels. Compared to patients with high HBV DNA levels, moderate HBV DNA levels (OR 0.63, 95%CI 0.40–0.99; p = 0.042) and low HBV DNA levels (OR 8.61, 95%CI 1.83–40.45; p = 0.006).

Conclusion: Lower HBV DNA level was associated with more severe liver fibrosis in serological IT patients with CHB. Determination of liver fibrosis by liver biopsy or non-invasive methods should be considered without delay for these patients.

WED-163

Clinical evaluation of highly sensitive iTACT hepatitis B core-related antigen and hepatitis B surface antigen assays in the management of HBV reactivation

Takako Inoue1, Takahiro Suzuki2, Kentaro Matsuura2, Etsuko Ito3, Katsuya Nagaoka2, Masakuni Tateyama2, Hiroki Setoyma3, Yoko Yoshimaru4, Takehisa Watanabe3, Yasuhiro Tanaka4, Nagoya City University Hospital, Department of Clinical Laboratory Medicine, Japan; Nagoya City University Graduate School of Medical Sciences, Department of Gastroenterology and Metabolism, Japan; Kumamoto University, Department of Gastroenterology and Hepatology, Faculty of Life Sciences, Japan

Background and aims: We developed a highly sensitive hepatitis B core-related antigen assay (iTACT-HBcrAg) and reported its usefulness for the diagnosis of HBV reactivation (Hepatol, 2021). In Japan, iTACT-HBcrAg has gained pharmaceutical approval and is now available for clinical use. Meanwhile, hepatitis B surface antigen (HBsAg) assays with a higher sensitivity, such as iTACT-HBsAg, have also been developed as an alternative marker to HBV DNA. In this study, we examined the clinical significance of iTACT-HBcrAg and iTACT-HBsAg in the diagnosis of HBV reactivation.

Method: Between 2012 and 2022, patients who had been assessed for HBV markers prior to the introduction of systemic chemotherapy or immunosuppressive therapy, who were diagnosed with HBV-related infection, based on positivity for hepatitis B surface antibody or (and) hepatitis B core antibody, were observed. Among them, 33 patients diagnosed with HBV reactivation and whose serial sera were stored were enrolled in this study. Serial sera were measured with iTACT-HBcrAg (cut-off value: 2.1 log IU/ml) and iTACT-HBsAg (cut-off value: 0.0005 IU/ml) and compared to the results of HBV DNA monitoring performed as a part of the medical practice. The diagnostic criterion for HBV reactivation was detection of serum HBV DNA. This study was approved by the ethical review committee of our institute.

Results: Thirty-three patients diagnosed with HBV reactivation during or after systemic chemotherapy or immunosuppressive therapy, and with quantitative detection of HBV DNA during the observation period, were selected. Their underlying diseases were...
hematopoietic malignancies in 22 patients, non-hematopoietic malignancies in 4 patients, autoimmune diseases in 5 patients, and others in 2 patients. Of the 33 cases in which serum HBV DNA was detected quantitatively, iTACT-HBcrAg was detected early or simultaneously with the diagnosis of HBV reactivation in 85% (28/33), and was detected simultaneously or within 1 month of serum HBV DNA detection quantitatively in 94% (31/33). When iTACT-HBcrAg and iTACT-HBsAg were measured simultaneously, at least one of them was detected earlier or simultaneously with HBV DNA in 100% (33/33).

Conclusion: In the diagnosis of HBV reactivation, a rapid test with comparable sensitivity to quantitative HBV DNA detection, which serves as a guide for administration of nucleos(t)ide analogues, is useful for monitoring outpatients. In this study, the usefulness of iTACT-HBcrAg for the diagnosis of HBV reactivation was reproduced, and the addition of iTACT-HBsAg provided a higher diagnostic performance. iTACT-HBcrAg and iTACT-HBsAg are useful tests for monitoring HBV reactivation because they have the same detection sensitivity as quantitative HBV DNA detection and yield rapid results (within 30 min).

WED-164
Serum thrombospondin-2 for predicting liver fibrosis in patients with chronic hepatitis B virus infection
Yun Chen¹, Yilin Liu², Jian Wang²,³, Zhiyi Zhang², Xin Tong³, Rui Huang¹,²,³, Chao Wu¹,²,³,⁴
¹Department of Infectious Diseases, Nanjing Drum Tower Hospital Clinical College of Nanjing Medical University, Nanjing, Jiangsu, China; ²Department of Infectious Diseases, Nanjing Drum Tower Hospital Clinical College of Traditional Chinese and Western Medicine, Nanjing University of Chinese Medicine, Nanjing, Jiangsu, China; ³Department of Infectious Diseases, Nanjing Drum Tower Hospital, The Affiliated Hospital of Nanjing University Medical School, Nanjing, Jiangsu, China; ⁴Institute of Viruses and Infectious Diseases, Nanjing University, Nanjing, Jiangsu, China
Email: dr.wu@nju.edu.cn

Background and aims: Thrombospondin 2 (TSP-2) is a secreted glycoprotein belonging to the thrombospondin family, and is involved in collagen/fibrin formation. Serum TSP-2 level has been reported to be associated with liver fibrosis in patients with non-alcoholic fatty liver disease and hepatitis C virus infection. We explored the association between TSP-2 and severity of liver fibrosis in patients with chronic hepatitis B virus (HBV) infection.

Method: Serum samples were collected from 228 patients with chronic HBV infection who underwent liver biopsy. Serum TSP-2 was detected by enzyme-linked immunosorbent assays. The Scheuer scoring system was used to evaluate the liver fibrosis stages. Logistic regression analysis was used to analyze the risk factors for fibrosis. The receiver operating characteristic curve (ROC) was used to evaluate the diagnostic accuracy of significant fibrosis (≥S2) and advanced fibrosis (≥S3).

Results: The median age of patients was 40 years, and 146 patients (64.0%) were men. 69 patients (30.3%) had significant fibrosis (≥S2) and 16 patients (7.0%) had advanced fibrosis (≥S3). The median serum TSP-2 level of patients was 16.7 ng/ml (Interquartile range:13.1–22.1 ng/ml). The serum TSP-2 level increased with fibrosis stages. The areas under the ROC (AUROCs) of serum TSP-2 for predicting significant fibrosis (≥S2) and advanced fibrosis (≥S3) were 0.643 (95% CI:0.565–0.721, P = 0.001) and 0.855 (95% CI:0.764–0.946, P < 0.001), which was comparable with APRI (0.677 and 0.836) and FIB4 (0.646 and 0.823). Serum TSP-2 level was an independent predictor of advanced fibrosis (Odds ratio:1.042, 95%CI:1.016–1.069, P = 0.002).

Conclusion: Serum TSP-2 correlated with fibrosis stages and could be as a promising predictor of advanced fibrosis in patients with chronic HBV infection.

WED-165
Impact of fatty liver on long-term outcomes in chronic hepatitis B: a systematic review and matched analysis of individual patient data meta-analysis
Yu Jun Wong¹,², Vy H Nguyen³,⁴, Hwai-I Yang⁵,⁶,⁷,⁸, Jie Li⁹, Michael Huan Le³,¹⁰, Wan-Jun Wu¹¹, Nicole Han¹², Khi Yung Fong¹², Elizabeth Chen¹³, Connie Wong¹⁴, Fajuan Rui¹⁵, Xiaoming Xu¹⁶, Qi Xue¹⁷, Xin Yu Hu¹⁸, Wei Qiang Leow¹⁹, Boon Bee George Goh²⁰, Ramsey C. Cheung²¹,²², Grace Wong²³, Vincent Wai-Sun Wong²⁴, Ming-Whei Yu²⁵, Mindie Nguyen²⁶, ¹Changi General Hospital,
Background and aims: Chronic hepatitis B (CHB) and fatty liver (FL) often co-exist, but natural history data of this dual condition (CHB-FL) are sparse. Via a systematic review, conventional meta-analysis (MA) and individual patient-level data MA (IPDMA), we compared liver-related outcomes and mortality between CHB-FL and CHB-no FL patients.

Method: We searched 4 databases from inception to December 2021 and pooled study-level estimates using a random-effects model for conventional MA. For IPDMA, we evaluated outcomes after balancing the two study groups with inverse probability treatment weighting (IPTW) on age, sex, cirrhosis, diabetes, ALT, HBeAg, HBV DNA, and antiviral treatment.

Results: We screened 2157 articles and included 19 eligible studies (17 955 patients: 11 908 CHB-no FL; 6047 CHB-FL) in conventional MA, which found severe heterogeneity ($I^2 = 88%-95\%$) and no significant differences in HCC, cirrhosis, mortality, or HBsAg seroclearance incidence ($p = 0.27-0.93$). IPDMA included 13 262 patients: 8625 CHB-no FL and 4637 CHB-FL patients who differed in several characteristics. The IPTW cohort included 6955 CHB-no FL and 3346 CHB-FL well-matched patients. CHB-FL patients (vs. CHB-no FL) had significantly lower HCC, cirrhosis, mortality and higher HBsAg seroclearance incidence (all $P \leq 0.002$), with consistent results in subgroups. CHB-FL diagnosed by liver biopsy had a higher 10-year cumulative HCC incidence than CHB-FL diagnosed with non-invasive methods (63.6% vs. 4.3%, $P < 0.0001$). On Cox regression, CHB-FL was associated with lower HCC, cirrhosis, mortality and higher HBsAg seroclearance incidence (hazard ratio = 0.68, 0.61, 0.38, 1.35, respectively, all $P \leq 0.004$).

Conclusion: IPDMA data with well-matched CHB patient groups showed that FL (vs. no FL) was associated with significantly lower HCC, cirrhosis, and mortality risk and higher HBsAg seroclearance probability.
Characterizing chronic hepatitis delta in Spain and the gaps in its management
Sergio Rodríguez-Tajes1,2, Adriana Palom3,2, Álvaro Giráldez-Callejo4, Antonio Moreno5, Juan José Urquiño5, Miriam Celada-Sendino6, Moises Diago3, María García Eliz7, Javier Fuentes Olmo8, Pilar Castillo9, Marta Casado10, Ana María Martínez-Sapía11, Elena Pérez Campos11, Raquel Muñoz Gómez12, Marta Hernández Conde13, Rosa María Morillas14, Rafael Granados15, Mireia Miquel16, Julia Morillas17, Montserrat García-Retortillo18, José A. Carrión18, José María Moreno Planas19, Mar Rivero Barciela20, Cristina Montón21, Jesús González Santiago21,22, Sara Lorente22, Susana Llerena23, Joaquín Cabezas24, Beatriz Mateos Muñoz24, Sergio Vaquez Rodríguez25, Fernando Díaz26, Jose Pinazo Bandera27, Merce Delgado Gerra28, Domingo Pérez-Palacios29, Díana Horta30, Cristina Fernández Marcos31, Carmen López Núñez32, José Luis Calleja Panero33, Inmaculada Fernández Vázquez32, Manuel Rodríguez34, Francisco Javier García-Samaniego Rey35, Xavier Forns36, María Buti37,38, Sabela Lens1,2,1 Hospital Clinic, Universitat de Barcelona, IDIBAPS, Barcelona, Spain; 2CIBEREHD, Spain; 3Hospital Universitari Vall d’Hebron, Barcelona, Spain; 4Hospital Virgen del Rocio, IBIS, Sevilla, Spain; 5Hospital Universitario General de Valencia, Spain; 6Hospital Universitario Central de Asturias, Spain; 7Hospital Universitario La Fe de Valencia, Spain; 8Hospital Miguel Servet, Zaragoza, Spain; 9Hospital Universitario La Paz, Madrid, Spain; 10Hospital General Torrecárdenas, Almería, Spain; 11Hospital Universitario 12 de Octubre, Madrid, Spain; 12Hospital Universitario Puerta de Hierro, Majadahonda, Spain; 13Hospital Germans Trias i Pujol, Badalona, Spain; 14Hospital Universitario Dr. Negrín, Gran Canaria, Spain; 15Hospital Parc Taulí, Institut d’Investigació i innovació I3PT, Sabadell, ISCIII, U Vic-UCC, Vic, Spain; 16Hospital Virgen de la Luz, Cuenca, Spain; 17Hospital del Mar, Parc de Salut Mar, Barcelona, Spain; 18Centro Hospitalario Universitario de Albacete, Spain; 19Hospital Clínico Universitario de Valencia, Incliva, Spain; 20Hospital Universitario de Salamanca, IBSAL, Salamanca, Spain; 21Hospital Clínico Universitario Lozano Blesa, Zaragoza, Spain; 22Hospital Universitario Marqués de Valdecilla, IDIVAL, Santander, Spain; 23Hospital Universitario Ramón y Cajal, Madrid, Spain; 24Centro Hospitalario Álvaro Cunqueiro, Vigo, Spain; 25Hospital Universitario Gregorio Marañón, Madrid, Spain; 26Hospital Universitario Virgen de la Victoria, Málaga, Spain; 27Hospital de Mataró Consorci Sanitari del Maresme, Spain; 28Hospital Infantia Elena, Huelva, Spain; 29Hospital Mutua de Terrassa, Spain; 30Hospital Universitario de Burgos, Spain; 31Hospital Universitario de Girona Dr. Josep Trueta, Spain Email: slens@clinic.cat

Background and aims: Chronic hepatitis delta (CHD) is the most severe form of chronic viral hepatitis resulting in high morbidity and mortality due to advanced liver disease. The estimated HDV prevalence in Spain is around 5–10% of patients with hepatitis B. However, true prevalence is probably underestimated due to migration and current limitations in screening and diagnosis. The recent approval of bulevertide and the development of other drugs will change the management of the infection. We aimed to characterize the clinical profile of patients with HDV/HBV infection in Spain and current barriers in their management.

Method: Multicenter registry including patients with positive anti-HDV serology actively monitored in 30 Spanish centers. Epidemiological, clinical and virological variables were recorded at the start of follow-up and at the last visit.

Results: A total of 329 patients were included: 59% were male with median age 51 (IQR: 42–56) years (only 5% were >65 years old), the most common geographical origin was Spain (53%) and East Europe (24%). The median follow-up time since diagnosis was 6 (3–12) years. Importantly, patients from Spain were older and had a longer follow-up with higher presence of cirrhosis and HCV and HIV coinfection.

Conclusion: The burden of HDV-related disease in Spain is high affecting mostly median age people. One-third of the patients already has cirrhosis at diagnosis and this increases up to 43% after less of a decade of follow-up. Despite a greater rate of active viremia, female sex is associated with less advanced liver disease. Importantly we have identified critical barriers for the management of CHD as it is not possible to locally determine or quantify HDV-RNA in most of the centers. The latter is relevant for prognosis and to assess response to new antiviral therapies.

Molecular epidemiology of hepatitis B virus and hepatitis virus coinfection in Sudan
Osama Mohamed1, Birgit Bremer2, Sabah Ibrahim3, Sofia Mohamed3, Petra Dörrge4, Yassir Hasamaln4,5, Mohamed Hassan6, Yasser Mofty4, Shamsoun Kafi4, Heiner Wedemeyer2,8, 1National University Biomedical Research Institute, National University-Sudan, Khartoum, Sudan, Department of Molecular Biology, Sudan; 2Hannover Medical School, Department for Gastroenterology, Hepatology and Endocrinology, Hannover, Germany; 3National University Biomedical Research Institute, National University-Sudan, Khartoum, Sudan, Department of Bioinformatics and biostatistics, Sudan; 4faculty of veterinary University of Bahri, Khartoum, Sudan, Department of Molecular Biology and bioinformatics, Sudan; 5Ibba Hospital, Oman; 6faculty of medical laboratory science-National University-Sudan, Khartoum, Sudan, Department of hematology, Sudan; 7Ribat scientific research center, the National Ribat University, Khartoum, Sudan; 8German Center for Infection Research, Site Hannover-Braunschweig, Germany Email: wedemeyer.heiner@mh-hannover.de

Background and aims: Hepatitis D virus (HDV) is dependent on Hepatitis B virus (HBV), and can lead to significant morbidity and mortality. Conflicting data on the impact of hepatitis D have been published for distinct regions in Africa. The aim of this study was to study the molecular epidemiology of HBV/HDV coinfection among a group Sudanese patient.

Method: A total of 324 patient samples (100 patients with hepatocellular carcinoma, 100with liver cirrhosis and 124 with chronic HBV infection were collected in Sudan during the year 2019. The CHB group received therapy Pegylated interferon for 48 weeks and Lamivudine for some of patients HBV markers and HDV total antibody were identified by immunoassays. Extracted HBV-DNA and HDV-RNA was quantified by real-time PCR. HBV genotype was determined by multiplex nested PCR and consecutive PCR gel, 11samples for HBV and 26 samples for HDV were additionally sequenced (Sanger sequencing). Statistical analysis was done using statistical package of social science (IBM SPSS version 20.0) considering a p value ≤0.05 as a level of significance.
Results: A total of 319 patients out of 324 were HBsAg positive, were HBV genotyped. the most dominant HBV Genotype was Genotype E in all three groups (52.00%, 44.30%, and 40.30% in HCC, LC and CHB respectively), followed by Genotype D (24.50%, 26.80%, and 31.50% in HCC, LC and CHB respectively). There was a mixed D/E genotypes with 21.40% in HCC group, 24.70% in LC group and 15.30% in CHB group. In addition, some patients possessed genotype A (2.00%, 4.10%, and 7.30% in HCC, LC and CHB respectively). A few Subjects in the CHB group showed a mixed A/E genotype (5.60%) in CHB Individuals with genotype E showed the highest HBV viral load (Median 1550.00, copies/ml, p value = 0.008) with 51.9% of them being HDV RNA positive. Anti-HDV was identified in 54 (16.9%) of HBsAg positive patients. HBV genotypes in HDV coinfected patients were 51.9% E, 27.8% D 20% E/D, while genotype A was not detected. HDV coinfection was more frequent in patients with HCC (27.3%) versus 12.4% of LC, and 17.2% of CHB.

Conclusion: Incidence and existence of HBV and HDV infections in Sudan was documented through the detection of HBV and HDV indicating high prevalence among HCC, LC and chronic HBV patients. Generally, these findings are useful for future studies since there is no information available about HBV and HDV infection in Sudan. HDV coinfection in Sudan show a distinct HBV backbone distribution which may contribute to pathogenesis. These findings establish a baseline for future studies of HBV and HDV coinfection in Sudan.

WED-168

In patients with chronic hepatitis D, the decline of ≥2log HDV-RNA levels that remain detectable is associated with better clinical outcomes

Adriana Palom1,2, Sergio Rodriguez-Tajes1,3, Ariadna Bono4, Antonio Madejón2,5, Mar Riveiro Barciela1,2 Ángela Carvalho–Gomes2,4, Sabela Lens2,3, Marina Berengue2,4, Francisco Javier García-Samaniego Rey2,5, Maria Buti1,2. 1Liver Unit, Hospital Universitari y Politécnico La Fe, Valencia, Spain; 2Liver Unit, Hospital Universitarit La Paz, IDIPAZ, Madrid, Spain

Background and aims: The end point of treatment for chronic hepatitis D (CHD) is HBsAg loss and/or HDV-RNA undetectability, but these end points are difficult to achieve. An intermediate virological end point of ≥2log decline in HDV-RNA has been considered in clinical trials. However, the impact of this response on the progression of the disease remains unknown. The aim of this study was to evaluate the impact of ≥2log declines in HDV-RNA remaining detectable on the development of clinical events in patients with CHD.

Method: Multicenter study including 80 patients with CHD (all with baseline detectable HDV-RNA) who during the follow-up had consecutive HDV-RNA determinations, which allowed to categorize them into three groups according to HDV-RNA kinetics: Group A) persistently stable levels of HDV-RNA, Group B) ≥2 log HDV-RNA decline but remaining detectable (intermediate end point), Group C) achievement of undetectable HDV-RNA. The clinical outcomes (liver decompensation, hepatocellular carcinoma (HCC), transplantation or liver-related death) were analysed. Biochemical (ALT) and virological (HBV-DNA, HDV-RNA) parameters were also compared.

Results: Most patients were male (53.8%), Caucasian (83.8%), median age 46 years and 74% on nucleos (t)ide analogues. Thirty (37.5%) had cirrhosis, and 5 (6%) history of a prior liver decompensation. During a median follow-up of 5.3 (3.1–7.2) years, 42 (52%) subjects had stable HDV-RNA levels, 15 (19%) had a ≥2log decline with detectable HDV-RNA, and 23 (29%) became undetectable. Overall, 19 patients developed clinical events during follow-up. All events occurred while presenting persistently detectable HDV-RNA levels: 13/42 (31%) in HDV-RNA stable subjects (Group A), 3/15 (20%) before reaching ≥2log decline (Group B) and 3/23 (13%) before reaching undetectable HDV-RNA (Group C). After these virological end points, none of the patients with ≥2log decline remaining detectable or undetectable HDV-RNA developed liver-related complications (Figure). Five (13.2%) subjects with undetectable HDV-RNA lost HBsAg during follow-up (p = 0.001). When only the 30 subjects with cirrhosis were analysed, those with a posterior ≥2log decline tended
### HDV-RNA end points

<table>
<thead>
<tr>
<th></th>
<th>N total</th>
<th>Number of patients with a liver-related outcome during follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Before end point</td>
</tr>
<tr>
<td>Group A)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persistently detectable</td>
<td>42</td>
<td>13 (31%)&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Follow-up: 6.7 ± 5.4 years</td>
</tr>
<tr>
<td>Group B)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥2log decline but detectable</td>
<td>15</td>
<td>3 (20%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Follow-up: 10.2 ± 7.2 years</td>
</tr>
<tr>
<td>Group C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undetectable</td>
<td>23</td>
<td>3 (13%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Follow-up: 4.1 ± 4.3 years</td>
</tr>
</tbody>
</table>

Follow-up: mean (SD), *p = 0.01, ³p = 0.002

Figure: (abstract: WED-168).

HDV-RNA end points, with liver-related events, defined as the first of a composite end point of HCC, liver transplantation or liver-related mortality. 

**Results:** We analysed 1102 patients with a median age of 38 years (inter quartile range [IQR] 30–48), predominantly male (53%) and non-Asian (67.5%). The median LSM was 5.3 kPa (IQR 4.3–7.2); 164 patients had an LSM >9 kPa. During a median follow-up of 5.6 years (IQR 2.7–9.3), 12 patients developed an HCC and 10 liver-related deaths were recorded, for a cumulative incidence of 2.3% at 10 years. Higher LSM at study enrolment was associated with an increased risk of liver-related events (hazard ratio [HR] 1.10 per kPa, 95% CI 1.07–1.13, p < 0.001). The cumulative 10-year incidence of liver-related events was 0.7% in patients with a LSM <9 kPa, compared to 9.9% in patients with a LSM >9 kPa (HR 14.62, 95% CI 4.71–45.41, p < 0.001). These results were consistent for patients who subsequently received antiviral therapy (n = 504, p < 0.001) and in patients with an initial HBV DNA >20 000 IU/ml (p = 0.016). LSM >9 kPa was independently associated with an increased risk of liver-related events when adjusting for age, sex, ethnicity, ALT and use of antiviral therapy (adjusted HR 8.9, 95% CI 2.70–29.63, p < 0.001).

**Conclusion:** An LSM >9 kPa at baseline is associated with negligible 10-year risk of liver-related events in CHB patients. An LSM >9 kPa identifies patients at increased risk of liver-related events who could potentially benefit from treatment with novel antivirals.

**POSTER PRESENTATIONS**

**WED-169**

Negligible 10-year risk of liver-related events in chronic hepatitis B patients with low liver stiffness

Lesley Patmore<sup>1</sup>, Kirsi van Eekhout<sup>2</sup>, Ozgur Koc<sup>3</sup>, Robert De Knecht<sup>1</sup>, Bettina Hansen<sup>4</sup>, Harry LA Janssen<sup>1,5</sup>, Matthijs Kramer<sup>3</sup>, Honkoo Pieter<sup>6</sup>, Robert De Man<sup>1</sup>, Bart Takkenberg<sup>2</sup>, Milan Sonneveld<sup>1</sup>, Erasmus MC, Gastroenterology and Hepatology, Rotterdam, Netherlands; <sup>2</sup>Amsterdam UMC, locatie AMC, Gastroenterology and Hepatology, Amsterdam, Netherlands; <sup>3</sup>Maastricht UMC+, Gastroenterology and Hepatology, Maastricht, Netherlands; <sup>4</sup>Erasmus MC, Epidemiology and Biostatistics, Rotterdam, Netherlands; <sup>5</sup>Toronto General hospital, Toronto Centre for Liver Disease, Canada; <sup>6</sup>Albert Schweitzer Hospital, Gastroenterology and hepatology, Dordrecht, Netherlands

**Email:** l.patmore@erasmusmc.nl

**Background and aims:** Patients with chronic hepatitis B (CHB) are at increased risk of hepatocellular carcinoma (HCC) and liver-related mortality. We aimed to study the long-term risk of HCC development and liver-related mortality in relation to the first liver stiffness measurement (LSM).

**Method:** We conducted a multicentre retrospective cohort study of all consecutive mono-infected CHB patients who underwent at least one LSM by transient elastography with FibroScan (Echosens, France) whilst off antiviral therapy. We analysed the association between liver stiffness as a continuous variable, and after categorization (<or >9 kPa), with liver-related events, defined as the first of a composite end point of HCC, liver transplantation or liver-related mortality.

<table>
<thead>
<tr>
<th>HDV-RNA end points</th>
<th>N total</th>
<th>Number of patients with a liver-related outcome during follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persistently detectable</td>
<td>42</td>
<td>13 (31%)&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Follow-up: 6.7 ± 5.4 years</td>
</tr>
<tr>
<td>Group B)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥2log decline but detectable</td>
<td>15</td>
<td>3 (20%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Follow-up: 10.2 ± 7.2 years</td>
</tr>
<tr>
<td>Group C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undetectable</td>
<td>23</td>
<td>3 (13%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Follow-up: 4.1 ± 4.3 years</td>
</tr>
</tbody>
</table>

Follow-up: mean (SD), *p = 0.01, ³p = 0.002

**WED-170**

Steadily decline of HBV DNA load under NAs in lymphoma patients and higher level of qAnti-Hbc predict HBV reactivation

Yi-Qi Liu<sup>1</sup>, Reyizha Nuersulitan<sup>2</sup>, Chi Zhang<sup>1</sup>, Wei Ping Liu<sup>2</sup>, Hong Zhao<sup>1</sup>, Gui-Qiang Wang<sup>1</sup>, Peking University First Hospital, China; <sup>2</sup>Peking University Cancer Hospital, China

**Email:** zhaoehong_pufh@bjmu.edu.cn

**Background and aims:** Patients with lymphoma and hepatitis B virus infection need to be treated with both chemotherapy and nucleotide analogues therapy. However, the dynamic change of HBV DNA level with the increase of chemotherapy cycles is lacking. Quantitative hepatitis B core antibody (qAnti-Hbc), HBV RNA, and hepatitis B virus core-related antigen (HBcRAg) are more sensitive markers to evaluate HBV replication in recent years. It is unknown whether these markers are more sensitive to predict HBV reactivation.
Method: From 29th June 2010 to 6th December 2021, clinical data and serial serum sample were collected from patients with diffuse large B lymphoma and HBV infection. Serum HBV DNA load (real time fluorescent quantitative PCR), qAnti-HBc (developed chemiluminescent particle immunoassay), HBV RNA (simultaneous amplification testing method (HBV-SAT) based on real-time fluorescence detection), and HBcrAg (Lumipulse G HBcrAg assay) were tested before and during chemotherapy. Factors related to HBV DNA reactivation were analyzed by Logistic regression analysis.

Results: Under the NAs, HBV DNA load of 69 with baseline DNA positive HBsAg+ patients declined from 3.15 (2.13–4.73) lg IU/ml at baseline to 1.00 (1.00–1.75) lg IU/ml at the end of chemotherapy, and further declined to 1.00 (1.00–1.04) lg IU/ml at the end of 24-month follow-up. Serum qAnti-HBc level decreased gradually during chemotherapy in HBsAg positive lymphoma patients (F = 7.090, p = 0.009). The levels of serum HBV RNA and HBcrAg stabled under the chemotherapy. Multivariate analysis revealed that a higher level of qAnti-HBc (1.97 ± 1.20 vs. 1.12 ± 0.84 lg IU/ml, OR = 8.367, [95% CI:1.439–48.645], p = 0.018) and a higher level of HBV RNA (0.86 (0.00–1.94) vs. 0.00 (0.00–0.00) lg copies/ml, OR = 3.654, [95% CI:1.208–11.048], p = 0.022) were related to HBV reactivation in HBsAg/-anti-HBc+ lymphoma patients.

Conclusion: The load of HBV DNA declined steadily by NAs under the chemotherapy in all lymphoma patients. In HBsAg-/-anti-HBc+ lymphoma patients, higher level of baseline serum qAnti-HBc and HBV RNA predict the HBV reactivation during chemotherapy.

WED-171
Liver stiffness measurement as a non-invasive method for the diagnosis of liver cirrhosis in patients with chronic hepatitis D virus infection
Lisa Sandmann1,2,3, Kerstin Port1, Pietro Lampertico2,4,5, Soo Aleman1, Markus Cornberg1,2,3,8, Benjamin Maasoumy1,8, Heiner Wedemeyer1,2,3,8, Katja Deterding1. Department of Gastroenterology, Hepatology and Endocrinology, Hannover Medical School, Germany; 2D-SOLVE Consortium, Germany; 3Excellence Cluster RESIST, Excellence Initiative Hannover Medical School, Germany; 4Foundation IRCCS Ca' Granda Ospedale Maggiore Policlinico, Division of Gastroenterology and Hepatology, Milan, Italy; 5CRC “A. M. and A. Migliavacca” Center for Liver Disease, Department of Pathophysiology and Transplantation, Milan, Italy; 6Karolinska University Hospital, Department of Infectious Diseases, Stockholm, Sweden; 7Karolinska Institute, Department of Medicine Huddinge, Infectious Diseases, Stockholm, Sweden; 8German Center for Infection Research (DZIF), Hannover/Braunschweig, Germany; 9Center for Individualised Infection Medicine, Helmholtz Center for Infection Research, Germany

Background and aims: Liver biopsy is the gold standard for the diagnosis of liver cirrhosis. Recently, non-invasive tests (NIT) for determining liver cirrhosis have been proposed as an alternative. Chronic hepatitis D virus infection (CHD) is a rare disease, but associated with high risk of liver cirrhosis. The evidence of NIT for diagnosing liver cirrhosis in this etiology has not been adequately studied due to lack of correlation with histologic findings.

Method: We retrospectively evaluated the diagnostic performance of liver stiffness measurement (LSM) by transient elastography (Fibroscan) for the detection of liver cirrhosis in a cohort of 144 patients with CHD and available liver biopsies. Data was collected from two different German sites and one multicenter clinical trial. LSM was performed within 6 months of liver biopsy, laboratory data was assessed on the day (± 30 days) of LSM. Results were compared to the serological tests AST to ALT ratio (AAR), AST to platelet ratio (APRI), and fibrosis 4 index (FIB-4). Area under the receiver operating characteristic (AUROC) curves was used to assess the performance of NIT, Youden-Index was used to select optimal cut-offs.

Results: Based on histological findings, three groups were defined: Cirrhosis (Metavir 4/Ishak ≥5, n = 22), no cirrhosis (Metavir ≤1/Ishak ≤2, n = 58) or intermediate fibrosis (Metavir 2–3/Ishak 3–4, n = 64).
Mean LSM was significantly higher in patients with liver cirrhosis compared to those without it (23.4 vs 10.2 kPa, p < 0.0001) or intermediate fibrosis (23.4 vs 13.5 kPa, p < 0.0001). For the detection of liver cirrhosis, LSM was superior to other NITs with an AUROC of 0.89 as compared to 0.74 (APRI), 0.73 (FIB-4) and 0.69 (AAR), respectively. The optimal cut-off value of LSM for identifying patients with liver cirrhosis was >15.2 kPa (sensitivity 0.91, specificity 0.84, NPV 0.98, PPV 0.50). With this cut-off, liver cirrhosis was correctly diagnosed in 20 of 22 patients and correctly excluded in 102 of 104 patients. When excluding patients with ALT >5×ULN, the PPV improved slightly to 55.6%. However, the false positive rate remained high as 15.5% of patients without cirrhosis had an LSM of >15.2 kPa. These patients were more likely to have advanced liver disease with histological staging of Metavir 3 (30% vs 14.7%), lower platelet levels (185 vs 137 ×1000/µl, p < 0.001) and higher levels of gammaGT (109 vs 44 U/L, p = 0.015). The ideal cut-off to exclude advanced fibrosis (Metavir ≥3/Ishak ≥4) was <10.2 kPa (sensitivity 0.55, specificity 0.86, NPV 0.45, PPV 0.90). 56 of 62 patients were correctly identified as having no advanced fibrosis. The six misclassified patients were all Metavir 3.

**Conclusion:** LSM is a useful NIT to identify patients at risk for liver cirrhosis defined by histology staging (META VIR 4/ISHAK ≥4) was <10.2 kPa (sensitivity 0.55, specificity 0.86, NPV 0.45, PPV 0.90). 56 of 62 patients were correctly identified as having no advanced fibrosis. The six misclassified patients were all Metavir 3.

**Figure:** ROC curves of LSM compared to serological markers for the differentiation of liver cirrhosis defined by histology staging (META VIR 4/ISHAK ≥4) from absence of liver cirrhosis (n = 144).

**Conclusion:** LSM is a useful NIT to identify patients at risk for liver cirrhosis and is superior to APRI, FIB-4 and AAR. The cut-off of <10.2 kPa correctly excluded liver cirrhosis in all patients while the cut-off of >15.2 kPa correctly identified liver cirrhosis in 91% of patients.

**WED-172**

**Distribution of the Natural History Stages of Pregnant Women with Chronic Hepatitis B Virus Infection and its Association with Pregnancy Complications and Adverse Pregnancy Outcomes**

Xuelian Zhang¹, Yunfei Gao², Jinna Li³, Xueru Yin¹, Yaohua Hao¹, Shimin Yin¹, Jingran Wu⁴, Xiaohuan Jiang⁴, Jialin Li⁵, Jing Hu⁶

**Background and Aims:** A large number of pregnant women are living with Hepatitis B virus (HBV). However, there is limited data on the natural history stages of pregnant women with chronic HBV infection. In this study, we aimed to describe the distribution of natural history stages of HBV infection and explore its relationship to pregnancy complications and adverse pregnancy outcomes.

**Method:** From Jan. 2015 to Aug. 2022, a total of 1276 pregnant women with chronic HBV infection were enrolled in this study. The natural course stages were defined based on AASLD 2018 Hepatitis B Guidance. Patients who cannot be classified into any of the stages are defined as ‘grey zone’ (GZ), which was classified into three groups: HBeAg positive, regardless of Alanine aminotransferase (ALT) and HBV DNA levels (GZ-A); HBeAg negative, with normal ALT levels and serum HBV DNA ≤2×10³ IU/ml (GZ-B); HBeAg negative, with elevated ALT levels and serum HBV DNA >2×10³ IU/ml (GZ-C).

**Results:** (1) A total of 1276 pregnant women with CHB were enrolled, with 19.04%, 14.73%, 42%, 4.39%, and 19.44% of them in immune-tolerant CHB, HBeAg positive immune active CHB, inactive CHB and HBeAg negative immune active CHB, and grey zone CHB, respectively. Among pregnant women in the grey zone, GZ-A, GZ-B and GZ-C accounted for 19.76%, 49.6% and 30.65%, respectively. (2) There were significant differences (p < 0.05) in the incidence of thyroid disease in pregnancy, ICP (intrahepatic cholestasis of pregnancy), caesarean section and LGA (greater than gestational age babies) among pregnant women with different natural history stages. The highest incidence of thyroid disease occurred in HBeAg-negative immune active CHB (7.1%); ICP in HBeAg-positive immune active CHB (7.8%); caesarean section in inactive CHB (40.5%); and LGA in the grey zone (12.9%). (3) Analysis of the three groups of “GZ” showed that the incidence of caesarean section was significantly increased in GZ-B compared to GZ-A (43.1% vs 22.4%, p = 0.014); the incidence of neonatal weight abnormalities was significantly higher in GZ-C compared to GZ-A (23.7% vs 8.2%, p = 0.026); the incidence of GDM (25.0% vs 13.8%), neonatal weight abnormalities (23.7% vs 7.3%) and LGA (21.1% vs 8.9%) were considerably higher in GZ-C compared to GZ-B (p < 0.05).

**Figure:** (abstract: WED-172): Distribution of natural course stages of pregnant women with CHB (a) and distribution of CHB pregnant women of grey zones (b)
Conclusion: Our study showed that inactive CHB was the most common natural course stage among pregnant women, but nearly one-fifth of CHB patients were classified as GZ. The risk of pregnancy complications and adverse pregnancy outcomes varied by natural history stage. Pregnant women with CHB should be closely monitored and managed to further prevent adverse pregnancy outcomes.

WED-173
Comparison of hepatitis B reactivation in patients with resolved hepatitis B infection receiving rituximab or non-rituximab based immunosuppressive therapy: does presence of hepatitis B surface antibody reduce the risk of reactivation?

Wei-Lun Liou1, Gayathry Morvil1, Rajneesh Kumar1, 1Singapore General Hospital, Gastroenterology and Hepatology, Singapore
Email: liouweilun@gmail.com

Background and aims: Hepatitis B virus (HBV) reactivation and flare may happen in patients with resolved HBV infection (Hepatitis B surface antigen negative, anti-HBc antibody positive) who receive immunosuppressants or chemotherapy. In comparison to Rituximab, most drugs only confer low to medium risk of HBV reactivation to this group of patients. The presence of hepatitis B surface antibody may reduce the risk of HBV reactivation. We compared the outcome of patients with resolved HBV infection who received rituximab or non-Rituximab immunosuppressive therapy and explored the utility of hepatitis B surface antibody in these patients.

Method: We retrospectively collected data of patients who were followed up at HBV immunosuppression clinic at Singapore General Hospital from 2016 to 2022. The lower limit of quantification of HBV DNA was 10 IU/ml. HBV reactivation (HBVr) is defined as a new detectable HBV DNA from previously undetectable DNA. HBV flare is defined as raised alanine aminotransferase of >3 times of upper limit normal in the presence of detectable DNA.

Results: Total 153 patients who did not receive prophylactic nucleoside analogue (NA) were included in the study. There were 70 male patients. The median age of patients was 64 years (IQR 15). The median duration of follow-up following initiation of immunosuppression was 21.4 months (IQR 25.5). 112 patients received non-rituximab therapy, and 41 patients received rituximab therapy. 11 patients in each group developed HBVr. Patients who received rituximab therapy had higher risk of HBVr when compared with non-rituximab group (26.8% vs 9.8%, p = 0.011). HBVr resolved without needing NA in 8 patients in the rituximab group, and 7 patients in the non-rituximab group. No patient developed HBV flare during the follow-up. A baseline hepatitis B surface antibody level of more than 100 IU/L was associated with lower risk of HBVr in patients who received rituximab therapy (6.7% vs 41.7%, p = 0.019), but no statistically significant difference in non-rituximab therapy patients (8.8% vs 9.8%, p = 0.573).

Conclusion: Although the risk of HBVr was higher in patients receiving rituximab therapy, none of the patients developed HBV flare and HBVr resolved spontaneously in the majority. A hepatitis B surface antibody level of more than 100 IU/L may confer additional protection against HBVr in patients receiving rituximab therapy. Regular monitoring instead of prophylactic NA should be considered in this specific group of patients, as well as patients receiving non-rituximab therapy.

WED-174
Hepatitis delta virus (HDV) infection: frequency and outcome in persons living with HIV (PLWH). Data from the ICONA (Italian cohort of naïve for antiretrovirals) cohort

Massimo Puoti1,2, Romina Salpini3, Alessandro Tavelli4, Lorenzo Piermatteo5, Stefano D’Anna6, Stefania Carrara6, Vincenzo Malagnino7, Valentina Mazzotta7, Giuseppe Brancaccio9, Giovanni Battista Gaeta10, Giulia Marchetti11,12, Pierluigi Viale13,14, Carlo Federico Perno15, Valentina Sivieri1, Antonella d’Arminio Monforte16. 1University of Milano Bicocca, School of Medicine, Milan, Italy; 2ASST GOM Niguarda, Infectious Diseases, Milan, Italy; 3University of Rome Tor Vergata, Department of Experimental Medicine, Italy; 4Icona Foundation, Milano, Italy; 5University of Rome Tor Vergata, Dept of Experimental Medicine, Italy; 6INMI, Unity of Microbiology and Biobank, Roma, Italy; 7University of Rome Tor Vergata, Department of Medicine of Systems, Clinical Infectious Diseases, Rome, Italy; 8INMI, Clinical and Research Infectious Diseases Department, Rome, Italy; 9University of Padua, Department of Molecular Medicine, Padua, Italy; 10University L. Vanvitelli, Infectious Diseases Unit, Naples, Italy.

Table: Comparison of baseline demographics and hepatitis B reactivation in patients receiving rituximab or non-rituximab therapy.

<table>
<thead>
<tr>
<th></th>
<th>Rituximab (n = 41)</th>
<th>Non-Rituximab (n = 112)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender: Male (%)</td>
<td>23 (56%)</td>
<td>47 (42%)</td>
<td>-</td>
</tr>
<tr>
<td>Age, median (IQR)</td>
<td>65.5 (13.8)</td>
<td>63 (13.0)</td>
<td>-</td>
</tr>
<tr>
<td>Underlying condition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haematological condition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chronic condition on immunosuppressants*</td>
<td>36 (87.8%)</td>
<td>16 (14.3%)</td>
<td></td>
</tr>
<tr>
<td>Breast malignancy</td>
<td>5 (12.2%)</td>
<td>28 (25%)</td>
<td></td>
</tr>
<tr>
<td>Duration of follow-up (months), median (IQR)</td>
<td>24.3 (25.8)</td>
<td>18.6 (25.8)</td>
<td>0.436</td>
</tr>
<tr>
<td>Baseline hepatitis B surface antibody</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;10</td>
<td>28 (68.3%)</td>
<td>83 (74.1%)</td>
<td>0.507</td>
</tr>
<tr>
<td>&gt;50</td>
<td>20 (48.8%)</td>
<td>57 (50.9%)</td>
<td>0.852</td>
</tr>
<tr>
<td>&gt;100</td>
<td>15 (36.6%)</td>
<td>45 (40.2%)</td>
<td>0.707</td>
</tr>
<tr>
<td>Overall hepatitis B reactivation</td>
<td>11 (26.8%)</td>
<td>11 (9.8%)</td>
<td>0.011</td>
</tr>
</tbody>
</table>

*Chronic conditions: autoimmune diseases, rheumatological diseases, renal transplant.

Figure: (abstract: WED-173): Comparison of baseline demographics and hepatitis B reactivation in patients receiving rituximab or non-rituximab therapy.
Background and aims: HDV causes the most severe liver disease and suppressive antiviral treatment was recently available for this infection. PLWH are at risk of HDV infection. The factors related to HDV infection and its natural history in PLWH have poorly investigated. In order to assess the need for suppressive anti HDV treatment in PLWH, this retrospective case control study investigates the prevalence, risk factors, clinical correlates and the long-term outcome of people with HDV infection in a large prospective cohort of Italian PLWH naïve for antiretroviral therapy the multicenter prospective ICONA cohort (Italian Cohort of Naïve for Antiretrovirals).

Method: We retrieved from the database or measured anti HDV reactivity in all HBsAg pos PLWH with an available serum sample: HDV RNA reactivity was tested by Robogene 2.0 (LOD: 6 IU/ml) in all anti HDV pos with an available serum sample. We compared demographic and clinical data between different groups and calculated Hazard Ratio (HR and Adjusted HR AHR) for Liver Related Hard Outcomes (LRHO: Liver decompensation, HCC, liver transplant or Liver Related Death whatever occurred first) from fitting a Cox regression model.

Results: 152/809 HBsAg pos PLWH (18.8%) showed anti HDV reactivity. They were significantly (p < 0.01) less frequently female (7.9% vs 18.1%), more frequently IDU (67.1 vs 15.8%), more frequently anti HCV pos (66 vs 16%), less frequently HCVRNA pos (11 vs 15%) and more frequently showed FIB-4 >3.25 (25 vs 11%). A significantly lower proportion of anti HDV pos pts was still on follow-up in 2022 (23 vs 42%). HDV viremia was detected in 63/95 (68%) anti HDV pos patients. PLWH with HDV RNA reactivity showed more frequently a FIB-4 >3.25 (34 vs 9.7%) without significant differences in other characteristics. 25/95 were still on follow-up in 2022 (25 HDV RNA+ vs 28% HDV RNA-). HR and aHR for LRHO are reported in the table.

<table>
<thead>
<tr>
<th>HDV Status</th>
<th>HR 95% CI</th>
<th>P 95% CI</th>
<th>AHR* 95% CI</th>
<th>P 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDV Ab neg</td>
<td>1.00</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HDV Ab pos/HDV RNA miss</td>
<td>4.68</td>
<td>1.81</td>
<td>12.09</td>
<td>0.001</td>
</tr>
<tr>
<td>HDV Ab pos/HDV RNA +</td>
<td>3.87</td>
<td>1.28</td>
<td>11.75</td>
<td>0.017</td>
</tr>
<tr>
<td>HDV Ab pos/HDV RNA -</td>
<td>6.60</td>
<td>3.08</td>
<td>14.14</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Conclusion: One out of five HBV/HIV coinfected individuals had been infected with HDV; they were more frequently male IDU with HCVA Ab pos/HCVRNA neg, suggesting a suppressive effect of HDV on HCV replication. Globally, 12% showed coinfection with 4 viruses (HIV, HBV, HDV, HCV). Both previous and active HDV infection are related to advanced liver disease. Only active HDV infection is related to a higher incidence of LRHO on follow-up. Pharmacological suppression of HDV replication may improve the prognosis in PLWH with active HDV replication.

Background and aims: Mongolia has the highest prevalence of the hepatitis D virus (HDV), leading to high morbidity and mortality from liver diseases and HCC. HDV causes the most severe form of chronic viral hepatitis. In a recent study, it was estimated that anti-HDV prevalence is 67.5% among HBsAg positive population in Mongolia. The prevalence of HDV infection is relatively high among sexually active and young people, thus, the virus might be transmitted during sexual intercourse. Therefore, it is important to confirm the possibility of sexual transmission of HDV by detecting HDV-RNA in the semen and vaginal secretions of patients with chronic hepatitis Delta.

Method: From October 2022 to December 2022, patients from Liver Center, Ulaanbaatar, Mongolia were asked to enroll in this study. A total of 26 patients, (male 18, female 8, aged 23–48 years old) participated in the study. The average age of all participants is 36.5 years and 94% of them are married. The males and females were to refrain from sexual activity for at least 48 hours prior to test. Females were also recommended to do not use any intravaginal products for at least 48 hours prior to the collection of vaginal/cervical swab specimens. The seminal fluids were collected in a sterile container by masturbation. Vaginal/cervical specimens were collected by rubbing with nasopharyngeal swab dedicated for a molecular biology test. Viral RNA was extracted by … and presence of HDV-RNA was detected subsequently by real time RT-PCR analysis.

Results: In male group, 38.8% (7/18) of seminal fluid samples were positive and in female group, 87.5% (7/8) of vaginal/cervical swab samples were positive. This result indicates that HDV is more likely present in genital cavity of female patients than in seminal fluid of male patients. For male group, correlation between HDV RNA existence in seminal fluid and serum RNA level was not observed. In contrast, female group has a correlation between HDV RNA existence in genital tract and serum RNA level. HDV-RNA was not detected in the sample from only one woman, who had low number of HDV RNA in her serum sample (197IU/ml).

Conclusion: HDV RNA can be detected in seminal fluid of male patient and in genital tract of female patient. This result is solid evidence to indicate the possible risk of sexual transmission of HDV. In the future, we need to study in more detail.
WED-176
Ultrasensitive HBV-RNA quantification by droplet digital PCR is a promising biomarker to optimize the staging of chronic HBV infection and to identify minimal viral activity under prolonged virological suppression
Romina Salpini1, Lorenzo Piermatteo1,2, Stefano D’Anna1, Leonardo Duca1, Giulia Torre1, Anna Francesca Guerra3, Chiara Boarini3, Alessandro Tavelli4, Paolo Ventura3, Francesca Ceccherini Silberstein1, Antonello Pietrangelo3, Massimo Piotto3, Antonella d’Arminio Monforte2, Gianluca Abbati3, Upkar Gill6, Patrick Kennedy6, Valentina Svicher1, 2.
1University of Rome Tor Vergata, Experimental Medicine, Italy; 2University of Rome Tor Vergata, Department of Biology, Italy; 3University of Modena and Reggio Emilia, Italy; 4Icona Foundation, Italy; 5Niguarda Hospital, Milan, Italy; 6Blizard Institute, Barts and The London SMD, QMUL, London, United Kingdom
Email: rsalpini@yahoo.it

Background and aims: Serum HBV-RNA quantification reflects the burden of virions containing pre-genomic RNA (pgRNA) and is used as surrogate marker of cccDNA transcriptional activity. Here, we define HBV-RNA levels across the natural history of HBV infection, including the under studied phase of occult HBV infection (OBI) and the levels after long-term NUC exposure.

Method: This study includes 106 treatment-naive patients (pts) categorized in 17 eAg+ with chronic infection (CI), 7 with eAg+ chronic hepatitis (CH), 50 with eAg- CI and 32 with eAg- CH according to EASL guidelines. 38 eAg- virologically suppressed pts under long-term NUC treatment and 28 Anti-HBc+/HBsAg- pts (HIV-coinfected with a serological status compatible with OBI) are also included. Serum HBV-RNA is quantified by droplet digital PCR (ddPCR) targeting pgRNA (LOQ: 5 copies/ml).

Results: eAg+ CI and CH have elevated HBV-RNA levels (median [IQR]: 7.5 [4.3–8.3] and 7.1 [6.5–7.5] log cps/ml) in line with high HBV-DNA and HBsAg production (median [IQR] HBV-DNA: 9.2 [6.4–9.9] and 8.9 [8.7–9.2] log IU/ml; HBsAg: 20,885 [6,778–72,608] and 52,518 [30,059–80,056] IU/ml). Notably, the rate of HBV-RNA positivity and HBV-RNA levels remain stable independently from NUC duration, suggesting no decline in intrahepatic HBV activity over prolonged therapy (73.3%, 75% and 90% for NUC duration of <5, 5–9 and ≥ 9 years, with median [IQR] HBV-RNA of 1.7 [1.5–1.9], 1.4 [1.2–1.4] and 1.8 [1.6–2.3] log cps/ml). Finally, HBV-RNA is also positive in 32.1% of Anti-HBc+/HBsAg- pts (median [IQR]: 1.1 [0.9–1.3] log cps/ml), supporting occult viral activity despite HBsAg negativity.

Conclusion: The production of pgRNA-containing viral particles predominates during the initial phases of chronic infection and decreases after HBeAg-seroconversion. In this context, HBV-RNA can enhance the categorization of chronic HBV infection including the eAg- infection status. The ultra-sensitive HBV-RNA quantification can detect minimal viral activity in the setting of long-term NUC treatment or OBI, providing added value in the identification of patients achieving functional cure.

WED-177
Study of hepatitis delta virus replication markers in anti-HBc positive patients with chronic hepatitis C
Antonio Madejón1,2, Miriam Romero1,2, Araceli García-Sánchez1, Antonio Oliveira Martin1,2, Pilar Castillo1, José Carlos Erdozain1, Francisco Javier Garcia-Samaniego Rey1,2, 1Hepatology Unit, Hospital Universitario La Paz, Madrid, Spain; 2Centro de Investigación Biomédica en Red (CIBER), Spain
Email: javiersamaniego@telefonica.net

Background and aims: Recent works have identified antibodies and genome sequences from the hepatitis delta virus (HDV) in patients with hepatitis C virus (HCV) infection. This study aimed to analyze the presence of HDV replication markers in anti-HBc positive patients with chronic hepatitis C (CHC) without active HBV infection.

Methods: A total of 153 CHC patients were included, 91 of whom were anti-HBc positive. All patients were negative for HBV-DNA and HBsAg. HDV-RNA was quantified by real-time RT-PCR targeting pgRNA (LOQ: 5 copies/ml).

Results: HDV-RNA was detected in 23/91 (25.3%) anti-HBc positive CHC patients with a median viral load of 1.1 [0.6–1.5] log copies/ml. The detection of HDV-RNA was significantly correlated with the presence of Anti-HEV antibodies (p = 0.012). No correlation was found with the presence of HCV-RNA, suggesting a role of a source other than HCV in HDV replication in these patients.

Conclusion: The presence of HDV replication markers in anti-HBc positive CHC patients without active HBV infection suggests a potential role of a source other than HCV in HDV replication in these patients. Further studies are needed to elucidate the epidemiological and clinical relevance of this finding.

Figure: (abstract: WED-175).
with chronic hepatitis C (CHC) in absence of any marker of infection with hepatitis B virus (HBV). The objective of this work was to analyze the prevalence of active HDV infection (positive for HDV genome) in patients with chronic hepatitis C with evidence of past exposure to HBV.

**Method:** A cohort of 129 anti-HBc positive patients was retrospectively analyzed, 20 of whom (15%) were positive for anti-HBs antibodies. Seventy-seven patients (60%) were Caucasian and 52 (40%) Sub-Saharan. Regarding co-infection markers, 65 (50%) were HIV positive, with HIV-RNA positivity in 20/65 (31%), and 92 (71%) were anti-HCV positive with detectable HCV-RNA in 23/92 (25%) patients. Fibrosis stage (TE) was: F0-F1 in 42/129 (33%), F2 in 16 (12%), F3 in 5 (4%), F4 in 15 (12%) and indeterminate in 51 (39%) patients. All patients were analysed for the presence of anti-HDV antibodies and delta antigen (HDAG) using commercial kits. The presence of HDV-RNA was also analyzed by in-house RT-PCR. A longitudinal follow-up was performed in these HDV-RNA positive patients, in order to analyze the evolution of HDV viremia. The complete coding region of HDAG was amplified in at least one sample. The presence of HBsAg and HBV-DNA was also confirmed.

**Results:** Anti-HDV antibodies were detected in 8 (6%) patients. The prevalence of anti-HDV was higher in anti-HCV positive than in negative patients [7/92 (8%) vs 1/37 (3%), respectively; p = 0.03]; in HIV-negative patients compared to positives [6/64 (9%) vs 2/65 (3%), respectively; p = 0.1]; and in Caucasian vs Sub-Saharan patients [7/77 (9%) vs 1/52 (2%), respectively; p = 0.09]. HDAG and HDV-RNA were detected in only 1 patient, who was HCV-RNA positive, HIV negative, and from sub-Saharan origin. The entire coding region of HDAG was amplified. HDV-RNA positivity was confirmed in three sequential samples of this patient taken every 6 months, showing slight fluctuations in viral load (2,540, 1,250, and 6,450 copies/ml, respectively). HBV-DNA and HBsAg were not detected.

**Conclusion:** It has been shown that active HDV viral replication can be detected in patients with detectable HCV-RNA in the absence of any marker of active HBV infection. Whether HDV replication process is sustained by low levels of HBsAg expression or by interaction with HCV must be further investigated.

**WED-178**

**Long-term outcomes of a population-based cohort of chronic hepatitis B (CHB) patients in West Africa**

Gibril Ndow1, Yusuke Shimakawa2, Damien Leith3, Sulayman Bah4, Rohey Bangura1, Lamin Bojang1, Amie Ceesay1, Queen Bola-Lawal1, Rohey Bangura1, Lamin Bojang1, Amie Ceesay1, Queen Bola-Lawal1, Gambia, Gambia; 8University of Sussex, United Kingdom; 9Hopital Henri Coumba Toure-Kane11, Isabelle Chemin12, Ramou Njie7, Sheikh Omar Bittaye7, Yazan Haddadin8, Erwan Vo Quang1, 1MRC Unit The Gambia in LSHTM, Gambia; 2Institut Pasteur, France; 3Glasgow Royal Infirmary, United Kingdom; 4Imperial College London, United Kingdom; 5Cicely Saunders Institute, United Kingdom; 6APHP Henri-Mondor University Hospital, France; 7University of Sussex, United Kingdom; 8Hospital Henri Mondor, France; 9Abbott Labs, United States; 10IRESSE, Senegal; 11U1052 INSERM, France

**Email:** gndow@mrc.gm

**Background and aims:** Longitudinal data in untreated chronic hepatitis B (CHB) infected patients in Africa who are ineligible for antiviral therapy is scarce and urgently needed to inform treatment and monitoring guidelines adapted to this population. We assessed the long-term clinical outcomes of a population-based cohort of CHB subjects in West Africa.

**Method:** Between 2019 and 2021, all CHB patients enrolled in the PROLIFICA cohort between 2011 and 2014 in The Gambia and Senegal were invited for reassessment of liver disease using fasting liver stiffness measurement (LSM) (Fibroscan), abdominal ultrasound, HBV DNA measurement (Abbott, USA), HBsAg and HBeAg serologies, liver enzymes, and full blood count.

This analysis focused on untreated participants in The Gambia who were ineligible for antiviral therapy at baseline according to the 2012 EASL criteria. Number of deaths was collected using death certificates and verbal autopsy to assess mortality rate. Liver disease progression was defined as the proportion of patients who: (i) became eligible for antiviral therapy according to the 2017 EASL treatment criteria; and/or: (ii) developed clinically significant fibrosis (LSM≥7.8 kPa) or cirrhosis (LSM≥9.5 kPa); and/or (iii) developed hepatocellular carcinoma (HCC).

**Results:** At baseline, 93 of 943 participants fulfilled EASL treatment criteria or received antiviral therapy, leaving 850 patients who were ineligible and untreated. After a median follow-up of 6.0 years (IQR: 5.5–6.8), 279 (32.8%) patients were lost to follow-up (LTFU) and 27/850 (3.2%) died, including 10 liver-related deaths, giving an overall mortality rate at 584/100,000 person-years (IQR: 400–852). After adjusting for sex and age, baseline APRI ≥ 2 was a strong predictor of overall mortality (OR: 7.2 (1.7–31.3), p = 0.008). 544/850 (64.0%) had a full liver reassessment: 321/544 (59.0%) were males, median age: 41 (37–48) years, median BMI: 22.8 (20.1–26.1) kg/m², and none reported excessive alcohol intake. Most participants (348/544 (64.0%)) were considered as inactive chronic carriers. 131/544 (24.0%) had viral load ≥2000 IU/ml, 49/541 (9.1%) had an ALT level ≥40 IU/L and 36/540 (6.7%) had significant liver fibrosis including 13 (2.4%) with cirrhosis and 1 with decompensated cirrhosis. Incidence of HBsAg loss was 0.69 (23/544, CI 0.46–1.04) and higher among males (OR: 2.56 (1.03–6.34), p = 0.042). Amongst 544 patients reassessed, no HCC was detected but 39 (7.2%) had liver disease progression: 3.3% newly eligible for treatment and 3.9% had liver disease progression, including 15/540 (2.8%) new cirrhotic patients. Amongst patients with no significant liver fibrosis at baseline, 32/492 (6.5%) had liver disease progression including 13 (2.6%) cases of cirrhosis. In multivariate analysis after adjusting for sex and age, baseline HBV DNA viral load ≥2000 IU/ml was associated with liver disease progression (OR 2.8, 95%CI: 0.9–8.5, p = 0.027).

**Conclusion:** This longitudinal study, the first of its kind in Africa, indicates that the number of liver events is not negligible in ineligible and untreated CHB patients, suggesting that monitoring should be maintained with a special focus on patients with viral load ≥2000 IU/ml.

**WED-179**

**Incidence of hepatitis D virus super-infection in HBsAg positive patients (The Inci-D cohort study)**

Patrick Ingiliz1-2-3, Erwan Vo Quang4-5, Maud Lemoine4-5, Annie Ceysay1, Gibril Ndow1, Marie-Noëlle Hilleret4, Anne Laure Maziallouva1, Yusuke Shimakawa2, Alhagie Touray4, Jean-Michel Pawlotsky2-9, Isabelle Chemin3, Stéphane Chevaliez2-9, Vincent Leroy1-2, APHP Henri-Mondor University Hospital, Hepatology, Créteil, France; 2Inserm U955, Créteil, France; 3Maison Medicale Chemin Vert, Paris, France; 4MRC The Gambia Unit @ LSHTM, Gambia; 5Imperial College London, London, United Kingdom; 6Cancer Research Center of Lyon (CRCL), INSERM U1052, CNRS UMR-5286, Lyon, France; 7University Grenoble-Alpes, Grenoble, France; 8Institut Pasteur, Paris, France; 9APHP Henri-Mondor University Hospital, Virology, Créteil, France

**Email:** patrick.ingiliz@aphp.fr

**Background and aims:** Super-infection with the hepatitis D virus (HDV) leads to a more aggressive form of chronic hepatitis in patients infected with the hepatitis B virus (HBV). While around 5% of HBsAg-positive individuals are estimated to be HBV-HDV dually infected globally, the timescale of super-infection is unknown and longitudinal repeated HDV testing is not yet supported by international guidelines. HDV infection occurs most likely parenterally or sexually and depends on the individual's risk factors. The primary aim of this study was to determine the incidence of HDV super-infection (HDAg and/or HDV-RNA) in HBsAg positive patients attending an antiviral therapy clinic in The Gambia and Senegal. Inci-D is a collaborative multicenter and longitudinal cohort study that aims to identify HDV super-infection in HBsAg positive individuals and the clinical features associated with it.
to evaluate the incidence of HDV super-infection in HBsAg chronic carriers from West Africa and Europe.

Method: The Inci-D cohort consists of two distinct HBV cohorts of clinical meta-data and stored clinical specimens including plasma or dried-blood spots (DBS). Cohort A is a West African cohort derived from the PROLIFICA population-based study in The Gambia. Cohort B is a French cohort including out-patients seen in two university hospitals (Grenoble Alpes and Henri Mondor APHP). The HBsAg positive patients’ first available stored blood sample was used to calculate the baseline prevalence. HDV-antibody (HDVAb) levels were detected using the Diasorin serology kit (Italy). The incidence rate was calculated using the most recent available blood sample.

Here, we present preliminary results from cohort A.

Results: For cohort A, 942 blood samples (915 plasma, 27 DBS) of HBsAg-positive individuals were available at baseline. The median age was 35 years (interquartile range (IQR): 31–33), 592/942 (63%) were male, the median ALT levels were 24 U/L (IQR: 19–31), and the median HBV DNA level was 1.90 Log IU/ml (IQR: 1–2.6). At baseline, 14/942 individuals (1.5%) were HDVAb-positive; median age 37 years (IQR: 34–57), 7/14 (50%) male, median ALT levels 21 U/L (IQR: 18–33), and median HBV DNA level 1.2 Log IU/ml (IQR: 1–2.2). Among HDVAb-negative patients at baseline, 566 individuals had a follow-up sample available (520 plasma, 46 DBS) with an overall follow-up time of 3363 patient-years. After a median follow-up time of 6.0 years (IQR: 5.5–6.8), 8 individuals were detected to be newly HDVAb-positive, representing an incidence rate of 2.37/1000 patient-years. The HDV prevalence at follow-up was 2.1%, indicating a 40% increase from baseline. Median age at of HDV super-infected patients was 35 years (IQR: 34–57), 88% were male. Analyses on cohort B are ongoing and will be presented.

Conclusion: Hepatitis delta superinfection increases considerably in HBsAg-positive carriers in an intermediate HDV prevalence setting, putting patients at risk for advanced liver disease and death. In order to identify individuals with need for treatment or surveillance, repeated HDV serology testing should be implemented by international guidelines.

WED-180
Significant heterogeneity in long-term risks of cirrhosis or hepatocellular carcinoma among a national cohort of U.S. veterans with non-cirrhotic, treatment naïve chronic hepatitis B in the immune tolerant phase

Zeyuan Yang1, Ramsey C. Cheung2, Robert Wong2. 1VA Palo Alto Health Care System, United States; 2Stanford University School of Medicine, VA Palo Alto Healthcare System, Palo Alto, United States

Email: rwong123@stanford.edu

Background and aims: Patients with chronic hepatitis B (CHB) in the “immune-tolerant” phase are not typically recommended for routine antiviral therapy. However, risk of progression to cirrhosis or HCC persists, and debate remains as to whether antiviral therapy is beneficial in certain subsets of this population. We aim to evaluate long-term risks of cirrhosis or HCC among non-cirrhotic, treatment naïve CHB patients with alanine aminotransferase (ALT) <70 U/L and whether disparities in cirrhosis or HCC risk exist.

Method: Using data from the U.S. National Veterans Affairs database from 2010 to 2022, Veterans with treatment-naive, e-antigen (eAg) positive CHB with baseline ALT <70 U/L and minimum 12 months of follow-up were identified. Patients with concurrent HIV, hepatitis C, or hepatitis delta infections were excluded. Patients with cirrhosis or HCC at baseline or within 6 months of study entry were excluded. Incidence of cirrhosis or HCC per 100 person-years was stratified by patient demographics, clinical characteristics, and baseline HBV DNA (<20 000 IU/ml (Low-DNA), 20 000–107 IU/ml (Intermediate-DNA), and >107 IU/ml (High-DNA). Patients were censored at development of cirrhosis or HCC, death, initiation of antiviral therapy, or end of follow-up period. Comparisons of cirrhosis or HCC incidence between groups utilized the z-statistic using standard equations.

Results: Among 3,526 Veterans with treatment-naive CHB and ALT <70 U/L, 19.2% (n = 678) were eAg positive, among whom 91.0% were men, 39.2% African American, 36.6% non-Hispanic white, 20.0% Asian, 4.2% Hispanic, mean age 53 ± 14, 69% had Low-DNA, 13% had Intermediate-DNA, and 18% had High-DNA. Overall incidence of cirrhosis was 1.22 per 100 person-years (95% CI 0.89–1.56) and incidence of HCC was 0.21 per 100 person-years (95% CI 0.07–0.35). Compared to patients with Low-DNA, there was a trend towards higher risk of cirrhosis in patients with Intermediate DNA (2.21 vs. 1.02 per 100 person-years, p = 0.07), but no difference in risk of HCC was observed by baseline HBV DNA. Older age was associated with higher risk of cirrhosis and HCC. Patients with diabetes had significantly higher incidence of cirrhosis (2.49 vs. 0.96 in patients without diabetes, per 100 person-years, p < 0.01). Compared to patients with baseline FIB-4 score <1.45, patients with FIB-4 >3.25 had higher incidence of cirrhosis (5.94 vs. 0.67 per 100 person-years, p < 0.01) and HCC (0.73 vs. 0.27 per 100 person-years, p < 0.05).

Conclusion: Among a national cohort of treatment-naive, eAg positive patients with non-cirrhotic CHB and baseline ALT <70 U/L, overall long-term risk of cirrhosis or HCC remains low. However, older age, presence of diabetes, and baseline FIB-4 >3.25 was associated with significantly higher risks of disease progression. Identifying “high risk” features among “immune tolerant” CHB patients may identify individuals that would benefit from earlier treatment initiation.
WED-181
Contrasting immune fingerprints of chronic hepatitis B Virus infection in adults from South Africa and the United Kingdom

Marion Delphin1, Louise Downs2,3, Emily Martyn1,4, Gavin Kelly1, Marjie Van Schalkwyk5,6, Susan Hugo2,7, Elizabeth Waddilove8, Cori Campbell2, Tingyan Wang2,8, Sheila Lumley2,3, Catherine De Lara2, Dominique Goedhals9,10, Christo van Rensburg5,6, Sue Wareing2, Polly Fengou2, Jacqueline Martin3, Monique Andersson2,6, Ivana Carey11, Azim Ansari2, Wolfgang Preiser5,7, Shiraaz Gabriel5,7, Jantjie Taljaard5,6, Eleanor Barnes2,3, Tongai Gibson Maponga12, Philippa Matthews1,2,13,14, 1The Francis Crick Institute, LONDON, United Kingdom; 2Nuffield Department of Medicine, Medawar Building for Pathogen Research, University of Oxford, Oxford, United Kingdom; 3John Radcliffe Hospital, Department of Infectious Diseases and Microbiology, oxford, United Kingdom; 4London School of Hygiene and Tropical Medicine, United Kingdom; 5Tygerberg Academic Hospital, South Africa; 6Stellenbosch University, Faculty of Medicine and Health Sciences, Cape Town, South Africa; 7Stellenbosch University, South Africa; 8NIHR Oxford Biomedical Research Centre, University of Oxford, Oxford, United Kingdom; 9PathCare Vermaak, South Africa; 10University of the Free State, South Africa; 11Institute of Liver Studies, King’s college Hospital, United Kingdom; 12Division of Medical Virology, Faculty of Medicine and Health Sciences, Stellenbosch University, South Africa; 13University College London, Division of Infection and Immunity, United Kingdom; 14University College London Hospital, Department of Infectious Diseases, United Kingdom

Email: marion.delphin@crick.ac.uk

Background and aims: Hepatitis B Virus (HBV) interaction with the immune system is a key determinant of infection outcome. As the HBV field advances towards novel therapies (amongst which immunoregulatory drugs), enhanced risk stratification, and cancer prevention, there is a pressing need to better understand the immunological profiles that underlie diverse disease outcomes. Unfortunately, while accounting for almost 70% of all HBV infections worldwide, African populations have been neglected in clinical studies. We set out to compare circulating levels of ten cytokines, alongside host demographics and viral biomarkers, in cohorts based in the United Kingdom (UK) and South Africa (SA).

Method: Serum samples were obtained from adult patients enrolled at Oxford University Hospitals, UK (n = 60), and the Tygerberg Hospital in Cape Town, SA (n = 32) with chronic HBV monoinfection (ethics ref.N17/01/013). HBsAg, HBeAg and HBV VL were estimated using standard clinical laboratory protocols, and HBcrAg were quantified using a chemiluminescent assay (Lumipulse G HBcrAg assay, Fujirebio). GM-CSF, IFNα2a, IL-2, IL-6, IL-8, IL-10, IL-21, IP-10, PD-1 and TNFα were quantified using multiplex ELISA (K151AEL-1, MesoScaleDelivery). Patient meta-data were recorded at the time of
Hepatitis B, C and delta
Department of Virology and INSERM U955,
Pierre Cappy1, Vincent Leroy2, Jean-Michel Pawlotsky1, Rola Matar1, Alexandre Soulier1, Valérie Ortonne1, Olivia Garrigou1, formed cytokine measurements using Ward hieerarchically clustered based purely on standardised log-transformed cytokine measurements using Ward’s method for linkage. P values were calculated using Mann Witney test in Prism v. 8.0.

Results: There were no significant differences between the two cohorts in terms of age (p = 0.09), sex (p = 0.07) or treatment (p = 0.61). HBV related biomarkers were comparable between the two cohorts, including HBCAg (p = 0.06), viral load (p > 0.99), HBsAg status (p = 0.74) and ALT (p = 0.81). However, the two cohorts presented distinct immune profiles. The SA cohort is dominated by a decreased level of IL-2, IL-10 and IFNα2a, while IP-10, PD-1 and IL-6 are increased (p < 0.0001 for all except IFNα2a, p = 0.09) compared to the UK cohort. These clusters did not co-vary with other attributes of the patient, markers of infection or treatment (Figure 1). Of note, the SA cohort could be subdivided into three immune profiles, but without any significant differences.

Conclusion: In this study, CHB patients from SA and the UK have distinct immune profiles, which are not clearly related to other host features or laboratory characteristics of infection. At present, it is unclear if these differences are attributable to host characteristics, viral genetics, exposure to treatment, or other environmental influences. Our data highlight the need for further population-based studies to unravel the diversity in immune profiles. Enhanced understanding of the mechanisms that determine disease outcomes and treatment response are needed to support interventions that reduce the burden of liver disease associated with HBV.

WED-182
Dried blood spot (DBS): a new tool for screening, diagnosis and monitoring of hepatitis D virus (HDV) infection
Rola Matar1, Alexandre Soulier2, Valérie Ortonne1, Olivia Garrigou1, Pierre Cappy1, Vincent Leroy3, Jean-Michel Pawlotsky1, Stéphane Chevaliez1,1 French National Reference Center for Viral Hepatitis B, C and delta Department of Virology and INSERM U955, Hôpital Henri Mondor, Université Paris-Est Créteil, France; 2Department of Hepatology and INSERM U955, Hôpital Henri Mondor, Université Paris-Est Créteil, France Email: rola.matar@aphp.fr

Background and aims: Hepatitis D virus (HDV) infection is one of the major public health concerns worldwide. Globally, it is estimated that 5 to 10% of chronic HBsAg carriers are co-infected with HDV. Hepatitis Delta infection can lead to a rapid disease progression towards cirrhosis and hepatocellular carcinoma. The diagnosis of HDV infection is crucial for the management of the disease. Dried blood spot (DBS) sampling is a useful tool for the collection, storage, and shipment of whole blood specimens. The current study was designed to evaluate the performance of standardized HDV diagnostic and monitoring tools in analyzing samples from DBS.

Methods: Paired plasma and whole blood specimens collected using the DBS technique from 110 individuals including 74 patients followed in a tertiary care center and 36 blood donors were tested for virological markers (anti-HD and HDV RNA detection as well as HDV genotype determination) used to diagnose and monitor HDV infection.

Results: Immunoassay detection of anti-HD antibodies in specimens from DBS was reliable after the establishment of a new signal-to-cutoff ratio (0.2545 and 0.2340 using LIAISON XL murex Anti-HDV from DiaSorin and HDV Ab from DIAPro assays, respectively). These optimal cutoffs were associated with specificities of 97.5% and 87.5% and sensitivities of 93.1% and 94.2% for the respective assays. HDV RNA viral load was detected from DBS in the vast majority of patients with active replication using the EurobioPlex HDV qRT-PCR assay, but HDV RNA levels were substantially lower than those detected in the corresponding plasma specimens. The mean HDV RNA detected in whole blood was 1.2 Log IU/disk lower compared to plasma. HDV genotype determination using phylogenetic analysis of a part of R0 region of the delta antigen was achieved in DBS samples with 100% concordance with results obtained from plasma specimens.

Conclusion: This study has shown that whole blood specimens collected on DBS can be used to diagnose and to monitor HDV infection. DBS specimen collection is a clinically relevant tool for improving the access to hepatitis D diagnosis around the world.

WED-183
The role of PAGE-B score in predicting the development of hepatocellular cancer in patients with chronic delta hepatitis
Onur Keskin1, Cagdas Kalkan2, Bengi Ozturk3, Ayşu Caliskan2, Hasan Sahin4, Mesut Gumussoy5, Esra Yurducu5, Mithat Bozdagi5, Murat Akylidiz6, Mujdat Zeybel6, Ramazan Ildiman6, Cihan Yurdaydin6, 1Hacettepe University School of Medicine, Gastroenterology, Ankara, Turkey; 2Ankara University School of Medicine, Gastroenterology, Ankara, Turkey; 3Hacettepe University School of Medicine, Gastroenterology, Ankara, Turkey; 4Hacettepe University School of Medicine, Internal Medicine, Ankara, Turkey; 5Ankara University Hepatology Institute, Ankara, Turkey; 6Koc University School of Medicine, Gastroenterology, Turkey Email: onurkeskin181@gmail.com

Background and aims: The aim of this study is to determine the effectiveness of the PAGE-B score in predicting the development of hepatocellular cancer (HCC) in chronic delta hepatitis (CDH) patients. Method: A total of 124 CDH patients (88 males/36 females; mean age: 40.3 ± 10; 28 cirrhotic-96 noncirrhotic) who received interferon therapy for at least 6 months and had a median follow-up of 115 (12–144) months were included in the study. Patients received median 2 (1–8) episodes of interferon (IFN) therapy. Patients who were found to be HDV RNA negative at the end of 2 years following the end of treatment were considered interferon responsive (n:40). PAGE-B scores of all patients were recorded using previously recorded baseline clinical and laboratory parameters. The clinical and laboratory parameters and PAGE-B scores of the patients who developed and did not develop HCC during the follow-up period were compared and the role of the PAGE-B score in the prediction of HCC in patients with CDH was evaluated.

Results: HCC developed in 21 (18M/3F) patients during the follow-up period. When the patients who developed and did not develop HCC were compared, it was found that the patients who developed HCC were older (47.4 ± 7.5 vs 38.8 ± 10.2; p < 0.01) and had higher GGT values (121 ± 68 vs 71 ± 74; p < 0.01). It was observed that HCC developed more frequently in patients with cirrhosis and those who did not respond to IFN (55% cirrhotics vs 11% in noncirrhotics; p < 0.01) and 7.5% in IFN-responders vs 21% in IFN-non-responders; p:0.04). By multivariate analysis, age, presence of cirrhosis and GGT level were independent predictors of HCC development. Patients who developed HCC had higher PAGE-B scores than patients who did not develop HCC (15.9 ± 3.4 vs 11.3 ± 4.6; p < 0.01). Using receiver operating characteristic (ROC) analysis with Youden index, a PAGE-B cut-off score of 13 predicted HCC development with 81% sensitivity, 60% specificity and area under ROC curve of 0.79. Only one patient with a PAGE-B score of <10 developed HCC on a median follow-up of close to 10 years.
Conclusion: PAGE-B score predicts HCC in CDH with a similar strength to that reported for chronic hepatitis B

WED-184
Identification and external validation of the optimal ALT thresholds for ruling in significant histologic disease in chronic hepatitis B

Zhiyi Zhang1, Jian Wang2,3, Li Zhu4, Yilin Liu5, Xiaomin Yan2, Yuanwang Qiu5, Chuanwu Zhu4, Jie Li1,2,3, Chao Wu1,2,3, Rui Huang1,2,3. 1Department of Infectious Diseases, Nanjing Drum Tower Hospital Clinical College of Traditional Chinese and Western Medicine, Nanjing University of Chinese Medicine, Nanjing, Jiangsu, China; 2Department of Infectious Diseases, Nanjing Drum Tower Hospital, The Affiliated Hospital of Nanjing University Medical School, Nanjing, Jiangsu, China; 3Department of Infectious Diseases, The Affiliated Infectious Diseases Hospital of Soochow University, Suzhou, Jiangsu, China; 4Department of Infectious Diseases, The Fifth People’s Hospital of Wuxi, Wuxi, Jiangsu, China
Email: doctor_hr@126.com

Background and aims: Identifying the optimal alanine aminotransferase (ALT) threshold for rule-in and rule-out significant liver inflammation and fibrosis is critically important for the management of chronic hepatitis B. The aim of this study was to identify the optimal ALT threshold for ruling in significant histologic disease in chronic hepatitis B.

Figure: (abstract: WED-184): Scatterplots showing PPVs, specificities (A) and misdiagnosis rates (B) of ALT cut-offs for ruling in significant histologic disease.
of treat-naïve patients with chronic hepatitis B (CHB). We aimed to explore the optimal ALT threshold for ruling in and ruling out significant liver inflammation and fibrosis in CHB patients.

**Method:** CHB patients underwent liver biopsy were retrospectively included from four hospitals. Patients from two canters were randomly divided into a training and internal validation set, and patients from two other hospitals comprised the external validation set. The grid-search method was used to determine the cut-offs in the training set with the aim of achieving a specificity and positive predictive value (PPV) of at least 90% for ruling in significant histologic disease. Additionally, the cut-off values were aimed to have a sensitivity of 90% and a negative predictive value exceeding 95% for the exclusion of significant histologic disease. Optimal cut-off values were subsequently validated in both the internal and external validation sets for accuracy. Significant histologic disease was defined as liver inflammation ≥G2 or liver fibrosis ≥S2 according to Scheuer scoring system.

**Results:** In proportions of significant histologic disease in the training set (n = 548), internal validation set (n = 235) and external validation set (n = 483) were 77.9%, 75.7% and 79.3%, respectively. The optimal ALT value of 77.3 U/L had a specificity and PPV of 90.22% and 91.9%, respectively, and misclassified only 12 of 121 (9.9%) patients with non-significant histologic disease in the training set. The performance of the newly optimal cut-off of ALT was significantly better than several previous cut-offs of ≥40 U/L (2017 EASL ULN), male ≥35 U/L or female ≥25 U/L (2018 AASLD 1 × ULN), male ≥30 U/L or female ≥19 U/L, slightly better than the cut-off of male >70 U/L or female >50 U/L (2018 AASLD 2 × ULN). The specificity and PPV of the newly optimal cut-off of ALT were all above 90% in two validation sets with a misclassification rate of 7% in the internal validation set, and 8% in the external validation set. Regrettably, the cut-offs of ALT to rule out significant histologic disease could not be found.

**Conclusion:** The newly identified threshold (≥77.7 U/L) of ALT had high specificity, PPV and low misclassification rate in ruling in CHB patients with significant histologic disease. The well-validated threshold of ALT could help the antiviral treatment decisions for treat-naïve CHB patients by accurately ruling in significant histologic disease.

**WED-185**

**Predominance of genotype 5 hepatitis delta virus infection in a Portuguese centre**

Mariana Cardoso1, Joana Branco1, Henrique Coelho1, Sofia Bragança1, Gonçalo Alexandre1, Mariana Costa1, Rita Carvalho1, Elizabeth Padua1, Alexandra Martins1. 1Hospital Prof. Doutor Fernando Fonseca, Gastroenterology, Portugal; 2National Health Institute Doutor Ricardo Jorge, Portugal

**Email:** marianafcardoso@gmail.com

**Background and aims:** Hepatitis delta virus (HDV) infection is the most severe form of viral hepatitis. Genotype (GT) 1 is by far the most prevalent in Europe and globally, while GT5 predominates in Western Africa. Data about HDV seroprevalence in Portugal are scarce and no genotyping studies have been performed to date. We aimed to analyse the seroprevalence of HDV in our centre and to characterize seropositive patients, including HDV genotyping.

**Method:** Patients followed in our Hepatology clinic between 2012 and 2022 for hepatitis B virus (HBV) infection, defined as positive HBsAg (HBV surface antigen), were retrospectively included. Patients seropositive for HDV and actively followed were subjected to cross-sectional analysis, including blood sample collection. RNA was extracted from the patients’ plasma and complementary DNA (cDNA) was synthesized before being submitted to PCR amplification of the 3′-terminal part of the HD (hepatitis delta) gene of HDV. The fragments obtained were analysed by electrophoresis, purified, sequenced and genotyped using an international public database. Clinical, laboratory and imaging data from this subgroup were collected.

**Results:** From a total of 835 HBsAg positive patients (age 48.3 ± 15.2 years; 56.6% male), 665 (79.6%) had been tested for total anti-HDV antibody. Portuguese patients represented 35.9% of total (n = 300), while the majority originated from African countries (57.5%, n = 480). The overall HDV seroprevalence was 43/665 (6.5%). Seroprevalence per country/area of origin was 3.0% in Portugal, 12.0% in Central and Eastern Europe and 8.3% in Africa, being as high as 20.3% in Guinea-Bissau. Seropositive patients were younger than the seronegative (41.3 vs 48.9 years, p < 0.001).

From the 43 seropositive patients, 21 were included in further studies (age 41.2 ± 9.9 years; 57.1% male). Most patients were HBeAg-negative (85.7% at baseline and currently 95.2%). Advanced chronic liver disease was present in 7 patients (33.3%), including 5 with liver stiffness (LS) ≥14 kPa, one with Ishak score of 5/6 and one with imaging findings of cirrhosis and cholangiocarcinoma. Median LS was 7.8 kPa. Most patients (71.4%) were treated with nucleos (t)ide analogs for HBV. One third of patients (7/21) had been treated with peginterferon (HDV clearance: 2; non-response: 4; intolerance: 1). In the current cross-sectional study, HDV RNA was positive in 8/21 (38.0%) patients, 3 of which had previously been classified as RNA negative using a commercial assay. HDV was classified as GT5 in 7 patients (6 from Guinea-Bissau and 1 from Cape Verde), and GT1 in one patient (from Ukraine). Five patients recently started therapy with bulevirtud through the national early access program.

**Conclusion:** In the largest national cohort to date, seroprevalence and genotype distribution of HDV (with predominance of GT5) were strongly influenced by immigration, notably from African countries.

**WED-186**

**Long-term outcomes of patients with chronic HBsAg positive/ HBe-negative infection: differences and transition between inactive carriers and low viremic carriers**

Giacomo Emanuele Maria Rizzo1, Gabriele Rancatore1, Pietro Graceffa1, Giuseppe Falco1, Fabrizio Bronte2, Donatella Ferraro3, Vincenza Calvaruso1, Vito Di Marco1. 1University of Palermo, Section of Gastroenterology and Hepatology, Department of Health Promotion, Mother and Child Care, Internal Medicine and Medical Specialties, PROMISE, Palermo, Italy; 2Ospedali Riuniti Villa Sofia-Cervello, Gastroenterology Unit, Palermo, Italy; 3University of Palermo, Section of Virology, Department of Health Promotion, Mother and Child Care, Internal Medicine and Medical Specialties, PROMISE, Palermo, Italy

**Email:** gabriele.rancatore@gmail.com

**Background and aims:** HBsAg-positive/HBeAg-negative Inactive Carrier (IC) with low viral load levels (<2000 IU/ml) has no indication for antiviral treatment, but HBsAg-/HBeAg-negative Low Viremic Carriers (LVC) with viral load between 2000–20 000 IU/ml, belong to a “grey area” of the HBV natural history. IC have a survival comparable to that of the non-infected general population, but it is not clear whether the status of IC represents a transient phase of low replication in a patient with chronic hepatitis B or whether it is a transition phase to an inactive infection. In this prospective study we evaluated the natural history of a cohort of HBeAg negative patients with viral load <20 000 IU/ml followed from 2007 to 2022.

**Method:** At baseline all patients were naïve to antiviral treatment and were evaluated for virus status by quantitative HBsAg (qHBsAg) and serum levels of HBV-DNA, and for disease stage by liver stiffness with FibroScan® and serum transaminase values. Every year patients checked HBV-DNA and transaminase values, performed HBsAg and Hbs-Ab tests, and measured liver stiffness by fibroscan. Change of virological status was defined as an increase or decrease in the value of HBV-DNA levels compared to the cut-off of 2000 IU/ml in at least two consecutive evaluations. A negative test for HBsAg and a positive test for HBsAb was considered a cure for HBV infection.

**Results:** After the screening, we identified 130 patients (21.6% of the entire cohort of 602 HBsAg positive patients) with HBsAg positive, HBeAg negative, anti-HDV negative, anti-HCV negative, normal transaminase levels and HBV-DNA levels less than 20 000 IU/ml.
We identified 91 IC and 39 LCV and two group showed no significant differences regarding age (49 vs 44 years), sex (63% vs 51% males), liver stiffness (mean 5.7 vs 5.3 kPa), and ALT values (28 vs 32 IU/ml) at baseline. At the end of follow-up (median 84 months, range 24–180) the mean of liver stiffness was of 5.5 kPa. Only 10% CI transited to LVC status and conversely 51% of LVC transitioned to CI status (p < 0.001).

During the follow-up 14 patients (10.7%) lost HBsAg and 9 (7%) showed positive HBs-Ab. Furthermore, the identification of CI status had relevant prognostic implications since 15.4% in these patients lost HBsAg compared to no patients in LVC status (p = 0.01). Finally, 14 (25%) of 56 IC with baseline levels of qHBsAg <1000 IU/ml lost HBsAg compared with none of 31 IC with qHBsAg values >1000 IU/ml.

**Conclusion:** Our data confirm that both IC and LVC had a good prognosis and no risk of progression to advanced liver disease. HBsAg loss is more frequent in the group of patients with HBV-DNA stably lower than 2000 IU/ml and with quantitative HBsAg values lower than 1000 IU/ml. These evidences can serve as a support in the therapeutic decisions of patients with HBV infection.

### Background and aims:
There are limited data on effects of antiviral treatment (A VT) pregnant woman with chronic HBV infection. Previous studies focused on ALT flare but not focused on virological events (Half decrease in HBsAg, HBV-DNA undetectable and HBeAg clearance) for patients with HBV-DNA stably lower than 2000 IU/ml and with quantitative HBsAg values lower than 1000 IU/ml. These evidences can serve as a support in the therapeutic decisions of patients with HBV infection.

### Method:
This is a retrospective real-world study on chronic HBV infected pregnant women. We compared the incidences of outcome events (Half decrease in HBsAg, HBV-DNA undetectable and HBeAg clearance) around 1 year postpartum in three groups (Group A: Subjects who started A VT before pregnant and continued it postpartum; Group B: Subjects who who received A VT at 24–28 weeks and continued it postpartum; Group C: Subjects who who started A VT at 24-28 weeks and discontinued it postpartum, but retreatment because of abnormal ALT (>40 U/L)).

### Results:
A total of 169 chronic HBV infection pregnant women were enrolled in this study, median follow-up time was 18 months. 131 subjects were HBsAg positive and 8 were HBsAg negative, of whom 109 and 7 subjects started antiviral treatment (A VT) at 24–28 weeks, respectively. For those who started A VT but discontinued it postpartum, ALT flare (ALT >80 U/L) was occurred in 20% (1/5) and 29.8% (28/94) in HBsAg negative and positive, respectively (p > 0.05), which was numerically higher than subjects who continued therapy in HBsAg negative (0%, p > 0.05) and positive (9.1%, p > 0.05). ALT flare occurred in 61.5% in group C, significantly higher than 9.1% in group B and 0% in group A. The proportion of half decrease in HBsAg occurred in 77.8% in Group C, significantly higher than 20% in group A and comparable with 71.4% in group B. It seems that the proportion was higher in group B than group A (p = 0.058). The proportion of HBV-DNA undetectable was comparable between three groups. However, the proportion of HBeAg clearance occurred in group C (25%) was significantly lower than group A (66.7%). And the proportion was comparable between groups A and B (28.6%), between groups B and C.

### Conclusion:
Although higher ALT flare occurred in pregnant woman who received A VT at 24–28 weeks and discontinued it postpartum, they can benefit from retreatment because of more significantly HBsAg decrease.

**WED-188**

Higher risk of disease progression in the gray zone relative to hepatitis B e antigen negative chronic hepatitis B infection

YunLing Xue1, Peng Hu1, Xiaoqing Liu1, Qiao Tang1, GuoRui Wang1, JinSong Wang1, 1The Second Affiliated Hospital of Chongqing Medical University, Department of Infectious Diseases, Institute for Viral Hepatitis, The Key Laboratory of Molecular Biology for Infectious Diseases, Chinese Ministry of Education, China

**Email:** hp_cq@163.com

### Background and aims:
Chronic hepatitis B (CHB) remains a global healthcare burden. Hepatitis B e antigen (HBeAg) negative CHB infection is the commonest CHB phase. However, there are some patients with normal alanine aminotransferase (ALT) and negative e antigen that cannot be clearly defined by the guidelines, which we call the grey zone (GZ). There is still confusion about the evolution of disease progression in the GZ and controversy about the need for antiviral therapy. So we aimed to study the natural history and antiviral treatment of HBe negative CHB infection and GZ.

### Method:
The study retrospectively enrolled 321 patients who were HBeAg negative and had normal ALT (<40 U/L) without antiviral therapy and without a diagnosis of cirrhosis and hepatocellular carcinoma at baseline. Patients with normal ALT, negative HBe antigen, DNA <2000 IU/ml and without significant liver fibrosis were diagnosed with HBeAg-negative CHB infection according to the European Liver Association guidelines. Patients who did not meet the above diagnosis were defined as grey zone (GZ). Compared the cumulative incidence of outcome events in GZ and HBeAg-negative CHB infection.

### Results:
At baseline, 211 (65.73%) of 321 patients were defined as HBeAg negative CHB infection and 110 (34.27%) were defined as GZ. By follow-up, 7 (3.32%) of the total 211 HBeAg negative CHB infection
and 27 (24.5%) of the total 110 patients in GZ at baseline transitioned to HBeAg negative chronic hepatitis B and its corresponding gray zone. The cumulative incidence of transitioning was significantly higher in GZ than HBeAg-negative CHB infection ($p < 0.0001$) (Figure 1a). Meanwhile we defined the occurrence of cirrhosis and/or hepatocellular carcinoma suggested by ultrasound as end-stage liver disease. 9 (2.8%) of in our study population (321) had end-stage liver disease events. 7 (77.78%) patients were in GZ and 2 (22.22%) in HBeAg-negative CHB infection. The cumulative incidence of End-stage liver disease was significantly higher in GZ patients than HBeAg negative CHB infection ($p = 0.0018$) (Figure 1b). We also followed up on the occurrence of ALT elevation and antiviral treatment in patients. ALT elevation occurred in 46 (54.8%) patients in GZ and 38 (45.2%) in HBeAg negative CHB infection. Antiviral therapy occurred in 22 (77.3%) patients in GZ and 8 (22.7%) in HBeAg negative CHB infection. The cumulative incidence of ALT elevation and antiviral therapy was significantly higher in GZ than in HBeAg negative CHB infection ($p < 0.001, p < 0.0001$) (Figure 1c, Figure 1d).

**Conclusion:** In summary, we showed that more than 1/3 of patients were in GZ at baseline. The cumulative incidence of transition to HBeAg negative chronic hepatitis B and its corresponding gray zone, end-stage liver disease, elevated ALT, and initiation of antiviral therapy were all significantly higher in patients with GZ than in HBeAg-negative CHB infection.

**WED-189** 
**Analysis of disease progression in patients with chronic hepatitis B using a large nationwide database**
Nobuharu Tamaki1, Masayuki Kurosaki1, Yutaka Yasui1, Kaoru Tsuchiya1, Hiroyuki Nakanishi1, Namiki Izumi1. 1Musashino Red Cross Hospital, Japan
Email: nobuharu.tamaki@gmail.com

**Background and aims:** Disease progression in patients with chronic hepatitis B remains unclear. In this study, we aimed to investigate disease progression (hepatocellular carcinoma [HCC] development and decompensation) in patients with chronic hepatitis B using a large claims database.

**Method:** We used a large claims database established by the Japan Medical Data Center (JMD Co., Ltd. Tokyo, Japan). The database contains monthly claims from medical institutions and pharmacies, thus it includes all ICD code, prescription history, medical practice, etc. The database contains records of approximately 14 million insured persons. Among these patients, 3 million patients with health examination data from 2016 to 2021 were examined. Of these, 16,676 persons with chronic hepatitis B disease (based on ICD code) were included. The occurrence of new decompensation (encephalopathy, ascites, varices) and HCC during the observation period was examined.
Results: The mean age of the 16676 patients was 51.4 years and 69.2% were male. 3575 (21.4%) were taking nucleic acid analogues (NA). New decompensation occurred in 503 patients (3.0%) and new HCC in 116 patients (0.7%) during the observation period. The 3- and 5-year HCC incidence rates were 0.9% and 1.1%, and the 3- and 5-year decompensation rates were 2.1% and 2.9%. The 5-year HCC incidence was 3.1% and 0.6% in patients with and without NA, respectively. Although patients with NA had a significantly higher incidence of HCC, HCC was also observed in patients without NA. Age, male gender (hazard ratio [HR]: 1.4), NA administration (HR: 5.3), and alanine aminotransferase (ALT) >20 IU/L (HR: 1.5) were significant factors associated with the development of HCC. The 3- and 5-year decompensation rates were 4.1% and 5.2% in patients with NA and 1.5% and 2.1% in patients without NA, respectively. The significant factors associated with decompensation were age, male gender (HR: 1.4), NA administration (HR: 2.4), and ALT >20 IU/L (HR: 1.7). When patients without NA were stratified by ALT level, the 3- and 5-year decompensation rates were 1.3% and 1.8% in patients with ALT ≤20 IU/L and 1.8% and 2.4% in patients with ALT >20 IU/L. The incidence of decompensation was higher in patients with ALT >20 IU/L (p = 0.01).

Conclusion: NA was introduced in high-risk cases for the development of HCC and decompensation. On the other hand, a small number of cases without NA also developed HCC and decompensation, suggesting the need for further verification of the identification of high-risk groups and the criteria for NA administration.

WED-190

The prognosis of hepatitis delta infections in Belgium is poor and determined by the hepatitis delta viremia

Arno Furquim d’Almeida1,2, Erwin Ho2, Liesbeth Govaerts2, Peter Michielsen2, Thomas Sersté3, Jean Delwaide4, Stefan Bourgeois5, Christophe Moreno6, Hans Van Vlierberghe7, Chantal De Galocsy8, Hans Orlent9, Michael Peeters10, Elizaveta Padalko11, Steven Van Gucht10, Thomas Vanwolleghem1,2.

1University of Antwerp, Viral Hepatitis Research Group, Laboratory of Experimental Medicine and Pediatrics, Antwerp, Belgium; 2Antwerp University Hospital, Department of Gastroenterology and Hepatology, Antwerp, Belgium; 3CHU Saint-Pierre, Department of Hepato-Gastroenterology, Brussels, Belgium; 4CHU de Liège, Department of Hepato-Gastroenterology, Liège, Belgium; 5AZ Sint-Jan, Department of Gastroenterology and Hepatology, Bruges, Belgium; 6CUB Hôpital Erasme, Department of Gastroenterology, Hepatopancreatology and Digestive Oncology, Brussels, Belgium; 7Ghent University Hospital, Department of Gastroenterology, Ghent, Belgium; 8Hôpitaux Iris Sud Bruxoeps, Department of Gastroenterology and Hepatology, Brussels, Belgium; 9AZ Sint-Jan, Department of Gastroenterology and Hepatology, Sint-Jan, Department of Gastroenterology and Hepatology, Brussels, Belgium; 10Sciensano, Infectious Diseases in Humans, Viral Diseases, National Reference Centre of Hepatitis Viruses, Brussels, Belgium; 11Ghent University Hospital, Laboratory of Medical Microbiology, Ghent, Belgium.

Email: thomas.vanwolleghem@uza.be

Background and aims: Hepatitis B virus (HBV)-hepatitis delta virus (HDV) co-infection is considered the most severe form of chronic viral hepatitis and remains a major global health problem worldwide. Long-term studies that investigate the disease severity are of crucial importance to identify the factors that define the prognosis of this population.

Method: In the present study we retrospectively performed a medical chart review of hepatitis delta patients seen at 8 Belgian hospitals. All relevant data was uniformly collected from July 2001 until January 2023. The inclusion criteria were a) HBsAg or HBV DNA positive at admission; b) anti-HDV or HDV RNA positive; c) at least 1 follow-up visit.

Results: A total of 138 patients were included. The patients were predominantly male (64.5%), had a median age of 36.6 years and had a median follow-up of 5.4 (max 20.4) years. 35.6%, 47.8% and 16.7% of patients respectively were from African, Caucasian and Asian descent. The last available HDV RNA was positive in 80/120 (66.7%) patients. Cirrhosis was diagnosed in 40.6% (52/128) of the patients using liver biopsy (n = 27), liver stiffness measurement (n = 19) or the combination of clinical and radiological findings (n = 6) and did not differ between ethnicity groups (p = 0.06). A total of 33 patients (23.9%) had at least one severe adverse outcome during follow-up: 27 liver decompensations (19.6%), 12 HCCs (8.7%), 10 liver transplantations (7.2%) and 9 deaths (6.5%). Patients of Caucasian ethnicity had more frequently an adverse outcome than the other ethnicities (p = 0.04). The median AST, ALT and MELD score at admission were 55 (range 9-1735) U/L, 62 (range 13-5463) U/L and 7.9 (range 6–37) respectively. Cirrhosis was diagnosed in 40.6% (52/128) of the patients using liver biopsy (n = 27), liver stiffness measurement (n = 19) or the combination of clinical and radiological findings (n = 6) and did not differ between ethnicity groups (p = 0.06). A total of 33 patients (23.9%) had at least one severe adverse outcome during follow-up: 27 liver decompensations (19.6%), 12 HCCs (8.7%), 10 liver transplantations (7.2%) and 9 deaths (6.5%). Patients of Caucasian ethnicity had more frequently an adverse outcome than the other ethnicities (p = 0.04). The mean age at time of outcome was 48.6 years. The 1-, 5- and 10-year cumulative outcome probability is 8%, 15% and 49% respectively. The last available HDV RNA was positive in 80/120 (66.7%) patients. These patients had a higher AST (89 vs 49 U/L, p <0.001), ALT (121 vs 61 U/L, p <0.001) at admission and had more frequently cirrhosis (46.7% vs 24.3%, p = 0.02) than the patients with a negative last HDV
RNA. There was no significant difference in gender \((p = 0.11)\), age \((p = 0.74)\) and MELD score at admission \((p = 0.08)\) between these groups. A detectable HDV viremia at last evaluation was associated with a higher frequency of severe adverse outcomes compared to patients without HDV viremia (1.1, 5.5- and 10-year cumulative outcome probabilities of 10% vs 0%, 18% vs 4% and 50% vs 14% respectively; Kaplan Meier \(p = 0.005\)). In addition, having a negative HDV RNA at any point during follow-up was associated with not having an outcome \((p = 0.009)\).

**Conclusion:** In this real-world national cohort study, approximately half of HBV-HDV co-infected patients develop a severe liver-related outcome within 10 years of diagnosis. Caucasian patients and those with a positive HDV RNA have a worse prognosis during long-term follow-up.

**WED-191**

Assessment of clinical and patient reported outcome measures in individuals with chronic hepatitis B who clear HBsAg, followed by the Canadian hepatitis B network

Carla Coffin1,2,3, Magdy Elkhashab4, Karen Doucette5, Scott K Fung4, Ainhoa Ramji2, Hin Hlin Ko7, Carla Osioswy1, Pamela Crotty1, Anna Mankol3, Chad Saunders6, Eric Chan10, Angelina Villasis Keever10, TianYan Chen11, Sebastien Poulin12, Julie Zhu13, Mang M13, Curtis Cooper14,1, University of Calgary, Department of Medicine, Canada; 12University of Calgary, Cumming School of Medicine, Calgary, Canada; 13Dalhousie University, Division of Gastroenterology, Halifax, Canada; 14University of Ottawa, Department of Medicine, Canada

**Method:** In this ongoing multi-centre 3-year prospective cohort study, 42 completed 1 year follow-up (median age 55.3, 95% CI 52.8, 57.5), 41.6% Female, 61% Asian, 17% Black, 17% White. NAFLD and diabetes occurred in 22% (17/77) and 10.4% (8/77), respectively. 57% had prior antiviral therapy (mean 5 years, 3.3, 6.7). 68% were born endemic area, 29% infant/childhood acquisition, and 3% adult acquired (sexual, drug use, or unknown). Participants with recent HBsAg loss reported 28% improvement in HRQoL. Patient perspectives are important to consider in assessing benefits of a functional cure.

**Results:** In 77 participants enrolled to date, 42 completed 1 year follow-up (median age 55.3, 95% CI 52.8, 57.5), 41.6% Female, 61% Asian, 17% Black, 17% White. NAFLD and diabetes occurred in 22% (17/77) and 10.4% (8/77), respectively. 57% had prior antiviral therapy (mean 5 years, 3.3, 6.7). 68% were born endemic area, 29% infant/childhood acquisition, and 3% adult acquired (sexual, drug use, or unknown). Participants with recent HBsAg loss reported 28% improvement in HRQoL. Patient perspectives are important to consider in assessing benefits of a functional cure.

**Conclusion:** In this prospective cohort study of ethnically diverse CHB patients, participants who achieve HBsAg loss reported improved HRQoL. Patient perspectives are important to consider in assessing benefits of a functional cure.
storage temperatures, except of S samples stored at 42°C. At 4°C, the most stable HBV RNA concentrations over time occurred in WB P samples (median decrease $-62.5$ c/ml). The maximum median decrease was $-4465$ c/ml (169 hours after BL in S samples). In contrast, 169 h after BL the maximum decrease in median HBV RNA level was $-104200$ c/ml at 25°C and $-165431$ c/ml at 42°C, respectively.

Number of samples with detectable HBV RNA (copies/ml) sorted by subgroups of HBV RNA <titer min, HBV RNA levels $\geq 10$–100 copies/ml and >100 copies/ml, respectively at A) 4°C, B) 25°C and C) 42°C storage condition. Red lines represent median level of HBV RNA, underlined numbers represent median BL level of HBV RNA in copies/ml, not underlined numbers represent the median change in HBV RNA levels compared to BL. Statistically significant changes of RNA level is expressed in red. Brackets indicate a statistically significant decrease in number of samples with detectable HBV RNA.

Conclusion: A qualitative detection of HBV RNA is feasible in samples with >100 c/ml up to 48 h under storage temperatures of 4–42°C. For most stable quantitative HBV RNA values storage at 4°C should be preferred.
WED-194
Barriers to hepatitis B treatment from the patient’s perspectives: survey study by the Canadian hepatitis B network

Hin Hin Ko1, Curtis Cooper2, Anna Manko3, Alnoor Ramji1, Chad Saunders4, Abdel Aziz Shaheen5, Carla Coffin4, 1University of British Columbia, Division of Gastroenterology, Canada; 2University of Ottawa, Department of Medicine, Canada; 3University of Calgary, Department of Medicine, Canada; 4University of Calgary, Haskayne School of Business, Canada

Email: hinnih@gmail.com

Background and aims: Although Canada has a universal health care system, this does not include prescription drug benefits, which vary according to provincial health jurisdiction. There are systemic factors impacting access to treatment leading to poor outcomes. Our previous study has shown undertreatment in patients with chronic hepatitis B who meet treatment guideline criteria. The goal of this survey study is to determine barriers to Hep B treatment from the patient’s perspectives.

Method: In this study, an in-person survey was conducted in three specialist hepatology infectious disease clinics for Hep B patients involved in the Canadian HBV Network. Patients’ clinical and demographic variables, their knowledge and perception of Hep B and treatment were collected in the survey. Data analyses were performed using SPSS statistics.

Results: Of 83 patient respondents to date from one jurisdiction, 58% (n = 48) were in the 40–59 age group, 50.6% (n = 42) were male. 79.5% (n = 66) were employed and 68.3% (n = 55) worked full time. 25.3% (n = 21) did not have any extended health coverage. 48.2% (n = 40) were employed and 66.3% (n = 55) worked full time. 25.3% (n = 21) did not have any extended health coverage. 48.2% (n = 40) were employed and 66.3% (n = 55) worked full time.

Discussion: In this ongoing survey study of CHB population in Canada, about one fifth of the patients would not accept treatment despite physician’s recommendations. Lower drug costs, treatment with limited side effects and shorter duration might potentially reduce barriers in people willing to accept treatment.

WED-195
Driving improvements in hepatitis B care in Africa: profile of the hepatitis B in Africa collaborative network (HEPSANET)

Nicholas Riches1,2, Michael Vinikoor3, Alice N. Guingané4, Asgeir Johannessen5, Maud Lemoiné6, Philippa Matthews7, Edith Okeke8, Yusuke Shimakawa9, Roger Sombie10, Alexander Stockdale11, Gilles Wandelé12, Monique Andersson13, Dawar Pantong Mark14, Hailemichael Desalegn15, Mary John Duguru14, Fatou Fall16, Tongai Gibson Maponga17, David Nyam P14, Moussa Seydil18, Edford Sinkala3, Jantjie Taljaard19, Mark Sonderup20, Wendy Spearman20, 1Malawi Epidemiology and Intervention Research Unit, Malawi; 2Liverpool School of Tropical Medicine, Department of Clinical Sciences, Liverpool, United Kingdom; 3University of Zambia, Department of Internal Medicine, Lusaka, Zambia; 4Bogodogo University Hospital Center, Hepato-Gastroenterology Department, Ouagadougou, Burkina Faso; 5University of Oslo, Institute of Clinical Medicine, Oslo, Norway; 6Imperial College London, Department of Metabolism, Digestion and Reproduction, London, United Kingdom; 7University of Oxford, Nuffield Department of Medicine, Oxford, United Kingdom; 8University of Jos, Faculty of Medical Sciences, Jos, United Kingdom; 9Institut Pasteur, Unité d’Épidémiologie des Maladies Emergentes, Paris, France; 10Yalgado Ouédraogo University Hospital Center, Ouagadougou, Burkina Faso; 11University of Liverpool, Department of Clinical Infection, Microbiology and Immunology, Liverpool, United Kingdom; 12University of Bern, Institute of Social and Preventive Medicine, Bern, Switzerland; 13Stellenbosch University, Division of Medical Virology, Cape Town, South Africa; 14University of Jos, Faculty of Medical Sciences, Jos, Nigeria; 15St Paul’s Hospital Millennium Medical College, Medical Department, Addis Ababa, Ethiopia; 16Hospital
**Background and aims:** There are approximately one million new cases of chronic hepatitis B virus (HBV) infection each year in the WHO African region, corresponding to two-thirds of all new infections globally. To achieve global elimination of HBV, Africa must be designated a priority region for future research and interventions. Improved understanding of the natural history of HBV in Africa is needed, since disease patterns may be determined by differences in natural history, circulating genotypes, environmental exposures and coinfections. With seed funding from EASL, the Hepatitis B in Africa collaborative network (HEPSANET) was founded to close gaps in knowledge around HBV in Africa.

**Method:** A systematic review was conducted to identify established and high-quality HBV cohorts in Africa, and those identified were invited to participate. A modified Delphi exercise was conducted with HBV experts across the region to identify research priorities for the initial period of HEPSANET. Ten research priorities were agreed by consensus, with the leading priority being to establish a longitudinal research cohort of people living with chronic HBV in Africa. Working groups for hepatocellular carcinoma, prevention of mother to child transmission, and data harmonization were formed. Baseline data from participating sites were shared. We described HEPSANET research priorities, site characteristics, patient-level demographics and HBV clinical features.

**Results:** As of October 2022, 13 cohorts representing sites from eight African countries and three regions (East, West, and Southern) had joined HEPSANET and shared their data. An initial cohort of 4,173 participants was analyzed. Median age of the cohort is 34 years (IQR 28–42), 38.8% are women, with 81.3% of cases identified through asymptomatic testing. 9.6% of the cohort are HBeAg-positive, 33.1% have HBV DNA >2000 IU/ml, and 14.3% are cirrhotic based on transient elastography. Among the 692 with chronic hepatitis (i.e., elevation of both ALT and HBV DNA), the majority (72.8%) were HBeAg-negative.

**Conclusion:** To address the dearth of longitudinal HBV data in Africa, HEPSANET is combining data from HBV cohorts throughout Africa for the first time. Improved understanding of HBV epidemiology in Africa will lead to better approaches to HBV case finding, care models, and treatment strategies, including with emerging curative therapies. Procedures are now being established to expand this cohort and to allow for collection of longitudinal follow-up data.

**WED-196**

Risk factors for viral reactivation in patients with overt or occult Hepatitis B virus infection receiving immunosuppressive treatments: a systematic review and meta-analysis

Ciro Celsa1, Giacomo Emanuele Maria Rizzo1, Gabriele Rancatore1, Pietro Graceffa1, Giuseppe Falco1, Gabriele Di Maria1, Marco Vaccaro1, Marco Enea1, Vincenza Calvaruso1, Calogero Camma1, Vito Di Marco1, Ciro Celsa1, Giacomo Emanuele Maria Rizzo1, Gabriele Rancatore1, Pietro Graceffa1, Giuseppe Falco1, Gabriele Di Maria1, Marco Vaccaro1, Marco Enea1, Vincenza Calvaruso1, Calogero Camma1, Vito Di Marco1.

1Section of Gastroenterology and Hepatology, PROMISE Department, University of Palermo, Italy

**Background and aims:** Patients with Hepatitis B virus (HBV) infection receiving immunosuppressive treatments are at risk of HBV reactivation (rHBV). We performed a systematic review with meta-analysis to estimate the risk of rHBV among patients naïve to antiviral prophylaxis and to identify factors associated with rHBV.

**Method:** Studies of immunosuppressive treatments in HBV patients were identified through literature search using PubMed, MEDLINE, and EMBASE until October 2022. Pooled estimates were obtained using random-effects model. Subgroup analyses were performed according to viral status, drug class and underlying disease. Decision curve analysis (DCA) was used to identify the threshold probability associated with the best net benefit of administering prophylaxis with nucleos(t)ide analogues (NAs) in HBsAg negative anti–Hbc positive patients.

**Results:** Seventy-nine studies (48 retrospective and 31 prospective) were selected, including 9946 patients (1108 HBsAg positive, 8203 anti-Hbc positive and 635 isolated anti–HBs positive). Pooled rHBV rate was 6% (95% CI 5–8%; I² 79%; p < 0.001) with a rate of 23% (95% CI...
POSTER PRESENTATIONS

WED-197

T-cell responses to PreS1 and PreS2 are correlated to anti-HBs antibody titres, which are higher and persist longer in volunteers vaccinated with 3-antigen than with 1-antigen hepatitis B vaccine in the PROTECT Study: 3.5 year follow-up

Francisco Diaz-Mitoma1, Timo Vesikari2, Tamara Berthoud2, Daniel Plaksin3, David Anderson3, Vlad Popovic3, VBI Vaccines, Inc, Ottawa, Canada; 2Tampereen Rautatieasema, Tampere, Finland; 3VBI Vaccines Inc., Cambridge, United States

Email: fdiazmitoma@vbiworld.com

Background and aims: PreHevbri is a 3-antigen hepatitis B vaccine containing S, PreS1 and PreS2 HBV envelope antigens and Engerix is a 1-antigen HBV vaccine containing the S Ag. PreS antigens have CD4+ T-cell epitopes which may mediate the improved antibody response against HBsAg after vaccination with PreHevbri. This study aimed to find the relationship between T-cell activation and induction and persistence of antibody responses after HBV immunization in a Phase 3 study (PROTECT) that compared the immunogenicity of these vaccines and followed volunteers for 3.5 years post vaccination.

Method: Statistical comparisons and correlation analysis between anti-HBs titer and cultured interferon (IFN)-gamma ELISPOT or stimulation index were measured after the 2nd and 3rd vaccination with PreHevbri or with Engerix in a subset of participants (n = 80) in the PROTECT study (N = 1,607). An additional subset of volunteers (N = 347) was followed with antibody titers 3.5 years postvaccination.

Results: Following the third vaccination, there was a statistically significant correlation between anti-HBs titer and cultured interferon (IFN)-gamma ELISPOT responses to pre-S1 (Pearson’s Coefficient = 0.39, p = 0.0137) and pre-S2 (Pearson’s Coefficient = 0.33, p = 0.0363), and a trend toward significance between anti-HBs titers and the elispot response to HBsAg (Pearson’s Coefficient = 0.31, p = 0.0534) in the PreHevbri arm. In contrast, in Engerix-B-vaccinated subjects, a statistically significant correlation was seen only between anti-HBs titer and ELISPOT responses to HBsAg (Pearson’s Coefficient = 0.46, p = 0.0026) and no correlation with ELISPOT responses to pre-S1 or pre-S2. The difference in adjusted mean frequency of IFN-γ-secreting SFU/million PBMCs was statistically significant (p < 0.05) and greater in PreHevbri arm. These responses to pre-S1 and pre-S2 at Day 35 (7 days post second vaccination) in the Sci-B-Vac group correlated with anti-HBs titer at Day 56 (4 weeks post second vaccination), 168 (20 weeks post second vaccination) and 196. (4 weeks post 3rd Vaccination) No such correlations to pre-S1 and pre-S2 were seen in the Engerix-B group.

Conclusion: This meta-analyses provided consistent results that all HBsAg positive patients should receive NAs prophylaxis. Our decision curve analysis in anti-HBs positive patients provided evidence that in patients with cancer treated with chemotherapy, NAs prophylaxis should be recommended, while in patients with cancer treated with targeted therapies either monitoring or NAs prophylaxis could be appropriate. In patients with cancer treated with monoclonal antibodies and in patients with autoimmune diseases, monitoring and on-demand NAs should be recommended.

WED-198

Baseline hepatocyte ballooning is a risk factor for adverse events in patients with chronic hepatitis B complicated with non-alcoholic fatty liver disease

Youwen Tan1, Wang Jiaming1. The Third Hospital of Zhenjiang Affiliated Jiangsu University, China

Email: tyw915@sina.com

Background and aims: To study the effect of non-alcoholic fatty liver disease (NAFLD) confirmed by liver pathology on the outcome of long-term serious adverse events (cirrhosis, hepatocellular carcinoma (HCC), and death) in patients with chronic hepatitis B (CHB) virus infection.

Method: Patients with chronic hepatitis B virus (HBV) infection who underwent liver biopsy at the Third People’s Hospital of Zhenjiang Affiliated Jiangsu University between January 2005 and September 2020 were enrolled. Baseline clinical and pathological data on liver pathology and clinical data at the end of follow-up were collected. Propensity score matching (PSM) was used to balance the baseline parameters, Kaplan-Meier (K-M) survival analysis was used to evaluate the risk of clinical events, and Cox regression was used to analyze the risk factors of events.

Results: Overall, 456 patients with chronic HBV infection were included in the study, of whom 152 (33.3%) had histologically confirmed NAFLD. The median follow-up time of the entire cohort was 70.5 months. Excluding 67 patients with cirrhosis at baseline, 34 developed cirrhosis, which was diagnosed using ultrasound during the follow-up period. K-M survival analysis showed that NAFLD was not significantly associated with the risk of cirrhosis (log-rank test, P > 0.05). Patients with CHB with fibrosis at baseline were more prone to cirrhosis (log-rank test, P = 0.046). After PSM, multivariate analysis showed that diabetes mellitus, ballooning deformation (BD), and platelet (PLT) were independent risk factors for cirrhosis diagnosed using ultrasound (P < 0.05). A total of 10 patients (2.2%) developed HCC and six patients were in the combined NAFLD group. The median interval between liver biopsy and HCC diagnosis was 100.5 months. K-M survival analysis showed that the cumulative risk of HCC in the NAFLD group was significantly higher (log-rank test, P < 0.05). Lobular inflammation, hepatocyte ballooning, and severe liver fibrosis were also associated with an increased risk of HCC (log-rank test, all P < 0.05). Cox multivariate analysis revealed that hepatocyte ballooning, liver fibrosis, and diabetes mellitus were independent risk factors for HCC.

Conclusion: There was no significant correlation between chronic HBV infection and risk of cirrhosis in patients with NAFLD. Diabetes mellitus, BD, and PLT were independent risk factors for liver cirrhosis. Patients with chronic HBV infection and non-alcoholic steatohepatitis (NASH) have an increased risk of HCC. BD, liver fibrosis, and diabetes mellitus are independent risk factors for HCC.
WED-199
Epidemiological landscape and clinical spectrum of chronic hepatitis B in East Africa
Abate Shewaye1,2, Amir Sultan1,2, Zebeaman Tibebu Gorfu2, Rabia Redi1,2.1Addis Ababa University, College of Health Sciences, Department of Internal Medicine, Addis Ababa, Ethiopia; 2Adera Medical and Surgical Center, Department of Internal Medicine, Addis Ababa, Ethiopia
Email: gzebeaman@gmail.com

Background and aims: According to WHO global report, 296 million people were living with chronic hepatitis B (CHB) infection in 2019, with 1.5 million new infections each year. Nearly 45% of the world’s population lives in regions of chronic hepatitis B virus (HBV) endemicity, of which highest percentage is in sub-Saharan Africa including Ethiopia. Fortunately, vaccine and antiviral therapy for CHB has been shown to be effective in preventing the infection and its complications. Thus, this study aims to assess the sociodemographic, clinical and epidemiological pattern of patients with chronic hepatitis B seen at Adera Medical Center, in Addis Ababa, Ethiopia.

Method: Four hundred-three patients were enrolled in this cross-sectional study. Sociodemographic, clinical, and laboratory and imaging parameters were collected and analyzed using SPSS (SPSS, Version 23)

Results: CHB was twice more prevalent amongst males with mean age of 37.96 ± 10.94. Seventeen patients developed HCC, while five patients died; four of whom were HCC patients and one developed Hepatic Encephalopathy. HCV and HIV coinfected patients accounted for 2.2% and 1.7% of the study population. HBeAg seropositivity was only 6.5%. Majority (60%) were from Addis Ababa followed by Jijiga, Zeway, and Harar regions. Poor outcomes were noted among older patients (>65 years) with chronic hepatitis B infection (p < 0.01).

Conclusion: Majority of our patients (93.5%) were HBeAg negative indicating childhood chronic HBV infection. Male predominance and clustering of CHB in south east Ethiopia was witnessed in our study. Chronic HBV complications like cirrhosis and HCC are more common among elderly patients (>65 yrs) resulting in poorer outcome (p < 0.01).
Results: Among 6,002 patients diagnosed with HDV during the pre- and post-HDV diagnosis period, we identified those with a diagnosis of compensated cirrhosis, 12% had decompensated cirrhosis, 5% had other liver-related complications, and the remaining 80% had no liver-related complications. At HDV diagnosis, 13% had a comorbidity index score ≥ 2.

Method: Adult patients with HDV infection in the United States;7Yale University School of Medicine, New Haven, United States;2VA Palo Alto Healthcare System, Palo Alto, United States;3Hepatitis B Foundation, Doylestown, United States;4Gilead Sciences, Inc., HEOR-Global Value and Access, Foster City, United States;5Gilead Sciences, Inc., RWE-Epidemiology, Foster City, United States;6NYU Grossman School of Medicine, New York, United States;7Yale University School of Medicine, New Haven, United States

Email: ankita.caushik@gilead.com

Background and aims: Hepatitis delta virus (HDV) is associated with more rapid progression to cirrhosis and liver-related complications compared with other hepatitis virus infections. Baseline (BL) characteristics, healthcare resource use (HCRU), and costs among commercially insured adults with HDV infection in the US were examined.

Method: Adult patients with ≥ 1 HDV or HBV diagnosis (ICD-9/10-CM) were identified retrospectively from 1 Jan 2013 to 31 Dec 2021 (study period) using the IQVIA PharMetrics Plus database covering ≥ 210 million patients from primarily commercial payers. HDV patients were identified from 1 Jan 2014 to 31 Dec 2020 (identification period) and defined as those who had ≥ 1 inpatient or ≥ 2 outpatient claims ≥ 30 days apart with an ICD-9/10-CM diagnosis code for HDV during the identification period (earliest date of diagnosis considered index date), ≥ 1 claim of HBV diagnosis during BL (12-month period prior to index date), and no claims with HDV diagnosis during BL. Continuous enrollment for ≥ 12 months before and after the index date was required, and patients aged ≥ 18 years at index with commercial health plans were included. Patient characteristics were assessed over the BL period and mean per patient per year (PPPY) all-cause HCRU and costs were compared in the 12 months pre- and post-HDV diagnosis.

Results: Among 6,002 patients diagnosed with HDV during the identification period, 440 met inclusion criteria. Baseline characteristics: mean (SD) age, 50.3 (10.50); 65% males; mean (SD) Charlson Comorbidity Index score, 1.97 (2.35). At HDV diagnosis, 13% had compensated cirrhosis, 12% had decompensated cirrhosis, 5% had hepaticcellular carcinoma, and 4% had history of liver transplant. Other comorbidities included hypertension (33%), obesity (8%), non-alcoholic steatohepatitis (7%), and hepatitis C (6%). Mean PPPY all-cause total HCRU was significantly greater post-HDV diagnosis vs pre-HDV diagnosis (29.8 vs 24.1, p < .0001), driven primarily by significantly increased outpatient visits (8.6 vs 5.5, p < .0001), physician office visits (10.8 vs 9.2, p < .0001), and pharmacy claims (13.5 vs 11.6, p < .001). Mean PPPY all-cause total healthcare costs were significantly greater post-HDV diagnosis vs pre-HDV diagnosis ($11197 vs $9281, p < .005), due to increases in total medical costs, including outpatient ($2471 vs $1650, p < .0005) and physician office ($1784 vs $1697, p < .01) costs.

Conclusion: Over 20% of commercially insured HDV patients had already developed cirrhosis or liver-related complications at time of diagnosis. Following HDV diagnosis, approximately 6 more visits and claims amounting to $1916 were observed. These findings underscore the need for more effective strategies for screening, diagnosis, linkage to care, and treatment of HDV-infected patients, to decrease the burden of disease for patients and the healthcare system.

Background and aims: The use of aspirin in hepatocellular carcinoma (HCC) prevention is still uncertain in patients with hepatitis B virus (HBV)-related cirrhosis. In addition, results regarding whether the risk of gastrointestinal (GI) bleeding is associated with aspirin use in patients with HBV related cirrhosis are controversial. Accordingly, we investigated the association between aspirin use and the risks of HCC and GI bleeding in HBV-related cirrhosis patients using a nationwide cohort.

Method: We conducted a 3-year landmark analysis using nationwide cohort data from the National Health Insurance Service of South Korea. Patients with diagnosed with compensated HBV-related cirrhosis in 2005–2017 were included. Patients who were prescribed aspirin for at least 90 days consecutively during the 3-year exposure period were classified as the aspirin-treated group. A propensity-score matching analysis was applied to balance the aspirin-treated and untreated groups. Using Cox proportional hazard regression analysis, we estimated the risks of HCC and GI bleeding, accounting for competing events.

Results: A total of 12,687 patients (608 aspirin-treated and 12,079 untreated) were included in the analysis. During a median of 7.6 years of follow-up, HCC developed in 219 (3.6%) patients of the aspirin-treated group and 4,265 (35.3%) patients of the untreated group. After multivariate adjustment, the aspirin-treated group showed a significantly lower risk of HCC than the untreated group (adjusted hazard ratio [aHR] = 0.84, 95% confidence interval [CI] = 0.73–0.96; P = 0.013). GI bleeding developed in 157 (25.8%) of the aspirin-treated group and 2072 (17.2%) of the untreated group. The aspirin-treated group showed a significantly higher risk of GI bleeding than the untreated group (aHR = 1.21, 95% CI = 1.03–1.43; P = 0.021). After propensity-score matching, the cumulative incidence rate of HCC was significantly lower in the aspirin-treated group than the untreated group (P = 0.013, log-rank test). Whereas, the cumulative incidence rate of GI bleeding was significantly higher in the aspirin-treated group than the untreated group (P = 0.025, log-rank test).

Conclusion: In patients with HBV-related cirrhosis, the aspirin-treated group showed a significantly lower risk of HCC than the untreated group, whereas the risk of GI bleeding was significantly higher in the aspirin-treated group.
Background and aims: Hepatic steatosis is likely to become a leading cause of liver related mortality, and can have a significant impact on the progression of liver disease in the setting of chronic hepatitis B (HBV) and HIV/HBV co-infection. It can be measured using controlled attenuation parameter (CAP), a simple non-invasive test, at the same time as fibrosis assessment by transient elastography. We aimed to describe the prevalence of steatosis in a cohort of adults with HBV and HIV/HBV co-infection, undergoing routine assessment in a central London clinic.

Methods: We performed a retrospective analysis of adults with HBV (including mono-infected and HIV co-infected) who had had CAP measured by Fibroscan® (Echosens) between 1/2017 – 10/2022. We used CAP scores to categorise steatosis as: S0 <230 dB/m; S1 230–264 dB/m; S2/3 ≥264 dB/m; and as a continuous scale in a univariate analysis. We investigated for relationships between CAP scores and liver outcomes (based on alanine transaminase [ALT] and fibrosis score on transient elastography), and age, sex, body mass index (BMI), HIV status and ethnicity.

Results: We reviewed data for 182 patients (80% male; median age 48 years [IQR 39 – 56]). Ethnicities categorised as 43% White, 30% Black, 10% Asian, remainder mixed/not stated. 99 (54%) had HBV/HIV co-infection. 56% had a BMI ≥25 kg/m². Evidence of steatosis was present in 45%, with 20% classified as S1, and 25% stage S2/S3. Median ALT was 23 (IQR 23 – 41) IU/L. CAP scores were not significantly associated with HIV status (figure 1), sex, or ethnicity, but increased with age (p = 0.009) and increased BMI (p < 0.0001). Increasing CAP scores were significantly associated with higher ALT (p = 0.02) and elevated fibrosis scores (p = 0.0003).

Conclusion: We identified a high prevalence of steatosis in our diverse cohort of adults living with HBV, however HIV co-infection was not associated with an increased risk of steatosis in our cohort, which warrants further investigation. We demonstrate that steatosis may contribute to adverse liver outcomes, and as steatosis is a modifiable cause of fibrotic/inflammatory liver disease, further efforts are required to determine its impact and deliver interventions to lower risk in people living with HBV. This is particularly important as people living with HBV and HIV/HBV co-infection are often excluded from therapeutic trials for steatosis.

Background and aims: In Italy, HDV-prevalence and its fluctuations over time are controversial while an extensive characterization of HDV-infected patients (pts) is missing. Here, we assess HDV-seroprevalence in a large cohort of HBsAg-positive pts, followed in Central Italy over time, and the epidemiological/virological characteristics of HDV-infected pts.
Method: This study included 1579 consecutive and well-characterized HBsAg-positive pts, followed in different clinical centers of Central Italy from 2005 to 2022. Factors (demographics, transaminases, HBeAg status) correlated with the lack of HDV screening were defined by multivariable model. HDV sub-genotypes were defined by phylogenetic-analysis.

Results: Most HBsAg-positive pts were male (67%) and Italian (59.4%) with a median (IQR) age of 47 (35–60) years. 75% of pts were HBeAg-negative, median (IQR) serum HBV-DNA and HBsAg were 3.1 (2.8–4.1) IU/ml and 3499 (618–11662) IU/ml, while median ALT was 42 (26–78) U/L. Overall, 45.3% (715/1579) received HDV-screening with an increasing temporal-trend: 17.1% (2005–2010), 43.2% (2011–2015), 56.5% (2016–2019), 75.8% (2020–2022), suggesting a higher awareness towards HDV-screening in recent years. By multivariable model, normal ALT was the only independent factor significantly correlated with the lack of HDV-screening (OR [95%CI]: 1.71 [1.29–2.30], P < 0.001). Notably, 13.4% (96/715) of HDV-screened pts resulted anti-HDV+ with a stable temporal trend: 10.7% (2005–2010), 15.6% (2011–2015), 10.8% (2016–2019), 10% (2020–2022). Among them, 80.5% had detectable HDV-RNA (median [IQR] log: 4.6 [3.6–5.6] copies/ml) with altered ALT in 89.3% (median [IQR]: 92 [62–177] U/L). Anti-HDV positivity was higher in pts from Eastern Europe than from Italy (23.6% vs 12.9%, P = 0.002) and remained stable over time in both groups. Notably, anti-HDV+ pts from Eastern Europe were younger (44 [37–54] vs 53 [47–62] years, P < 0.001) with higher HDV-RNA (4.8 [3.6–5.8] vs 3.9 [1.4–4.9] copies/ml, P = 0.016) and HBsAg (9,461 [4,159–24,532] vs 4,447 [737–13,336] IU/ml, P = 0.032), indicating more pronounced HDV replicative activity. Phylogenetic analysis revealed the circulation of HDV sub-genotype 1a (25.9%), 1b (33.4%), 1c (25.9) and 1d (14.8%). Notably, sub-genotype 1a and 1c correlated with 3xULN ALT compared to 1b and 1d (75% versus 27.3%, P = 0.039).

Conclusion: The awareness to request HDV-screening is increasing over time even if some gaps persist to achieve HDV-screening in all HBsAg-positive pts. The prevalence of HDV infection remains stable in both foreign and Italian pts over time. Notably, immigration from Eastern Europe contributes to fuel the circulation of HDV-strains with enhanced replication. The detection of different sub-genotypes, triggering variable inflammatory stimuli, supports the need to expand HDV molecular characterization.

WED-204
Ten years follow-up of patients with chronic hepatitis B and hepatitis D infection
Andreea Dobroaia1, Simu Razvan-Ioan1, Letitia Toma1, Ioana Tanasie1, Elena Laura Iliescu1. 1Fundeni Clinical Institute, Romania
Email: andreea.dobroaia@gmail.com

Background and aims: Hepatitis B virus (HBV) and hepatitis delta virus (HDV) infection is considered the most severe chronic viral hepatitis, due to the rapid onset of complications, such as cirrhosis and hepatocellular carcinoma. The prevalence of HDV and HBV infection is higher among patients from the Mediterranean basin, especially among those with a history of intravenous drug use. The aim of this study is to observe the evolution of the disease, the survival rate of the patients and to determine the key elements that may aid in rising the life expectancy and quality of life of the patients.

Method: We conducted a retrospective observational study on 110 patients diagnosed in our clinic with chronic HBV and HDV infection between January 2012 and December 2012. We monitored the patients for progression to cirrhosis, hepatocellular carcinoma (HCC), as well as APRI, MELD and FIB-4 scores at diagnosis. The survival rate of those patients was expressed as number of months. We only included patients in which interferon therapy was not tolerated or not indicated due to decompensated liver disease. Patients with hepatitis C or HIV co-infection, as well as patients with malignancies or other significant medical conditions with poor prognosis were excluded from the study.

Results: The mean age at diagnosis was 43.82 ± 22.91 years (range between 21 and 65 years). At the time of diagnosis, 52 patients (47.27%) were already diagnosed with cirrhosis (13 patients Child A, 26 patients Child B and 13 patients Child C), while the rest (52.72%) were classified as chronic hepatitis. 15 patients presented HCC at the
time of diagnosis (10 cirrhotic patients and 5 patients with chronic hepatitis). In cirrhotic patients, mean value of MELD was 16.34 ± 8.16, mean value of APRI was 5.28 ± 1.56, mean value of FIB-4 was 7.27 ± 4.75. During the 10 years follow-up, 70.68% of chronic hepatitis patients developed cirrhosis (41 out of 58 patients). New HCC was diagnosed in 18 patients (11 cirrhotic patients and 7 non-cirrhotic patients). Overall survival was 52.72% at 10 years (25% in the cirrhosis group and 34% in the chronic hepatitis group). Notably, only 9 patients underwent liver transplantation. Carcinogenesis rate was 26.19% in cirrhotic patients and 13.2% in non-cirrhotic patients. Increased APRI score as well as FIB-4 score and MELD at diagnosis were associated with mortality (p = 0.04, p = 0.02, p = 0.01 respectively, CI 95%).

Conclusion: While the survival rate for patients with chronic HBV and HDV infection is low, close monitoring for the development of cirrhosis and frequent HCC screening may increase overall survival and may offer bridging possibilities until liver transplantation.

WED-205

Overcoming barriers to care for Delta infected patients

Ariadna Bono1, Angela Carvalho-Gomes12, María Dolores Gómez Ruiz13, Susana Sabater Vidal4, Juan Carlos, Rodríguez Díaz2, Helena Hernández-Évole5, Antonio David Palau Canos6, Ana Forés6, Marisa Rodríguez2, María L. Molina2, Sonia Pascual3, Martin Prieto6, Marina Berenguer1237, La Fe Health Research Institute, Spain; CIBEREHD, ISCIII, Spain; La Fe Polytechnic and University Hospital, Spain; University General Hospital of Castellon, Spain; University General Hospital of Alicante, Spain; Clinical Hospital of Barcelona, Spain; University of Valencia, Spain

Email: marina.berenguer@uv.es

Background and aims: Delta hepatitis is a rare infectious disease that affects roughly 15 million people worldwide, unevenly distributed, with endemic such as the Mediterranean basin. Due to increasing worldwide migrations, changes in epidemiology have been highlighted recently. In the current setting of advanced therapies and changing epidemiology, a search and phenotyping of HDV cases are warranted. We aim to better understand the local epidemiology of HDV infection, establishing a registry of delta-infected patients in our region as well as linking to care prior undiagnosed or lost to follow-up (FU) cases.

Method: After a search of all possible HDV cases in a Spanish region, attempts were made to relink to care those lost to follow-up. Approaches were undertaken to detect all HDV infected patients in a Spanish region: (i) database search of the microbiology units for HBsAg positive results plus anti-HDV in 3 Public Healthcare Departments (those without HDV serology in the last 10 years to be further contacted for anti-HDV determination ± HDV RNA quantitation); (ii) electronic medical records software (ORION program) search from adult patients attending any of the 3 participant Hospitals (Jan 2011–Jun 2021) and codified in the system as HBV HDV.

Results: Two hundred forty-four anti-HDV cases were detected (11% of the chronic HBV patients in our Region), with similar distribution in the three hospital districts. In Hospital 1,133 anti-HDV cases were detected; of these, only 43 were patients that belonged to the Hospital Reference Area. After excluding two possible false positives (only one positive result followed by >5 negative), 41 cases (24 men, 27 European, 12 African, 1 Asian, 1 other) were revised to determine their phenotype and current linkage to care. Four had previously died (2 liver-related), 19 were adequately being followed up in the liver clinic (5 of these had undergone liver transplantation), 11 were no longer followed up in the hospital (2 Africans had left the country, 1 had moved to another city, and 8 were lost to FU: Of the latter 8, 2 out of 3 European and 1 of 5 African were re-linked to care); The reminder 7 anti-HDV + cases had never been studied and linked to care. Of these, 1 of 3 Europeans, 1 of 3 Africans and 0 of 1 Asians were eventually contacted and re-linked to care. Overall, 28% of patients without adequate local FU were relinked to care. Data on Hospital 2 and 3 will be presented at the meeting.

Conclusion: In a reference center hospital, only half of delta-infected patients are being adequately followed up. After an active search, about a third, particularly non-migrant patients can be relinked to care.
Risk stratification for hepatocellular carcinoma in patients with chronic hepatitis D

Leonie Steinhoff, Matthias Jeschke, Leonie Jochheim, Benedikt Hild, Moritz Passenberg, Hartmut Schmidt, Christoph Schramm. 1University of Duisburg-Essen, Department of gastroenterology, hepatology and transplant medicine, Essen, Germany

Email: christoph.schramm@uk-essen.de

Background and aims: Surveillance for hepatocellular carcinoma (HCC) is recommended in patients with increased risk. In recent years, scoring systems have been developed and validated in different populations but not in patients with chronic hepatitis D (CHD) to facilitate risk stratification and to identify subgroups in which surveillance can be safely omitted. We aimed to analyze performance of established scoring systems in CHD-patients.

Method: We retrospectively analyzed all patients with CHD presenting to a single tertiary center from Germany between 2012 und 2022. PAGE B, FIB-4, HCC-Rescue, CAMD, and THRI were calculated at baseline, with was defined as time of first presentation, irrespective of treatment with nucleos (t)id analoga. Patients were followed up until diagnosis of HCC, liver transplantation, or last available data, whichever came first. Patients with concomitant chronic liver disease, HCC at first presentation and with follow-up (FU) <12 months were excluded.

Results: Sixty-nine patients were identified (64% male gender, median age 41 years, IQR 36–48). Of these, 42 patients had cirrhosis (61%) and 16 patients had history of decompensation (38% of patients with cirrhosis). In the majority of patients (72.5%), FU was <5 years, whereas only 13% were followed up >10 years. During a median FU of 44 months (IQR 21–64.5), four patients developed HCC (6%) and 14 patients underwent liver transplantation (20%), accounting for an incidence of 1.2 per 100 patient years. Results for risk scores are displayed in table 1. One patient (female, age 56 years at HCC diagnosis, FU 49 months), which was categorized as low risk by all risk scores but THRI, did not have signs of cirrhosis at baseline, but histology revealed cirrhosis at time of HCC diagnosis. She had a long-standing CHD, moderate overweight, and history of kidney transplantation and ulcerative colitis, which may contributed to progression to cirrhosis.

Conclusion: FIB-4 and THRI seem most suitable for risk stratification in CHD. However, short FU and low number of patients limit results.
### Table: Risk Score and Incidence of HCC

<table>
<thead>
<tr>
<th>Risk score</th>
<th>Risk category</th>
<th>n (%)</th>
<th>HCC, n</th>
<th>FU (IQR)</th>
<th>Median FU (months)</th>
<th>Incidence per 100 py</th>
<th>Incidence per 100 py</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAGE B</td>
<td>Low</td>
<td>11 (16)</td>
<td>2</td>
<td>47.0 (24.0; 78.0)</td>
<td>2.05</td>
<td>2.05</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>44 (64)</td>
<td>2</td>
<td>44.5 (20.5; 61.0)</td>
<td>0.93</td>
<td>1.06</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>14 (20)</td>
<td>1</td>
<td>44.5 (22.5; 80.8)</td>
<td>1.49</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>FIB-4</td>
<td>Low</td>
<td>40 (58)</td>
<td>1</td>
<td>46.0 (32.3; 77.0)</td>
<td>0.49</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>29 (42)</td>
<td>3</td>
<td>33.0 (19.0; 57.5)</td>
<td>2.37</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>HCC-Rescue</td>
<td>Low</td>
<td>33 (48)</td>
<td>2</td>
<td>45.0 (32.0; 67.5)</td>
<td>1.37</td>
<td>1.37</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>26 (38)</td>
<td>1</td>
<td>48.0 (19.3; 80.8)</td>
<td>0.73</td>
<td>1.07</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>10 (15)</td>
<td>1</td>
<td>34.0 (19.5; 84.8)</td>
<td>2.01</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>CAMD</td>
<td>Low</td>
<td>22 (32)</td>
<td>1</td>
<td>45.5 (37.0; 80.3)</td>
<td>0.93</td>
<td>0.93</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>38 (55)</td>
<td>2</td>
<td>39.5 (19.5; 65.3)</td>
<td>1.15</td>
<td>1.34</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>9 (13)</td>
<td>1</td>
<td>45.0 (22.0; 98.0)</td>
<td>2.00</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>THRI</td>
<td>Low</td>
<td>6 (9)</td>
<td>0</td>
<td>40.5 (32.0; 57.8)</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>31 (45)</td>
<td>2</td>
<td>49.0 (31.0; 78.0)</td>
<td>1.10</td>
<td>1.29</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>32 (46)</td>
<td>2</td>
<td>36.5 (18.5; 51.3)</td>
<td>1.56</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

HCC = hepatocellular carcinoma; IQR = interquartile range; py = patient year

**Figure:** (abstract: WED-207).

**WED-208**

**Current status of hepatitis delta in Andalusia: multicenter study**

Marta Casado1, Annly Camelo Castillo1, Pilar Barrera Baena1, Ana Belen Pérez Jiménez2, Jose Pinazo Bandera3, Isabel Viciana3, Juan Cristobal Aguilar4, Juan Carlos, Alados Arboledas4, German José SantaMaría Rodríguez5, Carolina Freyre5, Rocio González Grande5, Begoña Palop5, Manuel Macías6, Carmen Molina Villalba6, Joaquín Salas Coronas6, M. Pilar Luzón García6, Elena Ruíz7, Teresa Cabezas Fernandez8, Pilar del Pino8, Francisco Franco Álvarez De La Luna9, Patricia Cordero9, Encarnación Ramirez Arralano9, Alvaro Giráldez Gallego9, María Carmen Lozano Domínguez9, Maria Angeles Lopez Garrido10, Antonio Sampedro11, Rocío González Grande12, Begoña Palop12, Manuel Macías13, Natalia Montiel13, Laura Castillo Molina14, Carolina Roldán14, Carmen Sendra Fernández15, Alberto De La Iglesia Salgado15, Carlota Jimeno Mate16, Maria del Carmen Domínguez16, Fernando Fernández Sánchez17, Jose Miguel Rosales Zabal17, Federico García García18. **Complejo Hospitalario de Especialidades Torrecidranas, Almería, Spain; 19 Complejo Hospitalario Regional Reina Sofia, Córdoba, Spain; 19 Complejo Hospitalario de Especialidades Virgen de la Victoria, Málaga, Spain; 19 Hospital de Especialidades de la Frontera, Jerez de la Frontera, Spain; 19 Hospital de Especialidades de Puerto Real, Puerto Real, Spain; 19 Complejo Hospitalario de Poniente, El Ejido, Spain; 19 Hospital San Cecilio, Granada, Spain; 19 Complejo Hospitalario de Especialidades Juan Ramón Jiménez, Sevilla, Spain; 19 Complejo Hospitalario Regional Virgen Macarena, Sevilla, Spain; 19 Complejo Hospitalario Regional Virgen del Rocío, Sevilla, Spain; 19 Complejo Hospitalario Regional Virgen de Las Nieves, Granada, Spain; 19 Complejo Hospitalario Regional de Málaga, Málaga, Spain; 19 Hospital Puerta del Mar, Cádiz, Spain; 19 Complejo Hospitalario de Jaén, Jaén, Spain; 19 Hospital Comarcal Infantia Elena, Huelva, Spain; Complejo Hospitalario de Especialidades Virgen de Valme, Sevilla, Spain; 19 Complejo Hospital Costa del Sol, Marbella, Spain Email: mm.casado.m@gmail.com

**Background and aims:** Chronic hepatitis delta (CHD) is the most severe form of chronic hepatitis, associated with high morbidity and mortality due to its high risk of developing cirrhosis and hepatocellular carcinoma. Its prevalence is unknown, but it is believed to affect around 5% of patients with hepatitis B in Spain. However, this percentage may vary, possibly influenced by migration from countries with higher prevalence. The development of new therapeutic alternatives could modify the management of this infection.

Our aim was to analyze the current state of diagnosis of CHD in hospitals in the autonomous community of Andalusia and describe the profile of patients with chronic infection by active hepatitis delta virus (HDV).

**Method:** Multicenter, retrospective study, in which the diagnostic workflow of hepatitis delta in the laboratory information systems (SIL) of the 17 participating centers has been analyzed. HBsAg-positive patients, with anti-delta antibodies and detection of HDV RNA, have been included. In patients with active HDV infection, demographic and clinical variables have been analyzed.

**Results:** The period between January 2018 to October 2022 has been analyzed. 17,899 HBsAg positive patients have been detected; of these, HDV serology (Ig G anti-HDV) was performed in 3314 patients (18%); 205 patients (6.2%) of those tested were anti-HDV positive; of these, HDV RNA was performed in 158 (77%) and finally, 63 patients (39.9%) were RNA-HDV positive, 1.9% of VHD determinations. Regarding the profile of our 63 viremic patients, 69% were men, with an average age of 50 years, 47% were immigrants, half of them coming from Eastern European countries. 37% had HIV or HCV coinfection and 21% history of drug use. 39% of patients had cirrhosis and of them, 6 patients had developed hepatocellular carcinoma, 21% of all viremic patients had presented some episode of decompensation, most of them ascites. 27% had portal hypertension. 40% of patients had been treated with interferon and 6 patients had been transplanted.

**Conclusion:** The prevalence of anti-HDV positive patients in Andalusia in HBAGs positive patients is 6% and 40% are viremic patients. However, HDV serology has only been performed in 18% of HBAGs-positive patients. The epidemiological profile of patients with active HDV infection has changed as almost half of the patients are immigrants, however, their morbidity remains high. With the new treatment options for HDV, and considering the benefits that the diagnosis of HDV can currently bring, its implementation in the autonomous community of Andalusia seems necessary.
**WED-209**
Treatment experience and acceptability in a UK HBV cohort- why personalised regimens may be necessary in chronic hepatitis B
Jane Abbott1,2, Patrick Kennedy1,2, Rageshri Dhairyawan1,2. 1Barts Health NHS Trust, United Kingdom; 2Queen Mary University of London, United Kingdom
Email: janeabbott85@gmail.com

**Background and aims:** Nucleos(t)ide analogues (NA) are the mainstay of treatment for Chronic Hepatitis B (CHB) and whilst they offer potent viral suppression, ultimately they are non-curative. In the context of the functional cure program, and expanding access to anti-viral therapy, it is vital to understand patient acceptability and perspective. We present preliminary results of a patient survey from a multi-ethnic CHB patient cohort.

**Method:** Patients were recruited from the Barts Health viral hepatitis service, London, UK and consented to a self-guided electronic survey. Patient experience and views on treatment were ascertained, and branch logic was used to tailor subsequent questions dependent on treatment status.

**Results:** Data are presented on the results of 55 individual patient responses. Respondents had a mean age of 42 years; 59% Male. Ethnicity was predominantly from Asian and African backgrounds: 28.3% Chinese, 20.8% Black African, 18.9% Bangladeshi. 44% of respondents had never taken antiviral therapy. Of the treatment experienced patients, n = 2 reported stopping medication due to concerns about side effects. Of patients currently on treatment (n = 34); 44% reported being careless or sometimes forgetting to take their medication. Patients not currently on treatment were asked about the factors that would influence their decision to start NA. Patients not currently on treatment were asked about the factors that would influence their decision to start NA. 83% stated the ‘benefit in terms of risk reduction’, but 83% were also concerned about treatment side effects. 66.7% stipulated the potential to stop treatment in the future, whilst 44% were worried about the cost. We asked about willingness to take different forms of treatment; 81.5% were willing to take NA daily, 60.4% were willing to take NA indefinitely. 75.9% were willing to take an approved injectable treatment. Patients were then asked what duration of this treatment would be acceptable; 3–6 months (27.5%), 6–12 months (37.5%), 12 m–2 yrs (12%) >2 years (25%).

**Conclusion:** Our results demonstrate a willingness to participate in clinical trials, and an understanding of potential benefits of treatment, which is paralleled with significant concern about side effects. Cost is also a concern. Most patients are willing to take a combination regimen to achieve functional cure but acceptability of treatment duration varies. Clear information about the rationale for treatment and patient education about drug safety may improve treatment uptake. Consultation with patients in drug development should be a vital component of the functional cure program and may usher in an era of personalised treatment regimens.

**WED-210**
Eliminating viral hepatitis one island at a time-the Hainan experience
Min Liao1, Jiao Wang1, Juan Fu1, Hui Gao1, Tao Wu1, Xuexia Zeng2, Zhijia Zhao3, Xingyang Zhou4, Feng Lin1, Biao Wu1, 1Hainan General Hospital, Haikou, China; 2Hainan Provincial Center for Disease Control and Prevention, Haikou, China; 3People’s Hospital of Baoting City, Baoting, China; 4Qionghai City Center for Disease Control and Prevention, Qionghai, China
Email: wubiao@hainmc.edu.cn

**Background and aims:** Hainan Island has the highest incidence of Hepatocellular carcinoma (HCC) in China. In 2021, HCC was the second most common cancer and the first leading cause of death from cancer in Hainan. Most of them are related to Hepatitis B and Hepatitis C in Hainan. However, low disease awareness among Hainanese and lack of disease knowledge among community Health Care Professionals (HCPs) make achieving the WHO targets a great challenge.

**Method:** Collaborating with Hainan Medical Association, Preventive Medicine Association and Hainan National Health Commission of the Hainan (NHCH), a series of activities were implemented. Education
Prevalence and predictors of HDV viremia in anti-HDV positive patients of the Hellenic multicenter Real-life Clinical Study (HERACLIS-HDV)

George Papatheodoridis1, Spilios Manolakopoulos2, Stylianos Karapanatian3, Ioannis Elefsiotis4, Dimitrios Christodoulou5, Demetrios N. Samonaki6, Melanie Deutsch7, Christos Ziratopoulos8, Christos Triantos9, Konstantinos Mimidis10, Emmanouil Manesis11, Ioannis Vlachogiannakos12, Ioannis Goulis13, Evangelos Chologristas14, Vasilis Sevastianos15, Andreas Kapa16, Nikolaos Papadopoulos17, Panagiota Ioannidou18, Georgios Germanidis19, George Giannoulis20, Dimitra Lakiotaki21, Dionisia Kogias22, Hariklia Kranidioti23, Konstantinos Zisimopoulos24, Maria Mela25, Georgios Kontos26, Paraskevi Fryll27, Chrysanthi Manolaka28, Polyxeni Agorastou29, Spyridon Pantziou30, Margarita Papatheodoridou31, Eleni Geladari32, Nikolaos Psychos33, Kalliopi Zachou34, Anna Chalkidou35, Konstantinos Zisimopoulos36, Maria Mela37, Georgios Kontos38, Ioannis Vlachogiannakos39, Andreas Kapa40, Nikolaos Papadopoulos41, Panagiota Ioannidou42, Georgios Germanidis43, George Giannoulis44, Dimitra Lakiotaki45, Dionisia Kogias46, Hariklia Kranidioti47, Konstantinos Zisimopoulos48, Maria Mela49, Georgios Kontos50, Paraskevi Fryll51, Chrysanthi Manolaka52, Polyxeni Agorastou53, Spyridon Pantziou54, Margarita Papatheodoridou55, Eleni Geladari56, Nikolaos Psychos57, Kalliopi Zachou58, Anna Chalkidou59, Konstantinos Zisimopoulos60, Maria Mela61, Georgios Kontos62, Ioannis Vlachogiannakos63, Andreas Kapa64, Nikolaos Papadopoulos65, Panagiota Ioannidou66, Georgios Germanidis67, George Giannoulis68, Dimitra Lakiotaki69, Dionisia Kogias70, Hariklia Kranidioti71, Konstantinos Zisimopoulos72, Maria Mela73, Georgios Kontos74, Paraskevi Fryll75, Chrysanthi Manolaka76, Polyxeni Agorastou77, Spyridon Pantziou78, Margarita Papatheodoridou79, Eleni Geladari80, Nikolaos Psychos81, Kalliopi Zachou82, Anna Chalkidou83, Konstantinos Zisimopoulos84, Maria Mela85, Georgios Kontos86, Ioannis Vlachogiannakos87, Andreas Kapa88, Nikolaos Papadopoulos89, Panagiota Ioannidou90, Georgios Germanidis91, George Giannoulis92, Dimitra Lakiotaki93, Dionisia Kogias94, Hariklia Kranidioti95, Konstantinos Zisimopoulos96, Maria Mela97, Georgios Kontos98, Paraskevi Fryll99, Chrysanthi Manolaka100, Polyxeni Agorastou101, Spyridon Pantziou102, Margarita Papatheodoridou103, Eleni Geladari104, Nikolaos Psychos105, Kalliopi Zachou106, Anna Chalkidou107, Anastasia Spanoudaki108, Konstantinos Thomopoulos109, George Dalekos110, 1Department of Athens "Laiko", Medical School of National and Kapodistrian University of Athens, Greece; 2Department of Internal Medicine, National and Kapodistrian University of Athens, Greece; 3Department of Infectious Diseases, National Drum Tower Hospital Clinical College of traditional Chinese and Western Medicine, Nanjing University of Chinese Medicine, Nanjing, Jiangsu, China; 4Department of Infectious Diseases, Nanjing Drum Tower Hospital, The Affiliated Hospital of Nanjing University Medical School, Nanjing, Jiangsu, China; 5Institute of Viruses and Infectious Diseases, Nanjing University, Nanjing, Jiangsu, China; 6Department of Hepatology, Huaian No. 4 People's Hospital, Huaian, Jiangsu, China; 7University Hospital of Western Attica, Agioi Anargyroi, Greece; 8University General Hospital of Larissa, Greece; 9University General Hospital of Ioannina, Greece; 10University Department of biomedical engineering, National and Kapodistrian University of Athens, Greece; 11Institute of Biomedical Sciences, National Hellenic Research Foundation, Athens, Greece; 12University General Hospital of Heraklion, Crete, Greece; 13University General Hospital of Athens, Greece; 14University General Hospital of Ioannina, Greece; 15Infectious Diseases, Nanjing Drum Tower Hospital Clinical College of traditional Chinese and Western Medicine, Nanjing University of Chinese Medicine, Nanjing, Jiangsu, China.
prediction scores of nomogram ranged from 0 to 100, patients with high scores (79.51–100) had significant higher cumulative incidence of HBeAg clearance than patients with low scores (0–79.51) in both cohorts (p < 0.05).

Conclusion: The novel nomogram provided an excellent prediction of antiviral efficacy in HBeAg-positive CHB patients after NAs treatment.

WED-213
The benefit of a local hepatitis B reactivation guideline to improve screening and prophylaxis for patients initiated on rituximab
Helen Boothman1, Kieran Reynolds1, Zainab Jadawdji1, Hannah Hesketh2, Sarah Clark1. 1St George’s Hospital, Hepatology, London, United Kingdom
Email: helen.boothman@stgeorges.nhs.uk

Background and aims: Immunosuppressant agents, especially rituximab, have the potential to cause flares and reactivation of hepatitis B virus (HBV) in patients who are currently infected or previously exposed to the virus. The European Association for the Study of the Liver (EASL) Hepatitis B guideline 20171 and a Drug Safety Update in England 20142 advise, prior to initiation of rituximab, HBV surface antigen (HBsAg) and HBV core antibody (HBcAb) should be checked and prophylaxis with tenofovir or entecavir should be initiated for any positive results. Despite national guidance, in 2016 there was a fatal HBV reactivation following rituximab at St George’s Hospital (SGH). A local guideline was developed in 2018 to highlight the risk and ensure adequate monitoring and prophylaxis. Prior to its implementation, an audit showed 67% of patients receiving rituximab had adequate HBV serology checked.

Method: Newly initiated rituximab prescriptions over a one year period in 2021/22 were identified. Serology results were reviewed to check if pre-screening and initiation of prophylaxis was completed as per the local policy.

Results: 96% of patients started on rituximab had HBV screening. However, only 82% were checked within 3 months of receiving rituximab. 14% of patients had appropriate serology results performed prior to or on the same day as receiving their first dose of rituximab. 10 patients were found to have positive HBsAg or HBcAb, 9 were initiated on prophylaxis (see Table 1).

Conclusion: The introduction of a local guideline and education sessions for specialties responsible for prescribing rituximab resulted in an improvement in HBV screening from 67% to 96%. This has also empowered clinicians to initiate prophylaxis prior to referral to the hepatology team. Despite this, further work is required to ensure the guideline is adhered to in all cases. All 4 patients with no HBV screening were paediatrics, education sessions were offered and the policy is now implemented by the paediatric teams.

References
1. Rituximab: screen for hepatitis B virus before treatment. MHRA. Published 11 December 2014.

Table 1: (abstract: WED-213): Adherence to local HBV reactivation guideline

<table>
<thead>
<tr>
<th>Prior to local guideline</th>
<th>Receiving rituximab</th>
<th>Adequate screening</th>
<th>Inadequate screening</th>
<th>HBsAg or HBcAb +ve</th>
<th>Prophylaxis initiated</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. pts</td>
<td>228</td>
<td>152</td>
<td>76</td>
<td>13</td>
<td>8</td>
</tr>
<tr>
<td>% pts</td>
<td>100</td>
<td>67</td>
<td>33</td>
<td>6</td>
<td>62</td>
</tr>
<tr>
<td>After local guideline</td>
<td>No. pts</td>
<td>106</td>
<td>102</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>% pts</td>
<td>100</td>
<td>96</td>
<td>4</td>
<td>9</td>
<td>90</td>
</tr>
</tbody>
</table>


WED-214
The comparisons of clinical relapse timing and severity after cessation of prophylactic nucleos (t)ide analogue between chronic hepatitis B patients with lymphoma receiving chemotherapy with and without Rituximab
Yen-Chun Liu1,2, Yu-Jia Shih1,2, Chao-Wei Hsu1,2, Rachel Wen-Juei Jeng1,2, Chang Gung Memorial Hospital, Linkou branch, Taiwan, Taiwan; 1College of Medicine, Chang Gung University, Taiwan, Taiwan
Email: rachel.jeng@gmail.com

Background and aims: Rituximab-based chemotherapy for hematologic malignancies has been well known for high reactivation comparing to other solid tumor chemotherapy regimen. Prophylactic nucleos (t)ide analogues (NUC) treatment is effective to prevent HBV reactivation during chemotherapy. Whether CHB with lymphoma patients will encounter different onset timing or severity of off-NUC clinical relapse after completion of chemotherapy with and without Rituximab remained unknown. The study aimed to investigate these issues.

Method: HBsAg-positive CHB patients who were diagnosed as lymphoma and had stopped prophylactic Nuc treatment for systemic chemotherapy after at least 12 weeks extended treatment duration were enrolled. In patients with detectable HBV DNA at end-of Nuc treatment (EOT), HBV reactivation was defined at least 2 log10 increase in serum HBV DNA level greater than that at EOT while in patients with undetectable HBV DNA at EOT, reactivation is defined by reappearance of HBV DNA or HBV DNA level ≥ 2000 IU/ml. Clinical relapse (CR) was defined as HBV reactivation with ALT elevation to 2 times upper limit of normal. Hepatic decompensation (HD) was defined was bilirubin ≥ 2 mg/dL and INR ≥ 1.5 with or without clinical syndrome of ascites or hepatic encephalopathy. Cox regressions were analyzed for predictors of off-therapy CR. The cumulative incidence was evaluated by Kaplan-Meier method.

Results: A total of 156 CHB patients with lymphoma were enrolled, mean age of 55-year-old, 51% male, 83% Rituximab-based regimens, and received prophylactic Nuc treatment of a median duration of 48 (range: 29–198) weeks, which the extended Nuc duration of 28 (range: 13–174) weeks. During a median of 56 months follow-up, there were 49 (31%) patients encountered CR with a median time to CR of 24 weeks, and 10 (6%) patients suffering from HD. Compared to patients without Rituximab-based regimens, those receiving Rituximab-based chemotherapy showed numerically higher 2-year cumulative CR incidence (32% vs. 23%, log-rank p = 0.314, Figure), three-fold higher peak ALT level at CR (864 vs. 282 U/L, p = 0.204), two times greater proportion of ALT ≥ 100 U/L (47% vs. 20%, p = 0.362), but comparable HD rate (6% vs. 8%, p = 0.673) and comparable timing to CR (23 vs. 24 weeks, p = 0.574). Multivariate cox regression showed male (adjusted hazard ratio (aHR): 1.855, p = 0.049), use of less potent Nuc rather than ETV or TDF (versus ETV; aHR:2.516, p =
0.007] and pre-treatment HBV DNA $\geq 4 \log_{10}$ IU/ml (aHR: 1.953, p = 0.030) were predictors for CR. Duration of Nuc extension therapy is not an independent factor for CR.

**Conclusion:** CHB patients who received Rituximab-based regimens for lymphoma had numerically higher off-NUC CR rates and higher ALT level at CR than those without rituximab-based chemotherapy while the timing of CR and hepatic decompensation rate were comparable. Stringent off-therapy monitoring is necessary, especially in patients receiving Rituximab-based regimens.

---

**Viral Hepatitis B and D Current therapies**

**TOP-105**

**Tenofovir is associated with a better prognosis of hepatocellular carcinoma compared with entecavir in patients with chronic hepatitis B**

Hyun Jun Um1, Jonggi Choi1, Young-Suk Lim1, Won-Mook Choi1.

1University of Ulsan College of Medicine, Department of Gastroenterology,Liver Center, Asan Medical Center, Korea, Rep. of South Email: dr.choi85@gmail.com

**Background and aims:** Whether tenofovir or entecavir has different effects on the prevention of hepatitis B virus (HBV)-related hepatocellular carcinoma (HCC) in secondary and tertiary preventive settings remains controversial. This study was aimed to compare the long-term prognosis of HCC between tenofovir and entecavir in patients with chronic hepatitis B (CHB).

**Method:** CHB patients who were diagnosed with HCC between November 2008 and December 2018 and were treated with either entecavir (n = 3,469) or tenofovir (n = 3,056) at a tertiary center in Korea were included. The effect of tenofovir vs. entecavir on the prognosis of HBV-related HCC was evaluated in a propensity score (PS)-matched cohort. Various predefined subgroup analyses were performed.

**Results:** The mean (SD) age was 54.6 (9.1) years, and 4,351 patients (81.1%) of the PS-matched cohort of 5366 patients were male. During a median follow-up period of 3.0 years, entecavir-treated patients had a mortality rate of 43.0%, whereas tenofovir-treated patients had a mortality rate of 33.5%. Overall survival (OS) was better in tenofovir-treated patients compared with entecavir-treated patients (hazard ratio [HR], 0.80; 95% confidence interval [CI], 0.73–0.88). The difference in OS probability between the two groups became more pronounced over time. The magnitude of the risk difference in OS after 3 years of HCC diagnosis (HR, 0.40; 95% CI, 0.30–0.53) was more prominent than that within 3 years (HR, 0.87; 95% CI, 0.79–0.95). In all subgroup analyses, tenofovir was associated with a better OS than entecavir, except for those with advanced or terminal stage HCC. For those who received curative-intent treatment, recurrence-free survival (HR, 0.83; 95% CI 0.73–0.95) and OS (HR, 0.63; 95% CI 0.50–0.79) were better with tenofovir compared with entecavir.

**Figure:** Survival probability between tenofovir and entecavir in patients with hepatitis B virus-related hepatocellular carcinoma of the propensity score-matched cohort.
Conclusion: In patients with HBV-related HCC, tenofovir showed a better prognosis than ETV, especially in those who survived longer.

SATURDAY 24 JUNE

SAT-144
Predictors of Baveno VII criteria for recompensation in patients with hepatitis B-related decompensated cirrhosis
Vicki Wing-Ki Hui1, Terry Cheuk-Fung Yip1, Vincent Wai-Sun Wong1, Henry LY Chan1, Grace Lai-Hung Wong1. 1Department of Medicine and Therapeutics, Hong Kong
Email: wonglaihung@mect.cuhk.edu.hk

Background and aims: The latest Baveno VII consensus established the foundation of a new concept of hepatic recompensation. The present study sought to investigate potential predictors for recompensation in individuals diagnosed with hepatitis B-related decompensated cirrhosis.

Method: Individuals diagnosed with both chronic hepatitis B and decompensated liver cirrhosis who were treated with first-line oral nucleos (t)ide analogues from March 2006 to December 2022 were identified from a territory-wide database in Hong Kong. A Fine-Gray subdistribution hazard model, which accounts for competing risks, was employed to identify potential predictors for recompensation.

Results: This study included 2,913 eligible patients, with a mean age of 63.0 ± 11.6 years, of whom 2,184 (75.0%) were male. The baseline Child-Pugh score and MELD score were 7[6, 8] and 8.5 ± 6.4, respectively. During a mean follow-up of 2.1 ± 1.9 years, 435 (14.9%) patients recompensated. High serum albumin correlated with recompensation in cirrhosis (adjusted subdistribution hazard ratio (sHR) 1.03; 95% CI 1.016–1.041; p < 0.001), while older age, high alpha-fetoprotein, positive hepatitis B e antigen (HBeAg), and high total bilirubin were associated with a decreased likelihood of recompensation (Age: sHR 0.983; 95% CI 0.975–0.992; p = 0.001; Alpha-fetoprotein: sHR 0.697; 95% CI 0.617–0.787; p < 0.001; Positive HBeAg: sHR 0.694; 95% CI 0.524–0.919; p = 0.033; Total bilirubin: sHR 0.992; 95% CI 0.988–0.996; p < 0.001). Patients with recompensation had higher mean serum albumin but lower median AFP, and median total bilirubin compared to those without recompensation over the 5-year follow-up period.

Conclusion: Albumin was an independent protective factor for recompensation, while age, alpha-fetoprotein, positive hepatitis B e antigen, and total bilirubin were identified as risk factors.
We analyzed differences in therapy and were hepatitis B e antigen (HBeAg) negative with undetectable HBV DNA at cessation. We aimed to examine the durability of partial cure after suppression of HBsAg and HBV DNA undetectability for six months thereafter and had favorable outcomes with a high probability of sustained response (HBV DNA <2000 IU/ml and ALT <2× ULN) was 60%, virological relapse (HBV DNA ≥2000 IU/ml) was 18%, ALT flare (≥5x ULN) was 7.7%, and treatment was 8.4%. Among this group, 1 patient developed hepatic decompensation, 1 patient was diagnosed with HCC, and no patients died during off-therapy follow-up. No patients in the HBsAg loss group experienced relapses or flares and thus none required retreatment. Compared to the group of patients who remained off-therapy without HBsAg loss or partial cure at six months post-cessation, the partial cure group had significantly higher rates of sustained response (p < .001), and lower rates of virological relapse (p < .001) and ALT flare (p = .08) (Figure). Conclusion: Most patients who achieved partial cure at six months after NA withdrawal, as defined in this study, remained off-therapy thereafter and had favorable outcomes with a high probability of subsequent HBsAg loss. Thus, it may be a viable end point among CHB patients who are well-suppressed and HBeAg negative with low levels of HBsAg at end of therapy.
Background and aims: Since tenofovir disoproxil fumarate (TDF) require long-term use, reduction in bone density should be considered when treating chronic hepatitis B (CHB) patients with aging and systemic diseases. Several studies have shown that patients treated with tenofovir alafenamide (TAF) had less or improved bone mineral density loss compared to patients treated with TDF. However, although improvement in bone density by taking TAF has been reported in previous studies, studies on the actual reduction of fractures are insufficient.

Method: A retrospective cohort study was conducted on 32,582 CHB patients who were initially treated with TDF or TAF from November 2017 to December 2020 using the national claims data of the Health Insurance Review and Assessment Service. The number of patients treated with TDF and TAF was 11,705 and 20,877, respectively. The annual rate of fracture per 100 patients in each group was calculated, and the cox proportional hazard ratio (HR) was analyzed after applying inverse probability treatment weights (IPTW) for both groups.

Results: Among a total of 32,582 patients, the average age was 47.8 ± 11.2 years, males were 64.5%, and the follow-up period was 24.4 ± 11.6 months. The incidence of osteoporotic fractures was 0.78 and 0.49 per 100 person-years in the TDF and TAF groups, respectively. After adjusting covariates including age, sex, cirrhosis status and baseline HBsAg levels by COX regression, the cox proportional hazard ratio (HR) was analyzed after applying inverse probability treatment weights (IPTW) for both groups.

Conclusion: In CHB patients, the risk for osteoporotic fracture was significantly lower in the TAF treatment group than the TDF treatment group.

SAT-147
Effects of interferon-based therapies in functional cure and hepatocellular carcinoma risk reduction in patients with chronic hepatitis B: real-world evidence from 2-year data of OASIS project
Qiran Zhang1, Peng Sun1, Ying Yu1, Tingting Zhao1, Shulan Sui1, Jinming Zhang1, Jia Shang2, Jia Wei Geng3, Yignli He4, Ying Guo5, Caiyan Zhao6, Yueyong Zhu7, Xuebing Yan8, Wenhong Zhang9, Jinming Zhang1, Jia Shang2, Jiawei Geng3, Ying Guo5, Caiyan Zhao6, Yueyong Zhu7, Xuebing Yan8, Wenhong Zhang9,
1Huashan Hospital, Fudan University, Department of Infectious Diseases, National Medical Center for Infectious Diseases, Shanghai, China; 2Hunan Provincial People’s Hospital, Department of Infectious Diseases, Changsha, China; 3The First People’s Hospital of Yunnan Province, Department of Infectious Diseases, Kunming, China; 4The First Affiliated Hospital of Xi’an Jiaotong University, Department of Infectious Diseases, Xi’an, China; 5The Third People's Hospital of Taiyuan, Department of Infectious Diseases, Taiyuan, China; 6The Third Affiliated Hospital of Hebei Medical University, Department of Infectious Diseases, Shijiazhuang, China; 7The First Affiliated Hospital of Fujian Medical University, Department of Infectious Diseases, Fuzhou, China; 8Xuzhou Medical University Affiliated Hospital, Department of Infectious Diseases, Xuzhou, China

Background and aims: Interferon (IFN)-based therapy (IFN alone or combined with nucleoside analog [Nuc]) is considered as an effective strategy to improve functional cure rate and reduce hepatocellular carcinoma (HCC) risk in patients with chronic hepatitis B (CHB). We aimed to evaluate the effects of interferon-based therapy in CHB patients with different anti-viral treatment history and baseline HBsAg levels in terms of functional cure and HCC risk reduction, based on large scale real-world data from China.

Method: The analysis was conducted in the data from a multi-center, prospective real-world study (OASIS Project) from China. This project recruited treatment-naïve, IFN-treated and Nuc-treated patients from 32 provinces in China. Participants in OASIS Project received either IFN-based therapy (IFN alone or combined with Nuc) or Nuc monotherapy, and would be followed up for five years. We made this analysis at the time-point of 2 years from project initiation. Data on those who have completed 48 weeks of treatment were analyzed for HBsAg-related events, and all subjects included in this project with complete information were analyzed for cumulative HCC incidence.

Results: A total of 24,946 patients with complete baseline information was included in this analysis, of which 17,210 received IFN-based therapy and 7736 received Nuc therapy. A total of 6978 participants reached 48-week follow-up visit at the timepoint of analysis, of which 4590 were with baseline HBsAg <1500 IU/ml and 2388 with baseline HBsAg ≥1500 IU/ml. In patients with HBsAg<1500 IU/ml, the HBsAg loss rates at 48 weeks of IFN-based therapy were high, regardless of treatment history, either in IFN monotherapy (28.0%–33.3%) or in IFN-Nuc combination therapy (18.1%–28.6%) (Figure 1A). In patients with HBsAg≥1500IU/ml, neither IFN monotherapy (2.6%–4.3%) nor IFN-Nuc therapy (1.8%–5.2%) could improve HBsAg loss rates significantly from Nuc monotherapy (0.0%–2.0%) (Figure 1B). The rates of significant HBsAg reduction at 48 weeks (HBsAg decline >1 log10 IU/ml from baseline) were high in patients with IFN-based therapy (26.3%–36.9% in IFN monotherapy and 24.0%–27.8% in IFN-Nuc therapy) (Figure 1C and D). There was significant difference between IFN-based and Nuc treatment, but no significant difference between IFN monotherapy and IFN-Nuc therapy. There were 28 cases developed HCC within 18 months. The cumulative HCC incidence was significantly lower in IFN-based group than Nuc group (0.0301% vs 0.1245%, P < 0.0001). After adjusting covariates including age, cirrhosis status and baseline HBsAg levels by COX regression, the difference between two groups was still significant (P < 0.0001), and the HR of IFN-based therapy for HCC was 0.153 compared with Nuc therapy (Figure 1E).

Conclusion: IFN-based therapy can significantly improve 48-week HBsAg loss rate from Nuc treatment in patients with low baseline
HBsAg levels, but in patients with high baseline HBsAg levels, HBsAg loss rate is similarly low in either IFN-based or Nuc treatment. However, a high proportion of patients with high baseline HBsAg levels can achieve significant HBsAg reduction after IFN-based therapy, and IFN-treated patients with low HBsAg levels still have relatively high HBsAg loss rates after 48-week IFN based therapy. This suggests that prolonged IFN therapy might be effective for patients with high HBsAg levels to achieve functional cure. Moreover, IFN-based therapy is superior in reducing HCC risks in patients with CHB.

SAT-148
Low HBV DNA and HBsAg levels at 24 weeks off-treatment predict sustained response and HBsAg loss in patients who discontinued antiviral therapy
Milan Sonneveld1, SM Chiu2, Jun Yong Park3, Sylvia Brakenhoff4, A Kaewdech5, Wai-Kay Seto6, Yasuhiro Tanaka7, Ivana Carey7, Margarita Papatheodoridi8, Piero Colombatto9, Florian van Bömmel10, Thomas Berg10, Fabien Zoulim11, Sang Hoon Ahn3, George Dalekos12, Nicole Erlér1, Maurizia Brunetto9, Heiner Wedemeyer13, Markus Cornberg13, Man-Fung Yuen5, Kosh Agarwal7, Andre Boonstra1, Maria Buti14, Teerha Piratvisuth6, George Papatheodoridis8, Chien-Hung Chen7, Benjamin Maasoumy1, 1Erasmus MC, Netherlands; 2Koahsiung Chang Gung Memorial Hospital, Taiwan; 3Yonsei University College of Medicine, Korea, Rep. of South; 4Prince of Songkla University, Thailand; 5The University of Hong Kong, Hong Kong, Hong Kong; 6Kumamoto University, Japan; 7Kings College, United Kingdom; 8National and Kapodistrian University of Athens, Greece; 9University Hospital of Pisa, Italy; 10Department of Medicine II, Leipzig University Medical Center, Germany; 11INSERM Unit 1052, France; 12General University Hospital of Larissa, Greece; 13Hannover Medical School, Germany; 14Hospital Universitari Vall d’Hebron and Ciberehd del Instituto Carlos III de Barcelona, Spain

Background and aims: Patients who discontinue nucleos (i) tide analogue (Nuc) therapy are at risk of severe viral rebound and hepatitis flares, necessitating intensive off-treatment follow-up. We studied the association between HBsAg and HBV DNA levels at 6 months after therapy cessation (FU W24) with subsequent outcomes.

Method: Chronic hepatitis B patients who discontinued Nuc therapy and who were still HBsAg positive and without clinical relapse or retreatment at FU W24 were identified in an existing multicenter database. The association between HBsAg and HBV DNA levels at off-treatment FU W24 with subsequent clinical relapse (defined as HBV DNA >2000 IU/ml + ALT >2× ULN or retreatment) and HBsAg loss was studied through univariable analyses using the Kaplan-Meier method, as well as multivariable Cox regression analysis adjusting for other potential predictors.

Results: We enrolled 641 patients, 86% Asian, 26% pretreatment HBeAg positive, and 59% treated with entecavir. At FU W24, we observed a weak correlation between HBV DNA and HBsAg levels (Pearson’s r = 0.254, p < 0.001). Patients with higher HBV DNA levels at FU W24 had a higher risk of clinical relapse (hazard ratio [HR] 1.617, p < 0.001) and a lower chance of HBsAg loss (HR 0.496, p < 0.001). Similarly, patients with higher HBsAg levels at FU W24 had a higher risk of clinical relapse (HR 1.616, p < 0.001) and a lower chance of HBsAg loss (HR 0.247, p < 0.001). A combination of both HBsAg <100 IU/ml and HBV DNA <100 IU/ml at FU W24 identified patients with excellent outcomes (8.5% clinical relapse and 56% HBsAg loss at 192 weeks of subsequent follow-up). Conversely, patients with both HBV DNA >100 IU/ml and HBsAg >100 IU/ml had a very high risk of clinical relapse (68% at 192 weeks), and virtually no chance of HBsAg loss (<1% at 192 weeks). Findings were consistent in multivariable analysis.

Conclusion: Serum levels of HBV DNA and HBsAg at FU W24 can be used to predict subsequent clinical relapse and HBsAg clearance in patients who discontinued NUC therapy. A combination of both HBsAg <100 IU/ml with HBV DNA <100 IU/ml identifies patients with very low risk of relapse and excellent chances of HBsAg loss, and could potentially be used as an early surrogate end point for studies aiming at finite therapy in HBV. Patients with both high HBsAg and HBV DNA levels have a very high risk of relapse and virtually no chance of HBsAg loss, and should be closely monitored and/or retreated.
SAT-149
NTCP genetic variants may influence early virological response to bulevirtide monotherapy in patients with HDV related cirrhosis
Pierluigi Toniutto1, Edmondo Falletti1, Sara Cnet2, Annarosa Cussigh2, Elisabetta Degaspersi3, Maria Paola Anolli3, Dana Sambarino3, Floriana Facchetti3, Marta Borghi3, Riccardo Perbellini3, Sara Monico3, Floriana Facchetti3, Marta Borghi3, Riccardo Perbellini3, Sara Monico3, Pietro Lampertho3,4. University of Udine, Hepatology and Liver transplantation unit, Udine, Italy; 4CRC Ospedale Maggiore Policlinico, Division of Gastroenterology and Hepatology, Milano, Italy; 5Foundation IRCCS Ca' Granda Ospedale Maggiore Policlinico, Division of Gastroenterology and Hepatology, Milano, Italy; 5Foundation IRCCS Ca' Granda Ospedale Maggiore Policlinico, Division of Gastroenterology and Hepatology, Milano, Italy. 6Azienda Sanitaria Universitaria Integrata, Clinical Pathology, Udine, Italy; 7Foundation IRCCS Ca' Granda Ospedale Maggiore Policlinico, Division of Gastroenterology and Hepatology, Milano, Italy; 8CRC “A. M. and A. Migliavacca” Center for Liver Disease, Department of Pathophysiology and Transplantation, Milano, Italy.
Email: pierluigi.toniutto@uniud.it

Background and aims: Bulevirtide (BLV) is an entry inhibitor of BLV up to 48 weeks (n = 37) were enrolled. Responses to BLV were categorized as: biochemical (BR), i.e. alanine aminotransferase (ALT) normalization; virological (VR). HDV RNA undetectable or ≥ 2 log IU/ml decline from baseline, and combined (CR), BR+VR. Virological non-response (VNR) was defined as <1 log IU/L decline in HDV RNA from baseline. HDV RNA was quantified by Robogene 2.0 (LOD 6 IU/ml). Six different NTCP single nucleotide polymorphisms (SNPs) (rs943277 C>T, rs943276 C>T, rs76385306 A>C, rs17556915 C>T, rs9323529 A>C, and rs4646296 C>G) were genotyped by Sanger sequencing.

Results: Among all the 6 SNPs investigated, only the carriage of rs17556915 CC (n = 27) vs. CT/TT (n = 25) genotypes was associated with higher HDV RNA levels, both at baseline (5.6 vs. 4.6 log IU/ml, p = 0.016) and at week 24 (3.3 vs. 2.0, p = 0.044), but not at week 48 (2.9 vs. 2.3, p = 0.26). In contrast, no significant correlations were found between these two genotypes and BR, VR, and CR, both at 24 (59.3% vs. 80.0%, p = 0.105; 63.0% vs. 64.0%, p = 0.938; 44.4% vs. 56.0%, p = 0.405) and at week 48 (68.2% vs. 73.3%, p = 0.736; 68.2% vs. 73.3%, p = 0.736; 63.6% vs. 60% p = 0.823). Interestingly, carriers of rs17556915 CC vs. CT/TT genotypes presented more frequently NVR at week 24 (25.0% vs. 4.0%, p = 0.029) but not at week 48 (22.7% vs. 13.3%, p = 0.474). HBsAg serum levels remained unchanged in VR at 48 weeks (3.56 vs. 3.61 Log IU/ml, p = 0.081) but significantly increased in VNR (3.69 vs. 3.83, p = 0.005), independently from the rs17556915 genotypes. Bile acids serum levels increased significantly from baseline to week 48 (21 vs. 42 mmol/L, p < 0.001) during BLV treatment. Carriers of rs17556915 CC genotype had similar bile acids levels compared to CT/TT both at baseline (21 vs. 30 mmol/L, p = 0.260), at week 24 (32 vs. 38 mmol/mL, p = 0.203) and at week 48 (48 vs. 36 mmol/L, p = 0.608).

Conclusion: NTCP genetic variants may influence early virologic response of 2 mg BLV monotherapy in cirrhotic patients with CHD.

SAT-150
Stopping bulevirtide in long-term HDV-RNA suppressed patients seems safe and may enable long treatment-free intervals
Mathias Jachs1, Marlene Panzer2, Lukas Hartl1, Michael Schwarz1, Lorenz Balcar2, Jeremy Camp3, Petra Mundla1, Mattias Mandorfer1, Michael Trauner1, Stephan Aberle1, Heinz Zoller4, Thomas Reiberger1, Peter Ferenci1, 1Medical University of Vienna, Austria; 2Medical University of Innsbruck, Austria; 3Medical University of Innsbruck, Austria.
Email: peter.ferenci@meduniwien.ac.at

Background and aims: Bulevirtide (BLV) has been licensed for the treatment of chronic hepatitis D based on on-treatment data over looking 24–48 weeks, without label recommendations on treatment duration or stopping rules. Method: Patients included in the ongoing prospective Austrian BLV registry study were offered BLV treatment discontinuation upon the achievement of long-term HDV-RNA suppression to undetectable levels. Off-treatment safety and efficacy were closely monitored. Results: Seven patients (aged 31–68 years, four with cirrhosis, BLV treatment duration: 46–141 weeks, negative HDV-RNA levels: 12–69 weeks) were included in the study and discontinued treatment. Five had undergone BLV monotherapy, while pegylated interferon-alpha2a (PEG-IFN) was used in combination with BLV in two patients. Until December 2022, patients were followed 10 to 98 weeks (≥24 weeks of BLV-free follow-up reached by n = 6). Only one patient showed significant ALT increases within 24 weeks of follow-up. Three patients showed a virological relapse, i.e., detectable HDV-RNA levels, within 24 weeks of BLV-free follow-up, while another relapse occurred after almost one year. So far, relapses occurred exclusively in patients who had undergone BLV monotherapy, while HDV-RNA remained undetectable in the two patients who had undergone combined treatment with PEG-IFN. Overall, treatment with BLV was reintroduced in three patients after 13 to 62 treatment-free weeks. All patients showed antiviral response during their second cycle of BLV treatment. Updated data will be presented at the meeting.

Conclusion: BLV discontinuation upon long-term HDV-RNA suppression appears to be safe, even in patients with cirrhosis, and enable long treatment-free intervals and off-treatment HDV-RNA suppression in some patients, particularly after combined treatment with BLV and PEG-IFN. In case of HDV-RNA relapse, BLV can be safely reintroduced.
SAT-151
Switching to Besifovir in chronic hepatitis B patients receiving Tenofovir Disoproxil Fumarate: 96 weeks results of phase 4 trial

Hyung Joon Yim1, Yeon Seok Seo2, Ji Hoon Kim3, Won Kim4, Young Kul Jung5, Jae Young Jang5, Sae Hwan Lee6, Yun Soo Kim7, Chang Wook Kim8, Hyoung Su Kim9, Jae-Jun Shim10, Eun Young Cho11, In Hee Kim12, Byung Seok Lee13, Jeong-Hoon Lee14, 1Korea University Ansan Hospital, Internal Medicine, Ansan, Korea, Rep. of South; 2Korea University Anam Hospital, Internal Medicine, Korea, Rep. of South; 3Korea University Guro Hospital, Internal Medicine, Korea, Rep. of South; 4Seoul Metropolitan Government Seoul National University Boramae Medical Center, Internal Medicine, Korea, Rep. of South; 5Korea University Ansan Hospital, Internal Medicine, Korea, Rep. of South; 6Soonchunhyang University Seoul Hospital, Internal Medicine, Korea, Rep. of South; 7Soonchunhyang University Cheonan Hospital, Internal Medicine, Korea, Rep. of South; 8Gachon University Gil Medical Center, Internal Medicine, Korea, Rep. of South; 9Uijeongbu St.Mary's Hospital, the Catholic University of Korea, Internal Medicine, Korea, Rep. of South; 10Kangdong Sacred Heart Hospital of Hallym University Medical Center, Internal Medicine, Korea, Rep. of South; 11Kyujeong University Cheonan Hospital, Internal Medicine, Korea, Rep. of South; 12Wonkwang University College of Medicine, Internal Medicine, Korea, Rep. of South; 13Jeonbuk National University Hospital, Internal Medicine, Korea, Rep. of South; 14Chungnam National University Hospital, Internal Medicine, Korea, Rep. of South; 15Seoul National University Hospital, Internal Medicine, Korea, Rep. of South
Email: gudwns21@korea.ac.kr

Background and aims: In the previous 48-week phase 4 study, switching from TDF to BSV therapy contributed to the maintenance of antiviral effects and improved bone and renal safety in patients with virologically-suppressed CHB. We evaluated longer-term outcomes in CHB patients in the extended follow-up of the study.

Method: After 48 weeks of comparison of BSV with TDF, eligible patients who had agreed with participating in the extended study continued or switched to either of the drugs, and were followed-up to 96 weeks. We analyzed antiviral efficacy as well as bone and renal safety for the 4 groups.

Results: Among 130 patients who received randomized treatments, 101 patients were included for this observational study (BSV-BSV group, 5; BSV-TDF group, 46; TDF-BSV group, 4; TDF-TDF group, 46). At 96 weeks, 100.0% of patients in the BSV-BSV and TDF-BSV group, and 97.8% in the BSV-TDF and TDF-TDF group maintained virologic response (HBV DNA <20 IU/ml) (p = 1.00). Biochemical and serologic responses were comparable between the groups. Of note, bone turnover biomarkers were significantly improved in the BSV-BSV and TDF-BSV groups, and were worsened in the BSV-TDF and TDF-TDF group; accordingly, spine BMD increased in the BSV-BSV and TDF-BSV group, and decreased in the BSV-TDF and TDF-TDF group (% changes; 1.67 ± 1.68, 3.17 ± 4.31, −1.35 ± 3.98, −0.20 ± 3.91, respectively). The mean %changes of estimated glomerular filtration rates improved in the TDF-BSV group (2.29 ± 9.93%) while those decreased in the BSV-TDF and TDF-TDF group (% changes; −2.97 ± 10.40%). There were no adverse events in the BSV-BSV and TDF-BSV groups from 48 to 96 weeks while there were three in the TDF-TDF and BSV-TDF groups.

Conclusion: In this extensional study, antiviral efficacies were comparable between the groups at 96 weeks. Patients receiving BSV for up to 96 weeks showed improved bone and renal safety after the completion of 48 weeks of BSV or TDF therapy in virologically-suppressed CHB patients.
SAT-152
Five years follow-up of 96 weeks peginterferon plus tenofovir disoproxil fumarate in hepatitis D
Olympia Aevdoxia Anastasiou1, Florin Alexandru Caruntu2, Manuela Gabriela Curescu3, Kendal Yalcin4, Ulus S Akarca5, Selim Gurel6, Andreas Erhardt7, Stefan Lüth8, Stefan Zeuzem9, Andreas Erhardt8, Stefan Lüth9, George Papatheodoridis10, Onur Keskin11, Kerstin Port12, Monica Radu12, Mustafa Celen4, Ramazan Idilman11, Benjamin Heidrich12, Ingmar Mederacke12, Heiko von der Leyen12, Julia Kahlhöfer12,13, Maria von Karpowitz12, Svenja Hardtke9,13, Markus Cornberg12,13, Cihan Yurdaydin11, Heiner Wedemeyer11,12,13.

1Medical Faculty of the University of Duisburg-Essen, Essen, Germany; 2Institutul de Boli Infectioase, Bucharest, Romania; 3Spitalul Clinic de Boli Infectioase si, Timisoara, Romania; 4Dicle University Medical Faculty, Diyarbakir, Turkey; 5Ege University Medical Faculty, Izmir, Turkey; 6Uludağ University Medical Faculty, Bursa, Turkey; 7Johann Wolfgang Goethe University Medical Center, Frankfurt am Main, Germany; 8Heinrich Heine University, Düsseldorf, Germany; 9University Medical Centre Hamburg-Eppendorf, Hamburg, Germany; 10Medical School, National and Kapodistrian University of Athens, Athens, Greece; 11Ankara University Medical School, Ankara, Turkey; 12Hannover Medical School, Hanover, Germany; 13German Centre for Infection Research (DZIF), HepNet Study-House/German Liver Foundation, Hannover, Germany

Email: olympiaevdoxia.anastasiou@uk-essen.de

Background and aims: Until recently pegylated interferon-alfa-2a (PEG-IFNa) therapy was the only treatment option for patients infected with the hepatitis D virus (HDV). Prolonged treatment of hepatitis D with PEG-IFNa with or without tenofovir disoproxil fumarate (TDF) for 96 weeks resulted in HDV RNA suppression in 44% of patients at the end of therapy but did not prevent short-term relapses within 24 weeks after therapy. The virological and clinical long-term effects after prolonged PEG-IFNa-based treatment of hepatitis D are unknown.

Method: The HIDIT-II study comprises of two parallel trials running in Germany, Romania and Greece as an investigator initiated trial and in Turkey as a Roche-sponsored study. Patients (including 41% with liver cirrhosis) received 180 µg PEG-IFNa weekly plus 300 mg TDF once daily (n = 59) or 180 µg PEG-IFNa weekly plus placebo (n = 61) for 96 weeks. Patients were followed until week 356 (5 years after the end of therapy).

Results: Until the end of follow-up 19 (16%) patients developed liver-related complications (n = 6, 32% receiving PEG-IFNa + TDF vs. n = 13, 68% in patients receiving PEG-IFNa plus Placebo, p = 0.113). Achieving HDV suppression at week 96 was associated with decreased long-term risk for the development of hepatocellular carcinoma (p = 0.022) and hepatic decompensation (p = 0.028). The number of patients developing serious complications was similar with (3/18) and without retreatment with PEG-IFNa (16/102, p < 0.999), but was associated with a higher chance of HDV-RNA suppression (p = 0.024, Odds Ratio 3.9 [1.3–12]).

Conclusion: Liver-related clinical events were infrequent and occurred less frequently in patients with virological response to PEG-IFNa treatment. PEG-IFNa treatment should be recommended to HDV-infected patients until alternative therapies become available. Retreatment with PEG-IFNa should be considered for patients with inadequate response to the first cycle of treatment.

SAT-153
Long-term safety profile of tenofovir alafenamide in chronic hepatitis B patients; final 8-year results of 2 Phase 3 studies
Young-Suk Lim1, Henry LY Chan2, Kosh Agarwal3, Patrick Marcellin4, Maurizia Brunetto5, Wan-Long Chuang6, Harry Janssen7,8, Scott Fung9, Namiki Izumi10, Maciej Jablkowski11, Frida Abramov12, Hongyuan Wang12, Leland Yee12, John F. Flaherty12, Calvin Pan13, Shalimar14, Wai-Kay Seto15, Edward J. Gane16, Maria Buti17,18.

1University of Ulsan College of Medicine, Asan Medical Center, Seoul, Korea, Rep. of South; 2Hôpital Beaujon, APHP, INSERM, University of Paris, Hepatology department, Clichy, France; 3Azienda Ospedaliero-Universitaria Pisana, Pisa PI, Italy; 4Kaohsiung Medical University, Kaohsiung Medical University Hospital, Kaohsiung City, Taiwan; 5University Health Network, Toronto Centre for Liver Disease, Toronto, Canada; 6Erasmus University Medical Center, Rotterdam, Netherlands; 7University of
Method: Here we present the final safety results at year 8. Eligible to receive open-label (OL) TAF through week 384 (year 8). TDF at week 96. After completing DB treatment, all patients were renal and bone safety compared to tenofovir disoproxil fumarate (TDF) demonstrated noninferior efficacy with superior

Results: Of 1298 randomized and treated patients, 1157 (89%; 775 TAF; 382 TDF) entered the OL phase. Overall, 974 (75%) participants completed OL study treatment. The overall incidence of patients experiencing AEs was similar among groups (Table). Rates of Grade 3/4 AEs and AEs leading to discontinuation (DC) were low and similar among groups. Few Grade 3/4 AEs or SAEs were related to the study drug. Overall, the most common Grade 3/4 lab abnormalities (>2%) were increased amylase (TAF 1.9%, TDF-TAF 2.7%), creatine kinase (TAF 1.4%, TDF-TAF 2.1%), fasting cholesterol (TAF 1.4%, TDF-TAF 2.9%), fasting LDL (TAF 5.9%, TDF-TAF 8.0%), and urine glucose (TAF 5.2%, TDF-TAF 2.7%). After experiencing declines in eGFRCG and hip/spine bone mineral density (BMD) by dual x-ray absorptiometry (DXA) scans were assessed.

Results: Of 1298 randomized and treated patients, 1157 (89%; 775 TAF; 382 TDF) entered the OL phase. Overall, 974 (75%) participants completed OL study treatment. The overall incidence of patients experiencing AEs was similar among groups (Table). Rates of Grade 3/4 AEs and AEs leading to discontinuation (DC) were low and similar among groups. Few Grade 3/4 AEs or SAES were related to the study drug. Overall, the most common Grade 3/4 lab abnormalities (>2%) were increased amylase (TAF 1.9%, TDF-TAF 2.7%), creatine kinase (TAF 1.4%, TDF-TAF 2.1%), fasting cholesterol (TAF 1.4%, TDF-TAF 2.9%), fasting LDL (TAF 5.9%, TDF-TAF 8.0%), and urine glucose (TAF 5.2%, TDF-TAF 2.7%). After experiencing declines in eGFRCG and hip/spine BMD with TDF treatment in the DB phase, renal and bone outcomes improved following the switch to OL TAF with minimal change through year 8. Overall, low rates of hepatocellular carcinoma (HCC) were observed over 8 years, with 11 cases occurring in the DB and 10 in the OL phases of the study.

Background and aims: In 2 similarly designed double-blind (DB), randomized (2:1), Phase 3 studies (Study 108 in HBeAg-negative [N = 425] and Study 110 in HBeAg-positive [N = 873] patients), tenofovir alafenamide (TAF) demonstrated noninferior efficacy with superior renal and bone safety compared to tenofovir disoproxil fumarate (TDF) at week 96. After completing DB treatment, all patients were eligible to receive open-label (OL) TAF through week 384 (year 8). Here we present the final safety results at year 8.

Method: In a pooled analysis, treatment-emergent adverse events (AEs), serious AEs (SAEs), discontinuations, and laboratory abnormalities were assessed in patients who received OL TAF. Changes from baseline in estimated GFR (by Cockcroft-Gault; eGFRCG) and changes in hip and spine bone mineral density (BMD) by dual x-ray absorptiometry (DXA) scans were assessed.

Results: Of 1298 randomized and treated patients, 1157 (89%; 775 TAF; 382 TDF) entered the OL phase. Overall, 974 (75%) participants completed OL study treatment. The overall incidence of patients experiencing AEs was similar among groups (Table). Rates of Grade 3/4 AEs and AEs leading to discontinuation (DC) were low and similar among groups. Few Grade 3/4 AEs or SAES were related to the study drug. Overall, the most common Grade 3/4 lab abnormalities (>2%) were increased amylase (TAF 1.9%, TDF-TAF 2.7%), creatine kinase (TAF 1.4%, TDF-TAF 2.1%), fasting cholesterol (TAF 1.4%, TDF-TAF 2.9%), fasting LDL (TAF 5.9%, TDF-TAF 8.0%), and urine glucose (TAF 5.2%, TDF-TAF 2.7%). After experiencing declines in eGFRCG and hip/spine BMD with TDF treatment in the DB phase, renal and bone outcomes improved following the switch to OL TAF with minimal change through year 8. Overall, low rates of hepatocellular carcinoma (HCC) were observed over 8 years, with 11 cases occurring in the DB and 10 in the OL phases of the study.

Table. OL safety parameters

<table>
<thead>
<tr>
<th>n (%)</th>
<th>TAF</th>
<th>TDF+TAF total</th>
</tr>
</thead>
<tbody>
<tr>
<td>n = 775</td>
<td>n = 382</td>
<td></td>
</tr>
<tr>
<td>Any AE</td>
<td>525 (68)</td>
<td>271 (71)</td>
</tr>
<tr>
<td>Grade 3/4 AE</td>
<td>60 (8)</td>
<td>27 (7)</td>
</tr>
<tr>
<td>Grade 3/4 AE related to study drug</td>
<td>2 (1%)</td>
<td>0</td>
</tr>
<tr>
<td>SAE</td>
<td>97 (13)</td>
<td>49 (13)</td>
</tr>
<tr>
<td>SAE related to study drug</td>
<td>4 (1%)</td>
<td>0</td>
</tr>
<tr>
<td>AE leading to DC</td>
<td>9 (1)</td>
<td>3 (1)</td>
</tr>
<tr>
<td>HCC (DB and OL), n</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>Median (G1, G3) change in eGFRCG, ml/min</td>
<td>-5.4 (-15.1, 4.9)</td>
<td>-5.0 (-14.6, 6.5)</td>
</tr>
<tr>
<td>Mean (SD) change in hip BMD</td>
<td>-1.64 (4.6160)</td>
<td>-2.05 (5.0434)</td>
</tr>
<tr>
<td>Mean (SD) change in spine BMD</td>
<td>-0.64 (6.4449)</td>
<td>0.04 (6.0641)</td>
</tr>
</tbody>
</table>

AEs are treatment-emergent during OL phase; renal/bone changes from original baseline; 1 renal neoplasia [G3] and cerebrovascular accident [G4]; ALT increase [G2]; renal neoplasia [G3], esophageal cancer [G4], cerebrovascular accident [G4]; No deaths were treatment-emergent, 6 total deaths (5 DB, 1 OL; TAF 3, TDF 3).

Figure: Conclusion: Long-term TAF treatment was safe and well tolerated, with minimal changes in eGFRCG and BMD occurring over 8 years.

SAT-154
Association of post-treatment virologic relapse and biochemical flares with HBV serum biomarkers in long-term virologically suppressed HBeAg-negative patients stopping NA treatment: Exploratory analyses from the control arm of the REEF-2 study
Florian van Bömmel1, Thierry Verbinnen2, Kosh Agarwal3, Thomas Vanwolleghem4, Pietro Lampertico5,6, Maria Buii7, Ewa Janczewska8, Marc Bourliere9, John Jerzowski10, Thomas Kakuda11, Sandra De Meyer12, Adam Bakala13, Oliver Lenz14, Michael Biermer15.
1 Division of Hepatology, Department of Medicine II, Leipzig University Medical Center, Leipzig, Germany; 2Janssen Pharmaceutica NV, Beerse, Belgium; 3Institute of Liver Studies, King’s College Hospital, London, United Kingdom; 4University of Antwerp, Faculty of Medicine and Health Sciences, Laboratory of Experimental Medicine and Pediatrics, Viral Hepatitis Research Group, Antwerp, Belgium; 5Foundation IRCCS Ca’ Granda Ospedale Maggiore Policlinico, Division of Gastroenterology and Hepatology, Milan, Italy; 6Catholic University of the Sacred Heart, Center for Liver Disease, Department of Pathophysiology and Transplantation, University of Milan, Milan, Italy; 7Hospital General Universitari Valle Hebron and CIBER EHD del Instituto Carlos III, Barcelona, Spain; 8Medical University of Silesia in Katowice, Faculty of Public Health in Bytom, Bytom, Poland; 9Hôpital Saint-Joseph, Department of Hepatology and Gastroenterology, Marseille, France; 10Janssen Research and Development, LLC, Titusville, United States; 11Janssen Research and Development, LLC, Brisbane, United States
Email: florian.vanboemmel@medizin.uni-leipzig.de

Background and aims: REEF-2 (NCT04129554) assessed efficacy and safety of the combination of siRNA JNJ-73763989, CAM-E JNJ-56136379, and nucleos (t)ide analogues (NA) compared to NA only in virologically suppressed hepatitis B e-antigen (HBeAg)-negative patients with chronic hepatitis B (CHB). All treatments were discontinued in both treatment arms at week 48, followed by 48 weeks of follow-up. In the NA arm, a higher rate of post-treatment virologic relapse and alanine aminotransferase (ALT) flares was observed compared to the JNJ-73763989 arm. We have characterized post-treatment virologic relapses and biochemical flares in the NA arm of the REEF-2 study and assessed their association with end of treatment (EOT) hepatitis B virus (HBV) serum markers.

Method: The association of virologic relapses (confirmed increases in HBV DNA >2000 IU/ml) and biochemical flares (ALT increases ≥3 x upper limit of normal [ULN]) was assessed with serum HBV markers, including HBV RNA (Abbott; lower limit of quantification [LLOQ] = 22 and 11 copies/ml, depending on sample input volume), hepatitis B core related antigen (HBcAg; Fujirebio; LLOQ/ lower limit of detection [LOD] = 3.0/2.6 log10 U/ml), and quantitative anti-hepatitis B core (HBc) IgG (Fujirebio).

Results: 41 of 45 REEF-2 NA-control arm patients (mean NA treatment duration of 8 [range 2–17] years at study entry) who entered follow-up were included. At EOT, all patients had HBV DNA <LLOQ and a mean HBsAg level of 3.41 (range 1.8–4.7) log10 IU/ml. Following NA treatment discontinuation, 27 (66%) and 16 (39%) patients experienced virologic relapses and biochemical flares, respectively. Peak HBV DNA levels during virologic relapse were associated with the magnitude of ALT flares. Ten of 11 (91%) patients with peak HBV DNA >100,000 IU/ml had peak ALT levels ≥10× ULN versus none of 16 patients with virologic relapse and peak HBV DNA levels >2000–<100,000 IU/ml. Virologic relapses were generally associated with parallel HBV RNA, HBcAg, and anti-HBc kinetics, and in few patients with transient HBeAg seroreversion. Six (15%) and 20 (49%) patients had HBV RNA and HBcAg levels target not
detectable (TND) at EOT, respectively. A similar proportion of patients with HBV DNA detectable and TND at EOT had virologic relapse or ALT flaresFigure. A higher frequency of virologic relapse (peak HBV DNA > 100,000 IU/ml) and biochemical flares was observed in patients with detectable HBcAg and HBsAg <1000 IU/ml at EOT compared to HBcAg TND and HBsAg ≥1000 IU/ml, respectively (Figure). No one of 11 patients with quantitative anti-HBc IgG titers <300 IU/ml at EOT had virologic relapse with peak HBV DNA > 100,000 IU/ml or peak ALT ≥10×ULN.

Conclusion: In patients discontinuing NA treatment, the level of HBV DNA increases during viral relapse correlated with the peak levels of biochemical flares. EOT anti-HBc IgG levels >300 IU/ml were strongly associated with the occurrence of high peak HBV DNA virologic relapse and high peak ALT levels ≥10×ULN, while this association was weaker for EOT HBcAg and HBsAg levels and absent for HBV RNA.

SAT-156
Comparative risk of cardiovascular events in chronic hepatitis B patients treated with tenofovir disoproxil fumarate or tenofovir alafenamide

Hyeeyeon Hong1, Jongji Choi1, Won-Mook Choi1, Danbi Lee1, Ju Hyun Shim1, Kang Mo Kim1, Young-Suk Lim1, Han Chu Lee1, Asan Medical Center, Department of Gastroenterology, Seoul, Korea, Rep. of South Korea

Background and aims: Tenofovir alafenamide (TAF) has been widely used as the first-line antiviral treatment for chronic hepatitis B (CHB) due to its comparable efficacy to tenofovir disoproxil fumarate (TDF) but better safety profile. Previous studies showed that TDF is believed to have lipid-lowering effects, but TAF has exhibited less influence on lipid profiles. Consequently, there were concerns regarding the long-term cardiovascular risk between the two treatments. Thus, we sought to examine the risk of cardiovascular events in a large cohort of patients treated with TAF or TDF.

Method: We retrospectively analyzed 3809 treatment-naive patients with CHB treated with TDF (n = 2895) or TAF (n = 914) at Asan Medical Center, Seoul, Republic of Korea between 2012 and 2022. The primary outcome was a composite of major cardiovascular adverse events (MACE), which included myocardial infarction, ischemic stroke, and hospitalization for unstable angina or heart failure. Mean follow-up period was 3.8 years.

Results: The median age was 49.6 years, and 59.1% of the patients were male. At baseline, 365 (9.6%) and 560 (14.7%) of the 3,809 patients had diabetes and hypertension, respectively. Among 2,861 patients for whom smoking history was provided, 633 (22.1%), 514 (18.0%), and 1,714 (59.9%) were current, former, and never smokers, respectively. A total of 41 MACE was occurred with an annual incidence of 0.2%/100 person-years (PYS). At 1, 3, and 5 years, the cumulative risk of MACE was 0.5%, 0.9%, and 1.3% in patients with TDF, and 0.2%, 0.7%, and 0.7% in patients with TAF, respectively. No statistically significant difference in the risk of MACE between the TAF and TDF treatments p = 0.524. Older age, diabetes, hypertension, coronary artery disease history, and current smoking were associated with an increased risk of MACE in multivariable analysis.

Conclusion: In the present study, patients treated with TAF had a comparable risk of MACE as patients treated with TDF.
**Background and aims:** Hepatitis D is the most form of viral hepatitis leading to liver cirrhosis and hepatocellular carcinoma. The entry inhibitor bulevirtide was approved for the treatment of compensated liver disease in patients with chronic hepatitis D. The FDA and EMA suggest combined end points of virologic and biochemical response for clinical trials. Hence, the conditional approval was based on promising results regarding improvements in biochemical hepatitis activity and reduction of HDV-RNA. We aimed for the characterization of ALT improvements in a real-world setting.

**Method:** We retrospectively collected anonymized real-world data from 16 German centers treating patients with bulevirtide for chronic hepatitis D. A total of 114 baseline cases was collected. ALT levels were considered normal when <35 IU/l in female and <45 IU/l in male patients. Virologic response was assumed when HDV-RNA was either undetectable, below the lower limit of quantification or had decreased by ≥2 log.

**Results:** Elevated baseline ALT levels were measured in 99/114 patients (mean ALT level 115 IU/l). We covered 4289 patient weeks of bulevirtide treatment with a mean observation time of 38 weeks. Virologic response was observed in 87/114 cases. Mean ALT levels had declined by 68 (± 66) IU/l at the time point of viral response. Comparable to clinical trials we investigated datapoints at week 12 and week 24 in more detail. A subset of 33 patients had reached treatment week 24. In this group elevated baseline ALT levels were seen in 26/33 patients. At week 12 and 24, ALT had normalized in 9/26 (39%) and 11/26 (42%), respectively. Within the first 12 weeks of treatment a significant decline of ALT was observed (114 IU/l vs. 53 IU/l, p < 0.001). This decline was also seen in patients without virologic response (Figure 1). Updated data with additional follow-up weeks will be presented at the meeting.

**Figure 1:** ALT levels at baseline and follow-up weeks grouped by viral response. Boxplots represent ALT levels at week 0 (white), week 12 (grey) and week 24 (dark grey). Outlying data points are visualized by dots.

**Conclusion:** In this real-world cohort ALT levels improved under bulevirtide treatment. This improvement was independent from the virologic response status when investigating distinctive follow-up time points. Different mechanistic explanations for this observation can be considered. The protection of hepatocytes from bile salts through bulevirtide mediated NTCP-blockade may have anti-inflammatory effects. At the same time, the rise in bile salts in the peripheral blood may affect immune cells. The observation of improved ALT values is of clinical relevance as such improvements should theoretically translate into better clinical outcomes.

**SAF-157**

**Comparison of body weight and lipid profiles following tenofovir disopropyl fumarate or entecavir switching to tenofovir alafenamide in chronic hepatitis B patients**

Pin-Nan Cheng1, Chun-Jen Liu2, Jyh-Jou Chen3, I-Cher Feng4, Hsing-Lao Kuo5, Pei-Lun Lee6, Ming-Lung Yu5, Yencheng Chiu1, Chiu Hung-Chih1, Shih-Chieh Chien1, Pei-Jer Chen7, National Cheng Kung University Hospital, Department of Internal Medicine, Tainan, Taiwan; 2National Taiwan University Hospital, Department of Internal Medicine, Taipei, Taiwan; 3Chi-Mei Medical Center, Liouying, Department of Internal Medicine, Tainan, Taiwan; 4Chi-Mei Medical Center, Department of Internal Medicine, Tainan, Taiwan; 5Kaohsiung Medical University Hospital, Department of Internal Medicine, Kaohsiung, Taiwan

Email: pncheng@mail.ncku.edu.tw

**Background and aims:** Body weight (BW) and lipid profiles have been reported in HIV infected patients treated with tenofovir alafenamide (TAF) containing regimens. Tenofovir disopropyl fumarate (TDF) treated chronic hepatitis B (CHB) patients exhibited lower lipid profiles in phase III study. The impact of TAF, as a new drug for CHB treatment, on BW and lipid profiles remains unclear and needs to investigate. The aim of this study was to compare the BW changes following switching to a 48-week TAF in prior tenofovir disopropyl fumarate (TDF) or entecavir treated CHB patients.

**Method:** This was a prospective, multi-center, observational study. CHB patients from sevenhospitals in Taiwan treated with TDF or entecavir for at least 1 years and then switched to TAF were enrolled. Treatment indication based on reimbursement criteria. Demography and serial biochemical, hematology, lipid profiles and sugar profiles tests were measured at baseline and then at and an interval of 3 or 6 months after switching to TAF. Primary end point was the body weight changes following switching to TAF. Secondary end points included ASCVD score changes, changes of lipid and sugar profiles, and virologic responses following Switching to TAF.

**Results:** Between June 2020 and May 2021, 159 patients including 100 males and 59 females, were enrolled. The mean age was 56.1 years. Before switching to TAF, 97 patients received TDF and 62 patients received ETV. ETV-switch patients presented with significantly older age, lighter BW, lower AST and ALT, higher total bilirubin, lower platelet counts, higher ASCVD risk score, and higher lipid profiles than TDF-switch patients. Significantly lower proportion of TDF-switch patients took lipid lower agents. BW increased shortly after 12 weeks (67.8 ± 12.7 kg, p < 0.001) of TAF in TDF-switch patients. The increased BW maintained following 24 weeks (68.7 ± 12.7 kg, p = 0.017) and 36 weeks (67.8 ± 12.5 kg, p = 0.007), and 48 weeks (67.9 ± 12.9 kg, p = 0.037) of TAF treatment. The BW of ETV-switch patients maintained during the first 36 weeks of TAF treatment, but significantly decreased at week 48 (62.6 ± 10.7 kg, p = 0.033). In TDF-switch patients, BW of males remained stationary during 48 weeks of TAF, while BW of females at 12 weeks (61.0 ± 8.4 kg, p < 0.001), 24 weeks (61.0 ± 9.0 kg, p = 0.023), and 36 weeks...
(61.2 ± 9.1 kg, p = 0.008) following TAF treatment increased significantly. In TDF-switch patients, cholesterol, triglyceride, HDL, and LDL significantly increased at week 24 and week 48 when compared with baseline (Fig. 2). After 48 weeks of TAF treatment, no significant change of the ASCVD risk score in TDF-switch patients (7.3 ± 9.9 at baseline vs. 7.9 ± 9.9 at week 48, p = 0.063) and ETV-switch patients (11.4 ± 13.7 at baseline vs. 12.0 ± 15.4 at week 48, p = 0.292).

**Conclusion:** After 48-week TAF treatment, BW gained significantly in TDF-switched rather than ETV-switched CHB patients. Lipid profiles increase only observed in TDF-switched to TAF CHB patients. ASCVD risk score remained following 48-week TAF treatment in both ETV or TDF switched patients.

SAT-158

**Model-based meta-analysis of pegylated IFN-alpha induced HBsAg loss at end of treatment and 24 weeks post treatment in chronic hepatitis B virus infection**

Nathan Hanan1, Matthew J Zierhut2, Ahmed Nader1, Anadi Mahajan3, Amandeep Kaur3, Krishna Kumar3, Susan Dixon4, Joyeta Das4, Mindy Magee1, Dickens Theodore5, Vera Gielen4.

1GSK, Collegeville, United States; 2Certara, San Diego, United States; 3Bridge Medical Consulting, London, United Kingdom; 4GSK, Brentford, United Kingdom; 5GSK, Durham, United States

Email: vera.x.gielen@gsk.com

**Background and aims:** Pegylated interferon alpha (Peg-IFNa) is one of two current treatment options for chronic hepatitis B virus (HBV) infection. Peg-IFNa can induce immunological control of HBV with a finite duration treatment, however, response is highly variable. We performed a model-based meta-analysis (MBMA) to establish absolute effect models of hepatitis B surface antigen (HBsAg) loss for peg-IFNa-based regimens at end of treatment (EOT) and 24 weeks post-treatment. This can be leveraged to perform clinical trial simulations that predict outcomes with respect to different populations.

**Method:** We conducted a systematic review of HBsAg loss rate with peg-IFNa monotherapy or in combination with a nucleos (t)ide analogue (NA) in participants with chronic HBV infection, searching major databases (Embase; MEDLINE; Cochrane) for literature published 2000 to July 2022. HBsAg loss was defined as HBsAg levels reported below the limit of detection (0.05 IU/ml). Models were developed to describe the proportion of participants achieving HBsAg loss at EOT and 24 weeks post treatment as a function of peg-IFNa and peg-IFNa + NA treatment effects. Baseline biological and demographic population characteristics were explored as covariates in both models.

**Results:** For the peg-IFNa EOT end point of HBsAg loss, a total of 83 study-strata-arms producing HBsAg loss results from 13 235 participants were included. 63 of the study-strata-arms were from randomised controlled trials, the rest are comprised from prospective and retrospective cohorts and single arm trials. For the 24 weeks post-peg-IFNa treatment end point, a total of 58 study-strata-arms producing HBsAg loss results from 4267 participants were included. 43 of the study-strata-arms are from RCTs, 8 from prospective cohorts, 3 retrospective cohorts and 3 single arm trials. In both EOT and post-treatment models, two covariates were identified that describe HBsAg loss in patients treated with peg-IFNa or peg-IFNa + NA: peg-IFNa treatment duration and baseline HBsAg levels. In the EOT model only, HBeAg status was an additional predictor of HBsAg loss. Age, gender, race, and continuation of NA after end of peg-IFNa treatment (24 weeks post-treatment only) were tested but not significant. Degree of missingness for HBV genotype, baseline HBV DNA and baseline alanine aminotransferase (ALT) did not support covariate assessments. The model was then used to simulate 100 000 trials of different populations and treatment arms. Example results of different populations are presented in the table.

**Conclusion:** The MBMA provides a quantitative description of between-trial variability in peg-IFNa-based regimens and has identified highly influential predictors of HBsAg loss that lend to...
Kinetics of HBsAg forms in chronic hepatitis delta patients treated with bulevirtide for 48 weeks: correlation with virological response

Stefano D’Anna1, Romina Salpini1, Elisabetta Degasperi2, Leonardo Duca2, Maria Paola Anolli2, Lorenzo Piermatteo1,2, Dana Sambarino2, Marta Borghi2, Floraiana Facchetti2, Francesca Ceccherini Silberstein1, Riccardo Perbellini2, Valentina Sivicher1,3, Pietro Lampertico2,4, Francesca Ceccherini Silberstein1, Riccardo Perbellini2, Valentina Sivicher1,3, Pietro Lampertico2,4. 1University of Rome “Tor Vergata”, Department of Experimental Medicine, Italy; 2Foundation IRCCS Ca’ Granda Ospedale Maggiore Policlinico, Division of Gastroenterology and Hepatology, Italy; 3University of Rome “Tor Vergata”, Department of Biology, Italy; 4CRC A.M. and A. Migliovacca Center for Liver Disease, Department of Pathophysiology and Transplantation, Italy

Email: stefanodanna26@gmail.com

Background and aims: HDV exploits the HBV surface protein (HBsAg) for the release of its progeny and entry into hepatocytes. HBsAg consists of three different proteins: Large HBsAg (L-HBs), including pre-S1, pre-S2 and S regions; Middle HBsAg (M-HBs) including pre-S2 and S regions and small HBsAg (S-HBs), containing only the S region. Among them, L-HBs is predominantly present in virions and is crucial for the binding to the NTCP receptor and thus for viral entry into the hepatocytes. Here, we investigate the still unknown kinetics of HBs forms in patients receiving the entry inhibitor bulevirtide (BLV).

Method: Consecutive patients with HDV-related compensated cirrhosis starting BLV monotherapy 2 mg/day were enrolled in this single-center retrospective/longitudinal study. All patients were under effective NUC treatment at entry. L-HBs, M-HBs and S-HBs (Beacle Inc.) were quantified by ad hoc ELISAs assays in baseline and week 48 samples. HDV-RNA was quantified by Robogene 2.0 (LOD: 6 IU/ml). Virological response (VR) was defined as HDVRNA undetectable (<6 IU/ml) or >2 log decline compared to baseline, biochemical response as ALT normalization.

Results: Twenty patients with compensated cirrhosis were enrolled: at baseline, median (IQR) age was 50 (40–62) years, 65% males, liver stiffness measurement (LSM) 17.6 (13.1–28.4) kPa, median (IQR) ALT was 110 (83–147) U/L, platelets 72 (59–93) × 10^3/mm^3, serum HDV-RNA was 4.9 (4.4–5.7) IU/ml and HBsAg levels 3.7 (3.4–3.9) log IU/ml. Pre-treatment, median (IQR) levels of S-HBs, M-HBs and L-HBs were 3421 (1240–6209) ng/ml, 791 (260–1930) ng/ml and 7 (2–15) ng/ml, respectively. Following 48 weeks of BLV, serum HDV-RNA declined by 3.1 (1.8–3.6) log IU/ml and ALT normalized in 14 (70%) patients. VR was observed in 14 (70%) patients while HDV-RNA undetectability in 6 (30%) with 5 of them achieving ALT normalization. During BLV treatment, S-HBs, M-HBs and L-HBs decreased in 60%, 70% and 45% of patients with a median (IQR) decline of 1095 [839–2403] ng/ml, 145 [39–350] ng/ml, 10 [4–15] ng/ml), respectively. HDV-RNA undetectability as well as HDV-RNA undetectability plus ALT normalization at week 48 were significantly greater in patients with low pre-treatment L-HBs levels (54% with vs 11% without L-HBs <9 ng/ml, P = 0.042; 50% with vs 0% without L-HBs <9 ng/ml, P = 0.03). Notably, the combination of pre-treatment L-HBs levels <9 ng/ml + HDV-RNA levels <5 log IU/ml was the best predictor for achieving combined response (67% with versus 7% without this combination achieved this end point, P = 0.01).

Conclusion: Quantification of L-HBs along with serum HDV-RNA may reflect the burden of circulating infectious virions, possibly providing a new tool to identify patients more likely to respond to BLV monotherapy.

Comparison of kidney function decline between chronic hepatitis B patients with versus without antiviral therapy

Jae Seung Lee1,2,3, Chan-Young Jung1,4, Jung Il Lee1,2,5, Sang Hoon Ahn1,2,3, Beom Seok Kim1,4, Seung Up Kim1,2,3,1Yonsei University College of Medicine, Department of Internal Medicine, Seoul, Korea, Rep. of South; 2Yonsei University College of Medicine, Institute of Gastroenterology, Seoul, Korea, Rep. of South; 3Severance Hospital, Yonsei Liver Center, Seoul, Korea, Rep. of South; 4Yonsei University College of Medicine, Institute of Nephrology, Seoul, Korea, Rep. of South; 5Gangnam Severance Hospital, Department of Internal Medicine, Seoul, Korea, Rep. of South

Email: ksukorea@yuhs.ac

Background and aims: Kidney function can deteriorate in patients with chronic hepatitis B (CHB). Herein, we compared the risk of kidney function decline between untreated and treated CHB patients receiving antiviral therapy (AVT).

Method: This retrospective study included 1,061 untreated CHB patients, tenofovir alafenamide (TAF) or besifovir dipivoxil maleate (BSV) users (n = 556), and entecavir (ETV) users (n = 2,029). Primary outcome was kidney function decline, defined as an increase in chronic kidney disease (CKD) stage ≥1 for ≥3 consecutive months. Results: The 1:1 propensity score matching yielded 588 pairs in each untreated and treated patient group. The risk of kidney function decline was significantly higher in the treated group (83 patients [2.7 per 1000 person-years (PYs)]) than in the untreated group (39 patients [1.3 per 1000 PYs]) (p <0.001), with an unadjusted hazard ratio of 2.09 (95% confidence interval, 1.43–3.05, P < 0.001), which remained the same after adjusting for potential confounders. However, when TAF or BSV users were matched, yielding 259 pairs, no significant difference in the kidney function decline risk was observed between the groups (12 patients in the untreated group [1.6 per 1000 PYs] and 21 in the treated group [2.9 per 1000 PYs], P = 0.107). However, when matched, ETV users showed a significantly higher risk of kidney function decline than untreated patients (100 patients [3.6 per 1000 PYs]) vs. 31 patients [1.1 per 1000 PYs], P < 0.001).
**S1-161**

**Effect of first-line nucleotide analogues on blood lipids in patients with chronic hepatitis B: a network meta-analysis**

Kexin Tong¹, Mingjing Chen¹, Danni Wang¹, Jiayi Peng¹, Jia Zhang¹, Jiao Zhou¹, Yujiao Chang¹, Wenxiang Huang¹. *The First Affiliated Hospital of Chongqing Medical University, Chongqing, China*

Email: wenxiang_huang@163.com

**Background and aims:** It has been found that blood lipids levels in patients with chronic hepatitis B (CHB) might be changed during antiviral treatment. At present, most studies focused on the comparison of three first-line nucleotide (s)ide analogues (NAs), entecavir (ETV), tenofovir disoproxil fumarate (TDF), and tenofovir alafenamide (TAF), but there lacks comprehensive evaluation of their effects on blood lipids under a unified standard. This study aims to evaluate the influence of first-line NAs on blood lipids in CHB patients by using the method of network meta-analysis.

**Method:** Seven Chinese and English databases were searched from the establishment of the database to November 1, 2022. Studies involving ETV, TDF and TAF on the effects of blood lipids in patients with CHB were included. The changes of serum total cholesterol (TC), triglyceride (TG), low-density lipoprotein cholesterol (LDL-C) and high-density lipoprotein cholesterol (HDL-C) before and after treatment were taken as outcome indicators. We used RevMan5.4 software for direct comparison, and Stata16.0 software for network meta-analysis based on the frequency framework.

**Results:** Eight articles were included in this study, including 2614 CHB patients in 10 trials, involving three different antiviral drugs, TAF, TDF and ETV, and the blank control group (inactive CHB patients without antiviral treatment). Direct comparison: Compared with TDF group, blood lipids in TAF group showed an increasing trend (ΔTC SMD = 15.18, 95%CI (11.44, 18.92); ΔTG SMD = 9.24, 95%CI (3.85, 14.63); ΔLDL-C SMD = 6.35, 95%CI (4.41, 8.28); ΔHDL-C SMD = 8.82, 95%CI (2.85, 14.80)); Compared with TDF group, blood lipids in ETV group also increased (ΔTC SMD = 20.39, 95%CI (12.85, 27.93); ΔTG SMD = 18.89, 95%CI (7.28, 30.51); ΔLDL-C SMD = 11.31, 95%CI (4.89, 17.74); ΔHDL-C SMD = 7.65, 95%CI (1.31, 14.00)). Network meta-analysis: TDF can reduce the levels of TC, TG, HDL-C and LDL-C (TDF vs blank control group: ΔTC SMD = −19.43, 95%CI (-27.90, −10.97); ΔTG SMD = −24.11, 95%CI (−44.21, −4.00); ΔLDL-C SMD = −8.91, 95%CI (−16.37, −1.45); ΔHDL-C SMD = −8.6, 95%CI (−14.23, −2.96), while TAF and ETV have no significant difference compared with the blank control group (TAF vs blank control group: ΔTC SMD = −0.36, 95%CI (−9.02, 8.30); ΔTG SMD = 2.37, 95%CI (−4.84, 9.58); ΔLDL-C SMD = −0.37, 95%CI (−4.73, 3.98). ETV vs blank control group: ΔTC SMD = 2.69, 95%CI (−7.04, 12.23); ΔTG SMD = 8.23, 95%CI (−13.07, 29.54); ΔLDL-C SMD = −0.36, 95%CI (−9.02, 8.30); ΔHDL-C SMD = 2.41, 95%CI (−3.81, 8.63)).

**Conclusion:** TDF had an effect on lowering the levels of TG, TC, HDL-C and LDL-C, and the effect is most obvious within first 24 weeks of treatment initiation. During follow-up for more than 48 weeks, the blood lipids of CHB patients would remain relatively stable. TAF and ETV had neutral effect on lipids change, and no significant difference in blood lipids changes among TAF, ETV and those without antiviral treatment. Switching from TDF to TAF or ETV made the blood lipids of CHB patients increase relatively, but such changes were still within an acceptable range.
SAT-162
The different immune response of B cells specific for hepatitis B virus core and envelope antigen in chronic hepatitis B patients with pegylated interferon-alpha treatment
Qi Zheng1, Ruimin Lai1, Jiawei Zhang1. 1the First Affiliated Hospital, Fujian Medical University, China
Email: zhengqi0825@sina.com

Background and aims: The humoral immune response against HBsAg and HBcAg have different functional capabilities during chronic hepatitis B virus (CHB) infection. The phenotype and functional impairment of HBsAg-specific B cells fail to produce detectable anti-HBs and promote the persistence of CHB infection. The seroconversion of the HBsAg provides a promising outcome for pegylated interferon-α (Peg-IFN-alpha) treated patients with CHB. But a detailed assessment of their impact on HBV-specific B-cell responses is lacking. The study aimed at functional cure including a thorough characterization of hepatitis B-specific B cell responses for Peg-IFN-alpha treatment.

Method: We included 13 nucleos (t)ide analogue-treated (NUCs) patients with chronic HBV for 48 weeks of Peg-IFN-alpha treatment. Peripheral blood mononuclear cells (PBMC) were collected before and at 24 weeks, 48 weeks with Peg-IFN-alpha treatment. Fluorescently labeled HBsAg and HBcAg reagents were synthesized and utilized to characterize ex vivo HBV-specific B cells. The frequency, phenotype and function of HBV-specific B cells and Tfh cells were examined by FACS.

Results: The frequency of HBcAg-specific B cells are similar to HBsAg-specific B cells in NUC-treated patients, and no significant change during Peg-IFN-alpha treatment. The phenotype and function of B cells specific for HBsAg and HBcAg were different in response to Peg-IFN-alpha treatment in CHB patients. The expression of CD38 on HBsAg-specific B cells was higher, with the subset of activated memory B cell (actMBC) and IgG+ class-switched memory B cells enriched (PactMBC = 0.0065; PIgG = 0.0006). And the subset of atypical memory B cells (atMBC) of HBcAg-specific B cells were increased along with IgG+ class-switched memory B cells reduced and IgM+ class-switched memory B cells increased during Peg-IFN-alpha treatment. HBsAg-specific B cells showed higher expression of liver-homing marker CXCR3, CD69 and IgG+ class-switched, and lower expression of CXCR5, IgM+ class-switched compared to HBcAg-specific B cells after 48 Weeks Peg-IFN-alpha treatment. Moreover, the expression of CD40 ligand in Tfh cells was increased (p = 0.0042) and showed a significant positive correlation with the expression of activation marker CXCR3, CD38 in HBsAg-specific B cells.

Conclusion: The humoral immune response against HBsAg and HBcAg was different in CHB patients with Peg-IFN-alpha treatment. The exhausted phenotype of HBsAg-specific B cells was recovered whereas HBcAg-specific B cells response was significantly reduced during Peg-IFN-alpha treatment. Moreover, the frequency of CD40L+ Tfh cells was increased and showed a positive correlation with the activation marker of HBsAg-specific B cells indicating the important role of CD40L+Tfh cells in functionally recovering HBsAg-specific B cells with Peg-IFN-alpha treatment.

SAT-163
Incomplete response with/without genotypic resistance to prior antivirals is not associated with a higher risk of hepatocellular carcinoma during tenofovir treatment for chronic hepatitis B
Ju Yeon Kim1, Hyunjae Shin1, Jeayeon Park1, Moon Haeng Hur1, Sungwon Chung1, Min Kyung Park1, Yun Bin Lee1, Yoon Jun Kim1, Jung-Hwan Yoon1, Jeong-Hoon Lee1. 1Seoul National University College of Medicine, Korea, Rep. of South
Email: pindra@empas.com

Background and aims: Resistance to antiviral agent is reportedly associated with a higher risk of hepatocellular carcinoma (HCC). However, tenofovir has enabled effective viral suppression even in chronic hepatitis B (CHB) patients who had incomplete response with/without genotypic resistance to previous antivirals. This study aimed to evaluate whether the incomplete response is a risk factor of HCC development in the tenofovir-available era.

Figure: (abstract: SAT-161): The better the effect of lowering blood lipids, the larger the surface under the cumulative ranking curve (SUCRA).
Method: This retrospective study included 852 consecutive non-cirrhotic CHB patients who started tenofovir between May 2012 and December 2018 at a single tertiary center in Korea: 654 patients started tenofovir as a first-line antiviral treatment (first-line group) and 198 as a rescue therapy for incomplete response to prior antivirals (rescue group). The primary outcome was HCC development. Baseline characteristics were balanced using inverse probability of treatment weighting method.

Results: The rescue group had older age (median, 50 vs. 46 years), included less females (27.3% vs. 47.4%), and lower baseline HBV DNA level (median, 3.1 vs. 6.6 log10 IU/ml) (all P < 0.05) compared to the first-line group. 84.3% of the rescue group (167 of 198) had previously documented genotypic resistance. The incidence rates of HCC were comparable between the first-line group (0.35 per 100 person-years [PY]) and the initial therapy group (0.35 per 100 PY) by a univariable Cox proportional hazards model (hazard ratio [HR], 0.91; 95% CI, 0.32–2.54; P = 0.851). After adjustment for age, sex, and platelet count, the rescue therapy group was not an independent risk for HCC (adjusted HR, 0.90; 95% CI, 0.33–2.49; P = 0.840).

Conclusion: Incomplete response with/without genotypic resistance to prior antiviral therapy was not associated with HCC development in CHB patients with subsequent viral suppression through tenofovir therapy.

SAT-164
Hepatitis B surface antigen loss rate and safety and discontinuations with pegylated interferon alpha in chronic hepatitis B virus infection, a systematic review
Vera Gielen1, Amandeep Kaur2, Krishna Kumar2, Saifuddin Kharawala2, Joyeta Das1, Jacob Vincent1, Anadi Mahajan2.
1GSK, United Kingdom, 2Bridge Medical Consulting, United Kingdom
Email: vera.x.gielen@gsk.com

Background and aims: Pegylated interferon alpha (Peg-IFNa) is one of two treatment options for chronic hepatitis B virus (HBV) infection. Peg-IFNa can induce immunological control with a finite duration treatment, however, response is highly variable and its safety and tolerable profile impacts eligibility and willingness of patients to take this treatment. The aim was to conduct a systematic review of peg-IFNa treatment in participants with chronic HBV infection, for whom data on baseline HBsAg levels was available, to understand durability and rates of HBsAg related outcomes, safety and discontinuation.

Method: A systematic review of studies in participants with chronic HBV infection who received PegIFNa, for whom data on baseline hepatitis B surface antigen (HBsAg) was available, was conducted. Outcomes included HBsAg related outcomes for efficacy, safety and treatment discontinuations. Studies included were clinical trials and retrospective and prospective cohorts. Major databases (Embase; MEDLINE; Cochrane) were searched for literature published between 2000 to July 2022.

Results: 126 primary studies were included. 29 studies reported data on durability of HBsAg loss; 10 studies (12 study arms) reported HBsAg loss at end of treatment (EOT), 24 weeks post-treatment and further end points and 19 studies (31 study arms) reported data at EOT and further end points. Range of HBsAg loss in all studies was between 0.0%-84.2% at EOT and in studies assessing durability of response this was 0.0%-44.4%. The majority of studies showed that EOT HBsAg loss with peg-IFNa was durable, 84% or 36 out of 43 study arms showed either no change or increase in HBsAg loss rates over time. Only 7 arms showed a decrease in response rate over time with numerical differences in patients regaining HBsAg being minimal. Data on HBsAg loss at EOT and 24 weeks and factors associated with likelihood of HBsAg loss will be reported in a separate abstract. Discontinuations were reported in 61 studies and ranged from 0.0% to 62.0%. Discontinuations due to AEs were reported in 52 studies and ranged from 0.0% to 26.8%. AEs were common. Fatigue was reported in 0.0–75.0% (34 studies), asthenia 5–44% (7 studies), headache 2.4–65.1% (30 studies), influenza like illness 8.5–92.9% (9 studies), myalgia 0.0–68.3% (28 studies), depression 0.0–21.5% (10 studies), other neuropsychiatric disorders 0–27% (19 studies, including anxiety, insomnia), and pyrexia 8.2–90% (34 studies).

Conclusion: These results show that some patients can achieve HBsAg loss with peg-IFNa and when achieved HBsAg loss is durable. However, this should be taken in the context of the safety and tolerability profile and therefore patients’ willingness to take peg-IFNa with discontinuations ranging between 0 and 62% for a finite regimen.

Funding: GSK (217324).
SAT-165
The efficacy of peginterferon alpha in Chinese inactive hepatitis B carriers and nucleoside analogs-experienced patients: a real world research
Chaojing Wen1,2, Xiaofeng Shi1,2, Yu Lei1,2.
1The Second Affiliated Hospital, Chong Qing Medical University, Department of Infectious Diseases, Chong Qing, China; 2Key Laboratory of Molecular Biology for Infectious Diseases (Ministry of Education), Institute for Viral Hepatitis, Chong Qing, China
Email: sxf7776@163.com

Background and aims: Due to the different immune states in inactive hepatitis B carriers (IHCs) and nucleoside analogs-experienced patients, whether those two groups of patients show different effectivity to Peginterferon alpha is still unclear. Hence, this study aims to investigate the effectiveness and discrepancy of Peginterferon between inactive hepatitis B carriers and nucleoside analogs-experienced patients.

Method: In this real world, observational study, all subjects were enrolled from June 2019 to September 2021 at the Second Affiliated Hospital of Chong Qing Medical University. A total 58 inactive hepatitis B carriers assigned to receive PEG-IFNa2b alone for 48 weeks (Peg-IFN group), 84 nucleoside analogs-experienced patients treated with PEG-IFNa2b plus nucleoside analogs (tenofovir disoproxil fumarate, entecavir or tenofovir alafenamide) for 48 weeks (Peg-IFN plus NAs group), 23 nucleoside analogs-experienced patients receive NAs alone for 48 weeks (NAs group). Patients were followed up 24 weeks after treatment discontinue. Twenty seven untreated IHCs were observed for 72 weeks (control group). The primary end point is the HBsAg clearance and seroconversion at 48 weeks and 72 weeks.

Results: Baseline characteristics are similar in every groups. At week 48, Intention-to-treat analysis showed that the rate of HBsAg clearance were 53.4% (31/58), 45.2% (38/84), 0% (0/27) and 0% (0/23) in Peg-IFN group, Peg-IFN plus NAs group, NAs group and control group respectively (ITT, P = 0.336, Peg-IFN VS Peg-IFN plus NAs; P < 0.001 Peg-IFN VS controls; P < 0.001, Peg-IFN plus NAs VS NAs). HBsAg seroconversion was achieved 36.2% (21/58) of Peg-IFN, 25.8% (23/89) of Peg-IFN plus NAs (ITT, P = 0.166). In Peg-IFN group, two patients (2/31, 6.5%) were observed HBsAg reappearance at 12 weeks and 48 weeks after HBsAg loss. Meanwhile, four subjects (4/38, 10.5%) experienced HBsAg relapse at 24 weeks, 32 weeks, 48 weeks and 56 weeks after HBsAg clearance in Peg-IFN plus NAs group (p = 0.867). Furthermore, we used the receiver operator curve to analyze HBsAg clearance. A baseline HBsAg level of <32 IU/ml provide good prediction for HBsAg clearance (sensitivity: 73.7%, specificity: 43.8%). All patients in treatment group exhibited virological response (HBV DNA<100 IU/ml). Generally, there are no serious adverse events during treatment, and the therapy was well tolerated.

Conclusion: Peg-IFN results in high rates of HBsAg loss and seroconversion in both IHCs and nucleoside analogs-experienced patients, especially, for those patients who HBsAg level below 32 IU/ml. Besides, HBsAg seroclearance achieved after Peg-IFN treatment was durable during 24 weeks’ follow-up.

SAT-166
Similarly low risk of chronic kidney disease (CKD) progression in chronic hepatitis B patients with Stage 2 CKD on tenofovir alafenamide versus entecavir
Yan Liang1, Vicki Wing-Ki Hui1, Terry Cheuk-Fung Yip1, Che To Lai1, Shuk Man Lam1, Yee-Kit Tse1, Henry LY Chan2, Vincent Wai-Sun Wong1, Grace Lai-Hung Wong3, 1the Chinese University of Hong Kong, Hong Kong
Email: wonglaihung@mect.cuhk.edu.hk

Background and aims: Tenofovir alafenamide (TAF) is a novel prodrug of tenofovir. There have been evolving data concerning its positive impact on renal safety as shown in registration trials. We aimed to compare the risk of chronic kidney disease (CKD) progression in chronic hepatitis B (CHB) patients on TAF versus entecavir (ETV).

Method: This is a retrospective cohort study. CKD Epidemiology Collaboration equation was used to determine the estimated
Viral Hepatitis B and D New therapies, unapproved therapies or strategies

Wednesday 21 to Saturday 24 June

TOP-109 VIR-2218 and VIR-3434 therapy is efficacious in preclinical models of hepatitis delta virus infection

Jiayi Zhou1, Hannah Kaiser1, Tassilo Volz2,3, Michael A. Schmid4, Luebeck-Borstel-Riems Site, Germany; 4Universitätsklinikum Jena, Klinik für Innere Medizin II, Germany; 5Universitätsklinikum Tübingen, Medizinische Klinik und Poliklinik, Germany; 6Goethe University, University Hospital Frankfurt, Medizinische Klinik I, Germany; 7Universitätsklinikum Jena, Klinik für Innere Medizin IV, Germany; 8Universität Leipzig, Medizinische Klinik und Poliklinik, Germany; 9Helios Klinikum Emil von Behring, Klinik für Innere Medizin I, Germany; 10Universitätsklinikum Heidelberg, Innere Medizin IV, Germany; 11Universitätsklinikum Magdeburg AöR, Germany; 12Otto-von-Guericke-Universität Magdeburg, Klinik für Gastroenterologie, Hepatologie und Infektiologie, Germany; 13Universitätsklinikum Düsseldorf, Klinik für Gastroenterologie, Hepatologie und Infektiologie, Germany; 14Universitätsklinikum Kiel, Medizinische Klinik II, Germany; 15MVZ Gastroenterologie Leverkusen GbR, Germany; 16Universitätsklinikum des Saarlandes, Klinik für Innere Medizin II, Germany; 17Medizinische Hochschule Hannover, Medizinische Klinik und Poliklinik, Germany; 18Helmholtz Zentrum München, Klinik für Innere Medizin II, Germany; 19Universitätsmedizin Mainz, I. Medizinische Klinik und Poliklinik, Germany; 20Universitätsklinikum Würzburg, Medizinische Klinik I, Germany; 21Medizinische Klinik und Poliklinik, Germany; 22Universitätsklinikum Großhadern, Medizinische Klinik und Poliklinik II, Germany; 23Zentrum für Infektiologie (zibp), Berlin, Germany; 24Henri Mondor University Hospital, Hepatology Department, France; 25Leberzentrum München-Sendlinger-Tor-Platz 9, Germany; 26LMU Klinikum Großhadern, Medizinische Klinik und Poliklinik II, Germany; 27Gastroenterologisch-Hepatologisches Zentrum, Kiel, Germany; 28Martin-Luther-University Halle-Wittenberg, Department of Internal Medicine I, Germany; 29Universitätsklinikum Würzburg, Medizinische Klinik II, Germany; 30Universitätsklinikum Hamburg-Eppendorf, I. Medizinische Klinik und Poliklinik, Germany; 31University Leipzig, Clinical Trial Centre, Germany

Email: flemp@vir.bio

Background and aims: Chronic Hepatitis Delta Virus (HDV) infections represent the most severe form of viral hepatitis with limited treatment options. HDV is a satellite virus of Hepatitis B Virus (HBV) that depends on HBV-derived HBsAg for envelopment and viral dissemination in the liver. VIR-2218 is an investigational siRNA therapeutic that targets a highly conserved region within the HBx open reading frame and demonstrates potent knockdown of all HBV transcripts including of HBsAg. VIR-3434 is an investigational neutralizing monoclonal antibody targeting the antigenic loop of HBsAg thereby inhibiting viral entry and reducing circulating HBsAg in preclinical models. VIR-2218 and VIR-3434 are currently being evaluated in clinical trials as monotherapy and in combination. This study aims to determine the antiviral effect of VIR-2218 and VIR-3434 on HDV infection in preclinical models.

Method: In vitro antiviral efficacy of VIR-2218 was determined in an HBV/HDV co-infection model of primary human hepatocytes (PHH). After treatment with siRNA, secreted HBsAg was quantified by ELISA and secreted infectious HDV virions were quantified by re-infection of HuH7-NTCP cells. In vitro neutralization capacity of VIR-3434 was determined against HDV enveloped with HBsAg of eight different HBV genotypes. In vivo, humanized uPA/SCID/beige mice were intra-peritoneally injected twice weekly for 4 weeks with VIR-3434 (1 mg/kg) after achieving stable HBV/HDV co-infection. Serological and intrahepatic viral markers were measured by ELISA and (RT-) qPCR.

Results: VIR-2218 reduced HBsAg and secreted infectious HDV with picomolar efficacy in a co-infection model of PHH. VIR-3434 neutralized HDV infection with >10 000-fold higher potency than Hepatitis B Immunoglobulins in vitro. Neutralization activity was pan-genotypic as tested with HDV enveloped with HBsAg of HBV genotypes A-H. In vivo, HBC34 (the parental molecule of VIR-3434) reduced HBsAg, HBV DNA and HDV RNA serum levels by >2 log10 copies/ml. As expected, intracellular levels of HBV and HDV RNAs were not affected by HBC34 treatment in the chronic infection model.

Conclusion: VIR-2218 and VIR-3434 have previously shown efficacy against HBV infection in multiple in vitro and in vivo models. Due to the shared usage of HBsAg by HBV and HDV, targeting HBsAg directly also influences concurrent HDV infection. By reducing HBsAg secretion, circulating HBsAg, and HDV virions, as well as blocking entry into hepatocytes, VIR-2218 and VIR-3434 exert antiviral efficacy against HDV through multiple modes of action. These data support the clinical development of VIR-2218 and VIR-3434 for treatment of patients with chronic HDV infection.
Background and aims: In the prospective, multicenter, randomized STOP-NUC trial, discontinuation of long-term nucleos (t)ide analogues (NA) treatment resulted in Arm A 8/79 (10%) patients achieving HBsAg loss and 54/79 (68%) patients remaining free of treatment indication within 96 weeks, whereas there were no HBsAg losses in the control Arm B. In the second prospective observation period of the STOP-NUC trial we have assessed effects of NA discontinuation after week 96 up to a maximum follow-up time of 371 weeks (84 months), with a median follow-up time of 200 weeks (46 months).

Method: HBeAg-negative patients without cirrhosis who had achieved suppressed HBV DNA for ≥4 years during NA therapy were randomly assigned to either stop (Arm A) or continue (Arm B) treatment. The primary end point was sustained HBsAg loss at week 96. The objectives of the prolonged observation was to investigate the ratios of HBsAg losses, of HBsAg seroconversions, the duration of NUC treatment free follow-up and of response to re-treatment as well as the ratio of HBsAg loss in Arm B.

Results: A total of 99 of 158 originally included patients consented to take part in the prolonged follow-up (46 Arm A, 53 Arm B). At 72 months, the rate of HBsAg loss was 22.3% [95% CI: 7.9%–34.4%] in Arm A and 2.2% [95% CI: 0%–6.4%] in Arm B (Figure 1, p = 0.0013). Four further HBsAg losses had occurred after week 96 in Arm A. In Arm B, 13 patients had discontinued NUC treatment according to the discretion of the treating physician of which 1 had lost HBsAg during the follow-up period. Re-treatment with NA during follow-up was introduced at the discretion of the treating physician, and did not necessarily follow-up the stringent rules applied during the first 96 weeks. Re-treatment rate in Arm A was 20.7% [95% CI 9.8%–30.3%] at 72 months after NA stop. No patient in Arm A suffered any serious adverse events possibly related to lack of NA therapy during the prolonged observation period.

Conclusion: The follow-up period of the STOP-NUC trial demonstrates increasing HBsAg loss rates and stable re-treatment rates after up to a maximum follow-up time of 84 months of discontinuation of long-term NA treatment in patients with HBeAg negative chronic hepatitis B (EudraCT-Nr.: 2013-004882-15).

SATURDAY 24 JUNE

SAT-167
Switching to peginterferon for chronic hepatitis B patients with hepatitis B e antigen seroconversion on entecavir-a long term follow-up study
Che To Lai1, Vincent Wai-Sun Wong1, Angel Mei-Ling Chim1, Vicki Wing-Ki Hui1, Yee-Kit Tse1, Terry Cheuk-Fung Yip1, Henry LY Chan2, Grace Wong1, 1The Chinese University of Hong Kong, Department of Medicine and Therapeutics, Hong Kong; 2Union Hospital, Department of Internal Medicine, Hong Kong
Email: wonglaihung@gmail.com

Background and aims: Previous studies looking into switching from entecavir to peginterferon in chronic hepatitis B (CHB) patients showed a high rate of hepatitis B surface antigen (HBsAg) seroclearance; yet long term data are lacking. We aimed to study the long-term virological outcomes of CHB patients with nucleos (t)ide analogue (NA)-induced hepatitis B e antigen (HBeAg) seroconversion switching to peginterferon treatment.

Method: This was a long-term follow-up study of CHB patients recruited from 2013 to 2016 in a prospective, single-arm open-label study receiving 48 weeks of peginterferon alfa-2a monotherapy after achieving HBeAg seroclearance by entecavir. Baseline date was the end of the peginterferon treatment and the patients were followed until the date of latest virological blood tests. Patients were censored upon retreatment with NA. The virological response defined by sustained HBeAg seroclearance and serum hepatitis B virus (HBV) DNA <2000 IU/ml, as well as the cumulative incidence of HBsAg seroclearance were analysed.

Results: 41 patients from the original study were followed for a mean of 54 months. 30 (73%) were male with a mean age of 44 years. 37 (90%) patients completed the intended 48 weeks course of peginterferon alfa-2a. 11 (27%) patients achieved HBsAg seroclearance, with one patient achieving that at the end of peginterferon
treatment. The cumulative incidences of HBsAg seroclearance were 16%, 19% and 31% at 12, 24 and 36 months respectively (Figure), and no HBsAg reversion was observed. 26 (63%) patients had sustained virological response with HBeAg seroconversion and serum HBV DNA <2000 IU/ml throughout, of which 18 of them had undetectable HBV DNA. On the other hand, 15 (37%) patients had virological breakthrough requiring retreatment of NA at a median of 12 months after cessation of peginterferon treatment. End-of-peginterferon treatment HBsAg level <100 IU/ml (odds ratio 6.75, 95% confidence interval 1.24–36.85) was the best predictor for long term HBsAg seroclearance.

Conclusion: In NA-treated patients with HBeAg seroconversion, switching from NA to peginterferon conferred to a high rate of durable HBsAg seroclearance, especially in those with low end-of-peginterferon HBsAg level.

SAT-168
Safety, pharmacokinetics, and antiviral activity of the next-generation hepatitis B core inhibitor ABI-H3733 in patients with hepatitis B e antigen negative chronic hepatitis B infection: preliminary results from a randomized, blinded, Phase 1b study
Edward J. Gane1, Alina Jucov2, Krum Katzarov3, Oana Sandulescu4, Ran Yan5, Kathryn M. Kitrinos5, Jieming Liu5, Katie Zomorodi5, Luisa M. Stamm5, Steven J Knox5, Michele Anderson5, Grace Wang5, Radoslava Tsrancheva6, Anca Streinu-Cercel4.

1University of Auckland, Auckland, New Zealand; 2ARENSIA Exploratory Medicine GmbH, Dusseldorf, Germany and Department of Gastroenterology, State University of Medicine and Pharmacy, Chisinau, Moldova; 3Department of Gastroenterology, HPP and Transplant Surgery, Military Medical Academy, Sofia, Bulgaria; 4Carol Davila University of Medicine and Pharmacy; National Institute for Infectious Diseases "Prof. Dr.Matei Bals", Bucharest, Romania; 5Assembly Biosciences, South San Francisco, United States; 6Diagnostic Consultative Center Aleksandrovska, Sofia, Bulgaria

Background and aims: ABI-H3733-102 (NCT05414981) is an ongoing, randomized, blinded, multiple-dose escalation study assessing the safety, pharmacokinetics (PK), and antiviral activity of the next-generation core inhibitor ABI-H3733 (3733), administered in patients (pts) with chronic hepatitis B virus infection. Here, we report preliminary safety, PK, and antiviral activity in hepatitis B e antigen (eAg) negative pts from completed cohorts.

Method: Each cohort randomized up to 10 pts (8:2 ratio) to 3733 or placebo (PBO) once-daily (QD) for 28 days. The first 2 cohorts evaluated 25 mg and 50 mg 3733. Eligible pts were male or female, aged 18–65 years, eAg positive (HBV DNA ≥2×10^4 IU/ml) or negative (HBV DNA ≥2×10^3 IU/ml), off antiviral therapy, non-cirrhotic with Fibroscan ≤9 kPa or Metavir F0–F2. Safety was assessed by adverse events (AEs), lab parameters, and electrocardiogram assessments. PK and viral biomarkers (including HBV DNA [Cobas TaqMan, lower limit of quantification = 20 IU/ml]) were assessed throughout.

Results: Baseline (BL) characteristics were similar between the 2 cohorts. As 18/20 pts enrolled were eAg negative, results are described for this subgroup. Most pts were male, White, aged ~40–50 years, with HBV DNA and hepatitis B surface antigen ranging from 3.3–4.5 log_{10} IU/ml and 3.2–3.9 log_{10} IU/ml, respectively. Treatment was well tolerated, with no serious AEs, deaths, or AEs leading to study drug discontinuation. AEs were reported in 4 pts and were all Grade 1. Graded lab abnormalities were observed in 53% (8/15) and 100% (3/3) of pts receiving 3733 and PBO, respectively, with most being Grade 1. No alanine aminotransferase (ALT) increases were observed. HBV DNA change from BL at Day 29 was −2.2 and −3.1 log_{10} IU/ml for 25 mg and 50 mg 3733, respectively. Mean Day 28 Cmax, AUC0–24, and t1/2, respectively, were 959 ng/ml, 14,820 ng·h/ml, and 24.3 h for 25 mg 3733 and were 2,188 ng/ml, 31,510 ng·h/ml, and 23.9 h for 50 mg 3733.

Conclusion: 3733 was well tolerated at doses up to 50 mg QD for 28 days. All AEs and lab abnormalities were Grade 1 or 2, with no serious AEs, treatment discontinuations, or deaths. No ALT elevations were observed. Increased in vitro potency of 3733 relative to first-generation core inhibitors is reflected in rapid, multi-log declines in HBV DNA at low doses. PK properties of 3733 support daily dosing with Cmax’s in multiple fold excess of protein-adjusted EC_{50}’s for HBV DNA and covalently closed circular DNA. These findings support further development of 3733.
SAT-169
Rescue of cirrhotic HBV/HDV infection from bulevirtide failure by subcutaneous REP 2139-Mg
Marc Bourliere1, Veronique Loustaud-Ratti2, Christiane Stern3, Souad Benali4, Edouard Bardou-Jacquet4, Laurent Alric5, Michel Bazinet6, Laurence Lecomte1, Sandrine Francois2, Cecilia De-Freitas3, Anita Levacher4, Segolene Brichler7, Michel Bazinet6, Laurence Lecomte1, Sandrine Francois2, Cecilia De-Freitas3, Anita Levacher4, Segolene Brichler7, Athenaïs Gerber5, Emmanuel Gordin6, Stéphane Chevaliez8, Andrew Vaillant9,10, Hôpital Saint Joseph, Marseille, France; 2CHU Limoges, Limoges, France; 3Hôpital Beaujon AP-HP, Clichy, France; 4CHU Rennes, Rennes, France; 5CHU Rangueil, Université Toulouse 3, Toulouse, France; 6Replicor Inc., Montreal, Canada; 7Centre national de référence des hépatite B, C et Delta-Lab, hôpital Avicenne, Bobigny, France; 8Hôpital Henri Mondor, Créteil, France; 9CHU Rangueil, Université Toulouse 3, Toulouse, France; 10Hôpital Henri Mondor, Créteil, France
Email: availlant@replicor.com

Background and aims: REP 2139 blocks HBV subviral particle assembly and hepatitis delta antigen function, driving HBsAg loss in HBV infection and HBsAg/HDV RNA loss in HBV/HDV co-infection. Compassionate access to REP 2139-Mg is being provided under the Replicor Compassionate Access Program (RCAP, NCT05683548). The safety and efficacy of SC injection of REP 2139-Mg in combination therapy is currently being assessed in cirrhotic patients with chronic HBV/HDV co-infection after failure on bulevirtide (BLV).

Method: Compassionate access to REP 2139-Mg has been approved by the ANSM in 11 patients with compensated cirrhosis having no response or viral escape in HDV RNA during 2 or 10 mg BLV. Existing TDF was supplemented with 48 weeks of QW SC 250 mg REP 2139-Mg and 90 μg pegIFN. Weekly safety evaluations were accompanied by virologic assessment every 4 weeks.

Results: As this abstract is submitted, seven patients have at least 4 weeks of REP 2139-Mg exposure. Four patients (#1, 2, 3 and 4) have greater than 24 weeks exposure with three (#1, 2 and 4) having no detectable HDV RNA and >3 log10 IU/mL decline in HBsAg and two (1 and 2) with HBsAg loss and anti-HBs seroconversion. One patient (#1) has completed 48 weeks of therapy and 8 months of TDF monotherapy and still maintains undetectable HDV RNA and HBsAg and anti-HBs seroconversion. TDF therapy has now been stopped in this patient. In patient 3, central obesity likely prevents optimal liver transition from SC injection to IV infusion and from 250 mg qW to 500 mg qW. Three patients (#6, 7 and 10) have completed 4–12 weeks exposure with mild declines in HDV RNA (0.5–1 log10 IU/mL) already present. The administration of SC 250 mg REP 2139-Mg with oral TDF and pegIFN has been well tolerated to date.

Conclusion: Subcutaneous REP 2139-Mg is well tolerated, and effective against HBV and HDV infection in combination with TDF and low dose pegIFN in patients with compensated cirrhosis. REP 2139-Mg is also an effective salvage therapy in bulevirtide failure patients.

SAT-170
The Nuc-Stop study: an open-label, randomized trial of different re-start strategies after treatment withdrawal in HBeAg negative chronic hepatitis B patients
Asgeir Johannessen1, Dag Henrik Reikvam2, Søo Aaleman3, Nega Berhe4, Nina Weis5, Hailmemichael Desaleg6, Tore Stenstad1, Lars Heggeland7, Ellen Samuelsen8, Karin Lindahl9, Anni Winckelmann6, Lars Normann Karlsen10, Pascal Brugger-Synnes11, Hans Erling Simonsen12, Jan Svendsen1, Marte Holmberg1, Olav Dalgard13, Westfold Hospital Trust, Tonsberg, Norway; 2Oslo university hospital, Norway; 3Karolinska Institutet, Sweden; 4Addis Ababa University, Ethiopia; 5Oslo University Hospital-Ullevål, Regional Centre for Imported and Tropical Diseases, Oslo, Norway; 6Hvidovre Hospital, Denmark; 7St. Paul's Hospital Millennium Medical College, Ethiopia; 8Vestre Viken Hospital, Norway; 9Akershus University Hospital, Norway; 10Stavanger University Hospital, Norway; 11Alesund hospital, Norway; 12Nordland Hospital Trust, Norway
Email: johannessen.asgeir@gmail.com

Background and aims: Stopping nucleos (t)ide analogue (NA) therapy in patients with chronic hepatitis B (CHB) may trigger a beneficial immune response leading to hepatitis B surface antigen (HBsAg) loss. However, treatment withdrawal may also induce a harmful hepatic necroinflammation that warrants re-start of therapy to prevent progressive liver injury. Whether it might be beneficial to allow patients to undergo a prolonged flare has not been studied in a prospective clinical trial. We therefore carried out the Nuc-Stop Study, an open-label, randomized, multicentre trial of two re-start strategies after stopping NA therapy in hepatitis B e-antigen (HBeAg) negative CHB.

Method: HBeAg negative CHB patients with at least 24 months of full viral suppression on NA therapy were eligible for inclusion. Patients with past or present evidence of cirrhosis were excluded. All study participants stopped antiviral therapy and were randomized to either low-threshold (alanine aminotransferase [ALT] >80 U/L and viral load >2000 IU/mL) or high-threshold (ALT >100 U/L for >4 months, or ALT >400 U/L for >2 month) for re-start of therapy. Patients in both groups with past or present evidence of cirrhosis were excluded. All study participants stopped antiviral therapy and were randomized to either low-threshold (alanine aminotransferase [ALT] >80 U/L and viral load >2000 IU/mL) or high-threshold (ALT >100 U/L for >4 months, or ALT >400 U/L for >2 month) for re-start of therapy. Patients in both groups with past or present evidence of cirrhosis were excluded.

Results: As this abstract is submitted, seven patients have at least 4 weeks of REP 2139-Mg exposure. Four patients (#1, 2, 3 and 4) have greater than 24 weeks exposure with three (#1, 2 and 4) having no detectable HDV RNA and >3 log10 IU/mL decline in HBsAg and two (1 and 2) with HBsAg loss and anti-HBs seroconversion. One patient (#1) has completed 48 weeks of therapy and 8 months of TDF monotherapy and still maintains undetectable HDV RNA and HBsAg and anti-HBs seroconversion. TDF therapy has now been stopped in this patient. In patient 3, central obesity likely prevents optimal liver transition from SC injection to IV infusion and from 250 mg qW to 500 mg qW. Three patients (#6, 7 and 10) have completed 4–12 weeks exposure with mild declines in HDV RNA (0.5–1 log10 IU/mL) already present. The administration of SC 250 mg REP 2139-Mg with oral TDF and pegIFN has been well tolerated to date.

Conclusion: Subcutaneous REP 2139-Mg is safe, well tolerated, and effective against HBV and HDV infection in combination with TDF and low dose pegIFN in patients with compensated cirrhosis. REP 2139-Mg is also an effective salvage therapy in bulevirtide failure patients.
Results: A total of 127 patients were included at 11 centres in Norway, Sweden, Denmark and Ethiopia; 121 patients completed 36 months of follow-up and were included in the final analysis. Median duration of antiviral treatment prior to inclusion was 46 months (interquartile range 32–78). Nine patients (7.4%) experienced a severe flare (maximum ALT 2600 U/L), all of whom quickly normalized after re-start of NA therapy; no other serious adverse events related to treatment withdrawal were observed. There was no statistically significant difference in HBsAg loss between the low-threshold and the high-threshold group (3 of 61; 4.9% vs. 7 of 60; 11.7%; P = 0.205). After 36 months of follow-up, 26 of 61 (42.6%) patients in the low-threshold group and 8 of 60 (13.3%) patients in the high-threshold group had met the pre-defined re-start criteria (Figure 1). Notably, none of the 34 patients who re-started therapy experienced HBsAg loss, compared to 10 of 87 (11.5%) of those who remained off therapy (p = 0.060). The only baseline factor independently associated with HBsAg loss was time on antiviral treatment prior to treatment withdrawal (per 1-year, adjusted odds ratio 1.30; 95% confidence interval 1.09–1.54, P = 0.003).

Conclusion: The re-start strategy did not significantly affect the chance of HBsAg loss among non-cirrhotic HBeAg negative CHB patients who stopped antiviral therapy.

Background and aims: Chronic hepatitis B virus (CHB) infection is characterized by heterogeneity in disease trajectories and response to therapy. A comprehensive mapping of heterogeneity in CHB could potentially aid in supporting future research. In this study, we investigate the use of machine learning for characterizing heterogeneity in CHB from deep phenotypic patient profiles on and off bepiroviren therapy.

Method: We used data from the B-Clear phase IIb study (NCT04449029) evaluating the efficacy of bepiroviren in CHB patients (N = 408) to identify response groups. We employed machine learning methods to reduce the dimensionality of response data in a manner that conserves information related to patients' response trajectories. The condensed deep phenotypic patient profiles included virologic, immunologic, proteomics and transcriptomics measurements. We performed a cluster analysis on the compressed patient representations to identify subgroups of patients that respond differently in terms of biomarker trajectories following bepiroviren therapy.

Results: Our results suggest that B-Clear study participants can be stratified into meaningful subpopulations indicative of heterogeneous response to bepiroviren therapy. The subpopulations recapitulate significant (Benjamini-Yekutieli corrected p < 0.05) differences in primary efficacy outcomes reflecting CHB virologic markers, while identifying new response subtypes and giving a higher resolution on the temporal development of relevant biomarkers. Notably, we observe a high-primary response subtype that is correlated with a considerable decrease in median HBsAg to the lower limit of quantification (p < 0.002 to closest subtype from day 78 onwards) and a continuous decline of HBV-DNA levels (p < 0.0001 to the high HBV-DNA non-responder subtype throughout the study). Additionally, the high HBV-DNA non-responder subtype is correlated with higher GFER (p = 0.04 at baseline, 162, and 324 days) and lower ADGRG1 (p < 0.03 throughout the study) protein abundances compared to the mixed response subtype.

Conclusion: We present a machine learning-based method to identify meaningful response subgroups within a study cohort. We characterized five subpopulations with heterogeneous clinical trajectories and differences in response to bepiroviren therapy. The subtypes capture markers associated with patient response trajectories and may guide CHB research. Further validation of the identified markers in additional cohorts is needed.

Funding: GSK (205695).
SAT-172

Safety and antiviral activity of RBD1016, a RNAi therapeutic, in Chinese subjects with chronic hepatitis B virus (HBV) infection

Wai-Kay Seto1,2, Zicai Liang3, Li Ming Gan3, Jing Fu3, Man-Fung Yuen2.

1The university of Hong Kong-Shenzhen Hospital, Shenzhen, China; 2Queen Mary Hospital, The University of Hong Kong, China; 3Suzhou Ribo Life Science Co. Ltd., China

Email: mfyuen@hku.hk

Background and aims: RBD1016, a small interfering RNA (siRNA) drug, is composed of siRNA and the N-acetylgalactosamine delivery system, targeting the conserved region of the X gene of chronic hepatitis B virus (HBV), and can concurrently inhibit 4 gene transcripts of HBV. Here, we report the preliminary data from an ongoing phase I clinical study evaluating the safety and antiviral activity of RBD1016 in subjects with chronic HBV infection.

Method: This randomized, double-blind, placebo-controlled, single and repeated dose escalation, phase I clinical study enrolled treatment naïve or previously treated subjects with chronic HBV infection without hepatic fibrosis or cirrhosis (NCT05017116). Subjects received RBD1016/placebo subcutaneously in combination with nucleos (t)ide analogues (NAs) during the study. In the single dose (SD) group, subjects were recruited in cohorts of six and were randomized 5:1 to receive RBD1016 or placebo. Upon cohort completion, RBD1016's dosage was escalated incrementally from 0.3 mg/kg to 1 mg/kg, 3 mg/kg and 6 mg/kg. For the multiple dose (MD) group, subjects were recruited in cohorts of eight and randomized 6:2 to receive RBD1016 (at 3 mg/kg, followed by 6 mg/kg) or placebo at Day 1 and D 29. Preliminary data for 0.3 mg/kg, 1 mg/kg, 3 mg/kg SD (follow-up to week 24) and 3 mg/kg MD (follow-up to week 16) are presented; dose escalation and follow-up are ongoing.

Results: As of December 28, 2022, twenty-seven subjects (mean age 43.2 years, 44.4% male) (SD = 20, MD = 7) were enrolled, of which 26 (96.3%) were on NAs therapy (entecavir: 17, tenofovir disoproxil fumarate: 6; tenofovir alafenamide: 3) for a median duration of 54.5 (range: 16–150) months. Maximum mean serum HBsAg reductions from baseline in subjects receiving RBD1016 of 0.3 mg/kg, 1 mg/kg, 3 mg/kg SD, 3 mg/kg MD and placebo were 0.48 (at week12), 0.75 (at week16), 0.97 (at week16), 1.34 (at week16) and 0.01 (at week16) log10 IU/ml, respectively. HBsAg reduction was durable till the end of study at week 24. Serum HBV DNA undetectability (<10 IU/ml) was achieved in three subjects with positive HBV DNA at baseline at weeks 1, 3 and 12, respectively. 9 subjects with RBD1016 therapy had positive serum HBV RNA (lower limit of quantification, 10 copies/ml) at baseline, median HBV RNA among positive subjects was 6240 (range: 11–518 000) copies/ml. By week 24, the median HBV RNA decline was 2450 (range: 1–50 980) copies/ml, with three subjects (one receiving 3 mg/kg SD and two receiving 3 mg/kg MD) achieving HBV RNA undetectability. For subjects with positive HBV RNA, an increased HBV RNA reduction was seen in patients with increased HBsAg decline. The 3 mg/kg MD cohort achieved 0.67 log10 kU/ml HBcAg reduction at week 6 and 0.5 log10 cp/ml HBV RNA reduction at week 24. RBD1016 was safe, with no serious adverse events or drug-related adverse events reported. No subjects withdrew from the study or discontinued treatment.

Conclusion: A single dose of RBD1016 demonstrated a rapid and durable reduction in serum HBsAg in a dose-dependent manner. Multiple doses of RBD1016 showed increased reduction in HBsAg. Preliminary safety data suggested that RBD1016 was generally safe and well tolerated. The present data supports the further evaluation of RBD1016 for functional cure of patients with chronic HBV infection.

SAT-173

AHB-137, a novel hepatitis B virus antisense oligonucleotide with substantially enhanced in vitro and in vivo antiviral activity

Xiaoli Wu1, Tingting Lu, Weiguo Zhang1, Yang Bai1, Liqun Zhang1, Shaoyi Ma1, Ying Chang1, Jihai Lei1, Chunxi Li1, Yuying Liu1, Zelei Pan1, Wei Peng1, Chang Shen1, Yipeng Wang1, Qingbo Xing1, Lisha Zhang1, Yue Zhou1, Yang Tian1,2, Chris Yang1,2, Cheng Guofeng1,2.

1Ausper Biopharma, China; 2AusperBio Therapeutics, United States

Email: guofengcheng1@hotmail.com

Background and aims: Antisense oligonucleotide (ASO) bepirovirsen (BPV) monotherapy has demonstrated activity to achieve sustained HBsAg seroclearance in chronic hepatitis B (CHB) patients, with a promise to be a backbone for HBV cure treatment regimen. However, the current cure rate with BPV remains low, thus a more potent ASO with good safety profile could further improve the
efficacy. Here we report a novel HBV ASO AHB-137 with substantially enhanced in vitro and in vivo antiviral activity.

**Method:** AHB-137 and BPV were synthesized via solid phase synthesis. In vitro antiviral activity was evaluated in HBV stable cell lines HepG2.2.15 and HepAD38, and in primary human hepatocytes (PHH) infected with HBV. In vivo antiviral activity was evaluated in hydrodynamic injection (HDI) mouse model, AAV–HBV transduced mice, and HBV transgenic mice. Secreted HBsAg was quantified by a clinical HBsAg chemiluminescent immunoassay (AutoBio).

**Results:** AHB-137 is a novel ASO without conjugation that has a distinct structure from BPV and targets a highly conserved sequence close to the 3' end of HBV mRNA at DR2 region. AHB-137 exhibited potent antiviral activity to inhibit HBsAg production in HepG2.2.15 cells with an EC50 value of 0.13 nM and a selectivity index (SI) >769-fold, compared to BPV with an EC50 of 1.50 nM and SI >67-fold. Similarly, AHB-137 demonstrated 10-fold and 6-fold more potent activity to reduce HBsAg than BPV in HepAD38 and HBV-infected PHH, respectively. More importantly, AHB-137 has shown potent and dose-dependent antiviral activity to reduce serum HBsAg, HBeAg, HBV DNA, and intrahepatic HBV RNA in AAV–HBV mice, HBV transgenic mice, and HDI HBV mice. A single subcutaneous dose of AHB-137 (60 mg/kg) could reduce serum HBsAg 1.3 to 3 log10 (IU/ml) and achieve at least 0.6 log10 additional reduction than BPV in every in vivo model. After 3 doses of AHB-137 (40 mg/kg) in HDI–HBV mice, the serum HBsAg was reduced by >3 log10 (IU/ml) to below LLOQ, compared to a 1.8 log10 (IU/ml) HBsAg reduction by BPV. The broad-spectrum antiviral activity of AHB-137 was also confirmed in HDI–HBV mice with higher potency than BPV across genotypes. As important, there was no significant body weight change and ALT increase in any of the animals treated with AHB-137. Finally, when combined with other classes of anti-HBV agents including Nuc and Peg-IFN in AAV–HBV mice, AHB-137 showed additive/synergistic activity and had no antagonistic activity.

**Conclusion:** The AHB-137 represents a novel class of HBV ASO that clearly demonstrated strong antiviral activity against HBV mRNA transcribed from both cccDNA and integrated genomes, and had more potent activity in reducing serum HBsAg than BPV across multiple in vitro and in vivo HBV models. Together with its favorable PK and safety profile, AHB-137 is advancing into clinical development.

**SAT-174**

**Vebicovir, entecavir, and pegylated interferon in patients with hepatitis B e antigen positive chronic hepatitis B virus infection: findings from a phase 2, randomized open-label study in China**

Xieer Liang1, Jinlin Hou1, Yujuan Guan2, Zhanqing Zhang3, Qing Xie4, Jidong Jia5, Jifan Sheng6, Qin Ning7, Wang Yang8, Afsaneh Mozaffarian9, Nuruddin Unchwaniwala9, Jieming Liu10, Katie Zomorodi10, Luisa M. Stamm10, Steven J Knox10, Michele Anderson10, Kathryn M. Kittinos10, Grace Wang10, Yu Chen11, Junqi Niu1, 1Hepatology Unit and Department of Infectious Disease, Nanfang Hospital, Southern Medical University, Guangzhou, China; 2Guangzhou Eighth People’s Hospital, Guangzhou, China; 3Rudan University, Shanghai, China; 4Ruijin Hospital, Shanghai Jiaotong University School of Medicine, Shanghai, China; 5Beijing Friendship Hospital, Capital Medical University, Beijing, China; 6The First Affiliated Hospital, College of Medicine, Zhejiang University School of Medicine, Hangzhou, Zhejiang, China; 7Tongji Hospital of Tongji Medical College, Huazhong University of Science and Technology, Wuhan, China; 8The First Hospital of Jilin University, Jilin, China; 9Former employee of Assembly Biosciences during the study; current affiliation Gilead Sciences, Foster City, United States; 10Assembly Biosciences, South San Francisco, United States; 11Beijing Youan Hospital, Capital Medical University, Beijing, China

Email: freeliang163.com

**Background and aims:** Vebicovir (VBR), a first-generation core inhibitor, in combination with entecavir (ETV) previously demonstrated deeper viral suppression compared to ETV alone in untreated patients (pts) with hepatitis B e antigen (eAg) positive chronic hepatitis B virus infection (cHBV). The addition of pegylated interferon alfa (IFN) may further increase the efficacy of VBR + ETV through complementary mechanisms of action. This open-label study (NCT04781647) assessed the relative safety and efficacy of VBR + ETV + IFN.

**Method:** Fifty-four eAg positive pts with cHBV with F0-F3 fibrosis who were off antiviral therapy were randomized to VBR + ETV (n = 20), VBR + ETV + IFN (n = 17), or IFN + ETV (n = 17) for 24 weeks (wks), after which all pts received VBR + ETV for 24 wks, then a 12-wk follow-up period with ETV alone. HBV DNA was measured by COBAS TaqMan (lower limit of quantification [LLOQ] = 20 IU/ml) and pregenomic (pg)RNA by Assembly Biosciences quantitative polymerase chain reaction assay (LLOQ = 165 U/ml). Quantitative hepatitis B surface antigen (sAg) was measured by Abbott Architect (LLOQ = 0.05 IU/ml). Safety was assessed by adverse events (AEs) and lab parameters.

**Results:** Baseline (BL) characteristics were similar across treatments; overall, mean (standard deviation [SD]) age was 32 (6.7) years, 39/54 (72%) pts were male, and all were Asian. Twenty-five of 54 (46%) and 29/54 (53%) pts were infected with HBV genotype B and C, respectively. Overall, mean (SD) BL HBV DNA, pgRNA, sAg, and alanine aminotransferase (ALT) were 8.0 (0.96) log10 IU/ml, 4.3 (0.58) log10 IU/ml, and 137 (84.3) U/L, respectively. After 24 wks of randomized treatment, there were no significant differences in change from BL between treatment arms for HBV DNA or HBsAg (Table). VBR + ETV + IFN resulted in a significantly greater reduction in pgRNA than ETV + IFN (p = 0.03). No pts developed anti-sAg antibodies or had evidence of functional cure. The safety profile was consistent with previous reports for VBR and IFN. The proportion of pts reporting treatment emergent AEs was higher in IFN containing arms; 13/20 (65%), 17/17 (100%), and 17/17 (100%) for VBR + ETV, VBR + ETV + IFN, and ETV + IFN, respectively. A single serious AE of Grade 4

**Table:** LS mean (SE) change from BL at wk 12 and 24 for HBV DNA, pgRNA, and sAg

| Table: LS mean (SE) change from BL at wk 12 and 24 for HBV DNA, pgRNA, and sAg |
|--------------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                                     | VBR + ETV       | VBR + ETV + IFN | ETV + IFN      | Diff from ETV   |
|                                     | (n = 17)        | (n = 17)        | (n = 17)       | (n = 17)        |
|                                     | Change from BL at Wk 12 | Change from BL at Wk 24 | Change from BL at Wk 12 | Change from BL at Wk 24 | Change from BL at Wk 12 | Change from BL at Wk 24 |
|                                     |                 |                 |                 |                 |                 |                 |
| HBV DNA (log10 IU/mL); LS mean (SE) | -5.0 (0.20)*    | -6.0 (0.20)*    | -5.2 (0.22)*    | -5.2 (0.29)     | -6.3 (0.21)     |                 |
| pgRNA (log10 U/mL); LS mean (SE)   | -2.9 (0.31)     | -2.8 (0.30)*    | -3.0 (0.38)*    | -2.6 (0.34)     | -2.6 (0.59)*    |                 |
| sAg (log10 U/mL); LS mean (SE)     | -0.6 (0.12)     | -0.6 (0.14)*    | -0.4 (0.14)*    | -0.7 (0.15)*    | -0.7 (0.15)     |                 |

*Wk 24: HBV DNA LS means (SE) difference: VBR + ETV + IFN vs VBR + ETV = -0.2 (0.20), p = 0.5018. VBR + ETV vs ETV + IFN = 0.2 (0.27), p = 0.5065. 
Wk 24: pgRNA LS means (SE) difference: VBR + ETV + IFN vs VBR + ETV = -0.9 (0.48), p = 0.0035. VBR + ETV + IFN vs ETV = -1.1 (0.48), p = 0.0005. VBR + ETV + IFN vs ETV + IFN = 0.1 (0.19), p = 0.7871.

**Figure:** (abstract: SAT-174).
ALT elevation was reported in a VBR + IFN + ETV pt that led to study discontinuation. No deaths were reported.

**Conclusion:** Overall, the addition of IFN to VBR + ETV did not result in significantly greater declines in HBV parameters compared to the dual agent control arms and is unlikely to result in significant rates of functional cure following 24 wks of treatment.

**SAT-175**

**Significant improvement of non-invasive fibrosis tests in HDV compensated cirrhotic patients with clinically significant portal hypertension treated with BLV monotherapy un to 96 weeks**

Elisabetta Degasperi1, Maria Paola Anolli1, Sara Colonia Uceda Renteria2, Dana Sambarino1, Marta Borghi1, Ricardo Perbellini1, Floriana Facchetti1, Roberta Soffredini1, Sara Monica1, Mirella Faquelli3, Andrea Costantino3, Ferruccio Ceriotti2, Pietro Lamperthio1,4,1 Foundation IRCCS Ca’ Granda Ospedale Maggiore Policlinico, Department of Gastroenterology and Hepatology, Milan, Italy; 2Foundation IRCCS Ca’ Granda Ospedale Maggiore Policlinico, Virology Unit, Milan, Italy; 3Foundation IRCCS Ca’ Granda Ospedale Maggiore Policlinico, Division of Gastroenterology and Endoscopy Digestive, Milan, Italy; 4CRC “A.M. and A. Migliavacca” Center for Liver Disease, Department of Pathophysiology and transplantation, University of Milan, Milan, Italy

Email: elisabetta.degasperi@policlinico.mi.it

**Background and aims:** Antiviral treatment of HBV- and HCV-related hepatitis D has been shown to significantly improve non-invasive fibrosis tests (NITS), however their course in patients with chronic hepatitis Delta with a virological response during a long-term treatment with Bulevirtide (BLV) monotherapy is currently unknown.

**Method:** Consecutive HDV patients with compensated cirrhosis and clinically significant portal hypertension (CSPH) according to Baveno VII criteria with a virological response (≥2 Log HBV DNA decline vs. baseline) to BLV monotherapy 2 mg/day up to 96 weeks were enrolled in this single-center study. HDV RNA was quantified by Robogene 2.0 (LOD 6 IU/ml). Clinical variables, AST to Platelet Ratio Index (APRI) and Fibrosis-4 (FIB-4) Index were assessed at baseline (baseline) to BLV monotherapy 2 mg/day up to 96 weeks were enrolled in this single-center study. ALT elevation was reported in a VBR + IFN + ETV pt that led to study discontinuation. No deaths were reported.

**Conclusion:** In HDV compensated cirrhotic patients with CSPH, long-term treatment with BLV monotherapy led to a statistically significant improvement of serological fibrosis NITS, liver stiffness and LSPS.

**SAT-176**

**Analysis of HBV genotype association to bepivirsen treatment response in patients with chronic HBV infection (Phase 2b B-Clear study)**

Jerome Bouquet1, Robert Elston2, Phil Yates3, Shihyun You1, Amir Youssef1, Ahmed Nader1, Jennifer Cremer4, Geoff Quinn3, Fiona Campbell2, Melanie Paff3, Dickens Theodore4.

1GSK, South San Francisco, United States; 2GSK, Stevenage, United Kingdom; 3GSK, Collegeville, United States; 4GSK, Durham, United States

Email: jerome.x.bouquet@gsk.com

**Background and aims:** Bepirovirsen (BPV; GSK3228836) is an antisense oligonucleotide that targets a conserved 20 nucleotide sequence within HBV pregenomic RNA and mRNAs. B-Clear is a phase 2b trial (NCT04449029) assessing the efficacy and safety of 12 or 24 weeks (wks) of BPV treatment in patients (pts) with chronic hepatitis B (CHB) in which hepatitis B surface antigen (HBsAg) reductions and shear-wave elastography (ElastPQ) were performed every 24 weeks, as well as liver stiffness-spleen size-to-platelet ratio score (LSPS).

**Results:** 26 HDV cirrhotic patients were included: pre-treatment, median age was 49 (30–77) years, 54% males, ALT 102 (32–310) U/L, platelets 69 (17–217) ×103/mm2, 73% with varices, spleen 16 (9–25) cm, CPT-A 100%, HDV RNA 5.1 (2.4–6.9) Log IU/mL. During BLV monotherapy, serological NIT significantly improved at all time-points, APRI decreasing from baseline 3.6 (1.2–16.5) to 11 (0.3–3.6) at week 96 (p < 0.001), and FIB-4 from 7.1 (1.3–28.1) to 4.1 (0.9–7.2) (p = 0.02), LSM decreased from baseline 17.3 (7.8–68.1) to 15.7 (5.0–51.9) kPa at week 24 (p = 0.03) and LSPS from baseline 5.9 (0.5–23.7) to 3.9 (0.3–9.7) at week 48 (p = 0.01), whereas no other significant changes were observed throughout weeks 48 and 72. Conversely, other NITS did not significantly modify during the whole course of BLV treatment: liver ElastPQ 14.3 (4.2–35.2) vs. 16.5 (6.6–25.9) kPa (p = 0.14); SSM 51.7 (20–100) vs. 54.7 (18.2–100) kPa (p = 0.66). Four patients underwent liver transplantation (HCC n = 2; liver decompensation n = 2) and one patient died of liver unrelated causes.

**Conclusion:** Overall, the addition of IFN to VBR + ETV did not result in significantly greater declines in HBV parameters compared to the dual agent control arms and is unlikely to result in significant rates of functional cure following 24 wks of treatment.
HBsAg seroclearance have been observed. We present the HBsAg response for pts by viral genotype.

**Methods:** Multicentre, randomised, partial-blind study in pts with CHB who were either receiving concomitant stable nucleos (t)ide analogue therapy (on-NA) or were not receiving NA (not-on-NA). Pts were randomised (3:3:3:1) to receive BPV 300 mg weekly either for 24 wks (Arm 1); for 12 wks then 150 mg for 12 wks (Arm 2); for 12 wks then placebo (PBO) for 12 wks (Arm 3); or PBO for 12 wks then BPV 300 mg for 12 wks (Arm 4). A loading dose of BPV (Arms 1–3) or PBO (Arm 4) was given on days 4 and 11. Pts were followed for 24 weeks (off-treatment [OT]-WK24) after end of treatment (EOT). B-Clear recruited patients in 22 countries encompassing Asia, Europe, the Americas and South Africa. Genotype was determined by HBV DNA or RNA sequencing and/or was investigator reported.

**Results:** Seven different genotypes were observed: A, B, C, D, E, F and H. Genotypes were in majority B and C in Asia, A and D in Europe, A, B, C and D in the Americas. Not-on-NA: Genotype (GT) C (31%, 70/229 pts) was most frequently observed, followed by GT-B (21%), GT-D (20%), GT-A (18%), other (6%) and undetermined (4%). Pts with GT-B virus had the lowest mean HBsAg level at baseline (3.155 log IU/ml) and GT-A the highest (3.982 log IU/ml). On-NA: GT-C (31%, 70/226 pts) was most frequently observed, followed by GT-B (9%), GT-D, GT-A (8% each) and others (3%). On-NA pts had low/undetectable RNA/DNA resulting in a high proportion of undetermined genotypes (41%). Pts with GT-B virus had the lowest mean HBsAg level at baseline (3.090 log IU/ml) and GT-A the highest (3.724 log IU/ml). Treatment Response: End of BPV treatment response and 24 wks off BPV treatment response by genotype is shown in Table 1 (treatment arms pooled).

**Conclusion:** In both not-on-NA and NA cohorts, GT-B had the lowest baseline HBsAg and demonstrated the greatest log reduction in HBsAg, consistent with lower baseline HBsAg predicting the ability to achieve HBsAg seroclearance. HBsAg seroclearance 24 wks off-BPV treatment was achieved in HBV genotypes A, B, C and D.

**Funding:** GSK (209668).

[on behalf of the B-Clear study group].

---

**Footnote:** $r$ refers to Pearson Correlation Coefficient

Figure: (abstract: SAT-177): AUC_{last} vs baseline HBsAg (Figure 1A) and $C_{\text{max}}$ vs baseline HBsAg (Figure 1B).
SAT-177
Single dose pharmacokinetics of VIR-3434, a novel neutralizing monoclonal antibody in participants with chronic hepatitis B virus infection
Sneha V. Gupta1, Sophia Elie1, Andre Arizpe1, George Hristopoulos1, Pan Wu1, Daniel Cloutier1, Maribel Reyes1. 1VIR Biotechnology, San Francisco, United States

Background and aims: VIR-3434 is an investigational Fc engineered human monoclonal antibody targeting the conserved antigenic loop of hepatitis B surface antigen (HBsAg) in development for the treatment of chronic hepatitis B virus (HBV) and hepatitis D virus (HDV) infection. Here, we report, the free VIR-3434 pharmacokinetics (PK) after single dose administration in participants with chronic HBV infection, including those with HBV viremia and high HBsAg levels.

Method: VIR-3434-1002 is a randomized, double-blind, placebo-controlled phase 1 single ascending dose study evaluating safety, tolerability, antiviral activity, and PK of VIR-3434. Part A enrolled healthy participants whose PK and safety has been previously reported. Parts B-D enrolled noncirrhotic adults with chronic HBV infection. Participants were randomized 6:2 to receive a single subcutaneous (SC) dose of VIR-3434 6 mg, 18 mg, 75 mg, or 300 mg, or placebo. In Parts B and C, participants received nucleos (t)ide reverse transcriptase inhibitor (NRTI) therapy for ≥2 months prior to study entry. Parts B and C participants had baseline HBsAg <3000 and ≥3000 IU/ml, respectively. Part D participants were not on NRTI therapy and had baseline HBV DNA ≥1000 IU/ml. Participants were followed for up to 40 weeks after study drug administration.

Results: 72 participants were enrolled in Parts B-D; 54 received VIR-3434. Among active participants, median Tmax was 3–5 days. Larger and more durable HBsAg reductions and higher free VIR-3434 PK for 4 weeks postdose were observed at the 300 mg dose level. Participants with a wide range of baseline HBsAg across Parts B-D and with detectable free VIR-3434 PK received 75 or 300 mg and are described further. Free VIR-3434 PK exposures (AUClast and Cmax) negatively correlated with HBsAg levels at baseline (Figure 1). Following 300 mg VIR-3434 dose, mean (CV) AUClast and Cmax was higher in Part B at 967 (21%) ug/ml/day and 32.6 (18%) ug/ml than Part C with 365 (64%) ug/ml/day and 22.5 (39%) ug/ml, respectively. Similarly, VIR-3434 was cleared faster in participants with higher baseline HBsAg. At the 300 mg dose level, median CL/F was 600 ml/day in Part B vs 818 ml/day in Part C, suggestive of target-mediated drug disposition (TMDD).

Conclusion: Among participants who received a single dose of 6 mg, 18 mg, 75 mg, or 300 mg VIR-3434, the highest and most durable free VIR-3434 exposure was observed with the 300 mg dose irrespective of baseline HBsAg. Correlation plots with free PK demonstrate a moderate impact of baseline HBsAg in free VIR-3434 exposure, suggestive of TMDD. These PK data support continued evaluation of 300 mg VIR-3434 administered every 4 weeks as monotherapy or in combination for functional cure of participants with chronic HBV infection. Footnote: r refers to Pearson Correlation Coefficient.
SAT-179
Consolidation treatment with Tiaogan-Buxu-jiedu granule (Traditional Chinese Medicine compound) plus entecavir reduces virological relapse following entecavir withdrawal in Chinese patients with chronic hepatitis B: a randomized, controlled trial
Xiaoke Li1,2, Mei Qiu3, Yi Huang4, Huanming Xiao5, Bingjiu Lu6, Yuyong Jiang7, Fuli Long8, Hui Lin9, Shuo Li1, Jinyu He10, Mingxiang Zhang11, Qikai Wu12, Li Wang13, Xiaoning Zhu14, Man Gong15, Jianguang Sun16, Xuehua Sun17, Fengxia Sun18, Wei Lu19, Weihua Xu20, Hongbo Du1,2, Yong'an Ye1,2.
1Dongzhimen Hospital, Beijing University of Chinese Medicine, Hepatology, Beijing, China; 2Beijing University of Chinese Medicine, Liver Diseases Academy of Traditional Chinese Medicine, Beijing, China; 3Shenzhen Traditional Chinese Medicine Hospital, Hepatology, China; 4Chongqing Traditional Chinese Medicine Hospital, Hepatology, China; 5The Second Affiliated Hospital of Guangzhou University of Chinese Medicine, Hepatology, China; 6Liaoning Hospital of Traditional Chinese Medicine, Hepatology, China; 7Beijing Ditan Hospital, China; 8The First Affiliated Hospital of Guangxi University of Chinese Medicine, China; 9Mengchao Hepatobiliary Hospital of Fujian Medical University, Hepatology, China; 10Shaanxi Hospital of Traditional Chinese Medicine, Hepatology, China; 11The Sixth People’s Hospital of Shenyang, China; 12The Third People’s Hospital of Shenzhen, Hepatology, China; 13The Public Health Clinical Center of Chengdu, Hepatology, China; 14Affiliated traditional Chinese medicine hospital of Southwest Medical University, China; 15The Fifth Medical Center of People’s Liberation Army of China, Hepatology, China; 16Shandong Hospital of Traditional Chinese Medicine, Hepatology, China; 17Shuguang Hospital Affiliated to Shanghai University of Traditional Chinese Medicine, Hepatology, China; 18Beijing Chinese Medicine Hospital, Beijing, China; 19The Second People’s Hospital of Tianjin, China; 20The Second Hospital of Shandong University, China
Email: yeysongan@vip.163.com

Figure: (abstract: SAT-179)
Background and aims: Several guidelines suggest that nucleoside analogues (NAs) may be discontinued in chronic hepatitis B (CHB) patients after hepatitis B e antigen (HBeAg) seroconversion, followed by a certain course of consolidation treatment. However, the withdrawal of NAs often results in virological relapse. In China, Traditional Chinese Medicine (TCM) is widely combined with NAs in treatment. The aim of this double-blind, placebo-controlled, randomized, multicentre trial was to assess whether enhanced consolidation therapy with entecavir (ETV) plus Taogan-Buxu-Jiedu granule (TGBXJD), an immune-modulatory TCM compound, can further reduce the risk of virological relapse following ETV withdrawal in CHB patients. The study was conducted as part of National Science and Technology Major Project of China, No.2018ZX10725505. Trial protocol was registered with the Chinese Clinical Trial Registry, ID: ChiCTR-TRC-12002784.

Method: 502 eligible NAs-treated CHB patients were randomly assigned to the experimental group (EG) or the control group (CG) in a 1:1 ratio as the intention-to-treat (ITT) population. During the initial 96-week consolidation phase, the EG received a combination therapy of ETV and TGBXJD, while the CG received ETV and a placebo for TGBXJD. Following the consolidation phase, an off-treatment observation phase of 24 weeks was implemented during which both groups discontinued ETV and TGBXJD (or placebo). The primary outcome measure of the study was the cumulative rate of virological relapse, defined as serum HBV DNA >200 IU/ml. The secondary outcome measures included levels of HBV serological markers, HBV DNA, liver enzymes, HBV pregenome RNA (pgRNA), and HBV large surface proteins.

Results: A total of 420 patients (modified intention-to-treat [mITT] population, 214 in the EG and 206 in the CG) completed consolidation therapy and finished the off-treatment observation. Upon completion of consolidation therapy, the levels of serum HBsAg were comparable between the two groups. During the off-treatment observation phase, 159 patients (69 in the EG and 90 in the CG) experienced virological relapse. In both the ITT population (27.38% vs. 36.00%, delta = 8.62%, relative risk [RR]: 0.761, 95% confidence interval [CI]: 0.586–0.987, p = 0.037) and the mITT population (32.24% vs. 43.69%, delta = 11.45%, RR: 0.738, 95% CI: 0.576–0.946, p = 0.016), the relapse rates were statistically lower in the EG than in the CG. According to the Kaplan-Meier survival analysis, the cumulative probability of virological relapse was reduced in the EG (p = 0.045). The decreased serum HBsAg levels (under 500 IU/ml, p = 0.004) and undetectable serum HBV pgRNA (p = 0.005) prior to ETV withdrawal may be related to a reduced risk of virological relapse.

Conclusion: A 96-week consolidation therapy combining the TGBXJD and ETV may improve off-treatment outcomes by reducing virological relapses. Serum HBV pgRNA and HBsAg levels could be evaluated as potential predictors of virological relapse prior to ETV withdrawal.

SAT-180
Positive impact of reflex testing in performing hepatitis delta serology in HBsAg+ patients
Régine Truchi1, Anne De Monte2, Albert Tran1, Valérie Giordanengo2, Laurence Ollier2. 1Archet 2 Hospital, Liver unit, NICE, France; 2Archet 2 Hospital, Virology laboratory, NICE, France
Email: truchi.r@chu-nice.fr

Background and aims: Several studies have shown that screening for the hepatitis Delta virus (HDV) was not optimal: between 30 and 50% of HBs antigen positive (HBsAg+) patients. The virology laboratory of University Hospital Center (CHU) from Nice has been carrying out HDV reflex testing (HDV RT) for several years in HBsAg+ patients.

Method: This work assesses the feasibility and effectiveness of HDV RT within the different departments of our establishment. HDV RT consists of systematically adding HDV serology to HBsAg+ patients if the latter was not requested by the prescriber. In the event of an insufficient quantity of sample, the virology laboratory contacts the clinical department to obtain a second sample in order to carry out HDV screening.

Results: From 01/01/2021 to 12/31/2021, 17 364 HBsAg screenings were carried out at the CHU. 182 HBsAg screenings were positive, corresponding to 138 patients (58 F and 80 M). 80 of these 138 patients (58%) were screened for the first time at the CHU. 182 HBsAg screenings were positive, corresponding to 138 patients (58 F and 80 M). 80 of these 138 patients (58%) were screened for the first time at the CHU and 58
Bulevirtide monotherapy in HDV compensated cirrhotic patients

Pretreatment and on-therapy HDV RNA levels predict response to SAT-181

SAT-182 Preliminary results of a Phase 1b, open-label, multicenter study of selgantolimod (GS-9688) in special populations of patients with chronic hepatitis B

SAT-181 Pretreatment and on-therapy HDV RNA levels predict response to Bulevirtide monotherapy in HDV compensated cirrhotic patients treated up to 96 weeks

Background and aims: Bulevirtide (BLV) has been approved for treatment compensated chronic hepatitis Delta (HDV), however baseline and on-therapy predictors of response are still unknown.

Method: Consecutive HDV patients with compensated cirrhosis treated with BLV monotherapy 2 mg/day up to 96 weeks were enrolled in this single-center study. HDV RNA was quantified by Robogene 2.0 (IOD 6 IU/ml). Clinical and virological variables were assessed at baseline and every 8 weeks.

Results: Overall, 49 HDV patients were enrolled: median age 52 (29–77) years, 59% males, platelets 78 (17–217) × 103/mm3, liver stiffness measurement 17.3 (6.4–68.1) kPa, ALT 97 (30–1074) U/L, HBsAg 3.7 (0.8–4.4) LogIU/ml, HDV RNA 5.2 (2.4–6.9) LogIU/ml. At baseline, 6% and 24% patients had ALT<ULN (<40 U/L) and <1.5 ULN, respectively. None of the patients had baseline HDV RNA<100 IU/ml, while 8% had HDV RNA<1000 IU/ml, where HDV RNA<1000 IU/ml was associated with ALT<1.5 ULN (p = 0.02). Following BLV monotherapy, virological response rates (undetectable or HDV RNA<100 IU/ml) and biochemical response rates were 57%, 68%, 81% and 67%, while for combined response ALT<1.5 ULN was associated with virological response at week 48 (p = 0.01) and 96 (p = 0.02) and predicted biochemical response at weeks 72 (p = 0.04) and 96 (p = 0.03) and predicted biochemical response at weeks 72 (p = 0.01) and 96 (p = 0.02). Baseline HDV RNA<1000 IU/ml was associated also with virological response at week 48 (p = 0.007), 72 (p = 0.04) and 96 (p = 0.04), while it did not predict combined response at any timepoint. In addition, HDV RNA<1000 IU/ml at week 24 predicted HDV RNA<100 at week 48 (p = 0.03), 72 (p = 0.04) and 96 (p = 0.03) and was also associated with ALT<1.5 ULN at weeks 72 (p = 0.01) and 96 (p = 0.03). Finally, HDV RNA<1000 IU/ml at week 24 predicted virological response (p = 0.03), combined response (p = 0.02) and ALT<1.5 ULN (p = 0.02) at week 96, but not biochemical response. Conversely, HDV RNA<100 IU/ml at week 24 was not associated with ALT values, virological response and combined response rates at weeks 48, 72 and 96.

Conclusion: HDV reflex testing is feasible at the level of an university hospital virology lab and makes it possible to optimize HDV screening in HBV identified patients from different departments, including those not specialized in the management of viral hepatitis.
judged related to study drug. In Cohort 3, 1 patient had severe nausea and vomiting. All other treatment-related AEs were Grade 2 or lower. No TEAEs led to study drug interruption or discontinuation. ALT elevation was observed in 1 patient in Cohort 1 and 2 patients each in Cohorts 2 and 3; all such increases were Grade 1 or 2. One patient (Cohort 2) met AASLD criteria for an ALT flare. Increases in serum IL-1RA and IL-12p40 levels were observed between 4 and 24 h after selgantolimod treatment in all cohorts.

**Conclusion:** In these unique populations of CHB, selgantolimod was safe with only 1 severe treatment-related AE. There was a small but consistent HBsAg decline in all cohorts with a trend in HDV RNA decline in the HDV/HBV Cohort. All ALT elevations were <Grade 3, and 1 met AASLD flare criteria.

**SAT-183 Safety and efficacy of REP 2139-Mg in association with TDF in chronic hepatitis delta patients with decompensated cirrhosis**  
Christiane Stern1, Cecilia De-Freitas1, Michel Bazinet2, Stéphane Chevaliez3, Marc Bourliere4, Andrew Vaillant2.  
1Hôpital Beaujon AP-HP, Clichy, France; 2Replicor Inc., Montreal, Canada; 3Hôpital Bichat, Service de Virologie, Paris, France; 4Centre national de référence des hépatite B, C et Delta-Laboratoire associé, Hôpital Avicenne, Bobigny, France; 5Hôpital Henri Mondor, Créteil, France; 6Hôpital Saint Joseph, Marseille, France  
Email: availlant@replicor.com

**Background and aims:** The only treatment option for chronic hepatitis delta (CHD) patients with decompensated cirrhosis is liver transplantation. REP 2139-Mg blocks the assembly and secretion of HBV subviral particles and hepatitis delta antigen function, providing multiple effects against both HBV and HDV infection. Compassionate access to REP 2139-Mg is being provided under the Replicor Compassionate Access Program (RCAP, NCT05683548). The objective of this study is to describe the safety and efficacy of REP 2139-Mg in CHD patients with decompensated cirrhosis.

**Method:** Compassionate use in the first three CHD patients with decompensated cirrhosis to receive REP 2139-Mg 250 mg QW SC and TDF 245 mg QD PO for 48 weeks was approved in France by the ANSM. Clinical, biological, virological and imaging data were collected at baseline and every week for the first month, then every month.

**Results:** Patient 1 is a Caucasian, 56-year-old female, HDV treatment-naive, with decompensated cirrhosis (Child Pugh B8, portal hypertension and ascites) with HBV RNA 7.04 log10 IU/ml and HBsAg 1177 IU/ml at baseline. Reversal of ascites was confirmed by ultrasound at week 4 HBsAg loss occurred at week 10 with confirmation by HBsAg seroconversion (27 mIU/ml) at week 14 increasing to 478.5 mIU/ml at week 30. HDV RNA has been undetectable since week 20. Patient 2 is an African, 56-year-old female with CHD and hepatocellular carcinoma (HCC) awaiting liver transplant. She had HDV relapse one year after discontinuing bulevirtide 2 mg and pegIFN 180 µg and progressed to decompensated cirrhosis (Child Pugh C11, portal hypertension, ascites and HCC) with accompanying edema and pronounced fatigue. Baseline HDV RNA was 3.64 log10 IU/ml and HBsAg 4270 IU/ml. A significant reduction of ascites was confirmed at week 4 with marked reduction of peripheral edema and fatigue. Successful liver transplant (due to HCC) was performed in this patient after 10 weeks of therapy. Prior to liver transplant, HDV RNA became undetectable at week 6, HBsAg was 1.75 IU/ml and anti-HBs was 8 mIU/ml. Patient 3 is an African, 47-year-old male, HDV treatment-naive, with decompensated cirrhosis (Child Pugh C10, portal hypertension, ascites, and hepatic encephalopathy). As observed in the first 2 patients, antiviral response is not yet evident at week 4. A significant reversal of ascites is present at week 6. All three patients experienced no significant adverse events and have presented a good tolerance to subcutaneous injections of REP 2139-Mg to date.

**Conclusion:** REP 2139-Mg in association with TDF is safe and well tolerated in patients with CHD and decompensated cirrhosis. Liver function improvement with significant ascites reversal was rapid, occurring after only 4 weeks of treatment. HBV-HDV functional cure with HBsAg loss and HBs seroconversion appears achievable for the first time in this special population, which could prevent the need for a future liver transplant.

**SAT-184 Is treatment with Bulevirtide 10 mg useful in poor responder patients to 2 mg? Results from the French multicenter early access program**  
Victor de Lédinghen1, Anne Minello Franza2, Nathalie Ganne-Carrié3, Laurent Aliorc4, Sophie Metivier4, Martin Signier4, Bernard Prouvost-Keller5, Bruno Roche5, Frederic Heluwaert5, Louis d’Alterroche5, Leon Mutì6, Juliette Foucher1, Fabien Zoulim7, Marie-Noëlle Hilleret10, 1CHU, Bordeaux, France; 2CHU, Dijon, France; 3AP-HP, Marseille, France; 6CHU, Rennes, France; 4CHU, Tours, France; 5CHU, Clermont-Ferrand, France; 7INSERM, France; 8CHU, Grenoble, France  
Email: victor.deledinghen@chu-bordeaux.fr

**Background and aims:** Significant HDV RNA decline was observed in HBV/HDV patients who received 48 weeks of Bulevirtide (BLV) in mono- or combination with PEG-interferon α-2a (PEG-IFNα) in the French early access program and ANRS Budelta cohort. However, no data are available of BLV 10 mg in poor responders to 2 mg. The aim of this analysis was to evaluate the efficacy and safety of BLV 10 mg daily with or without PEG-IFNα 2a for at least 6 months in HBV/HDV non-responder patients to BLV 2 mg.

**Method:** 15 patients (male 66.7%, mean age 43 years, cirrhosis 66.7%) with CHD patients with decompensated cirrhosis. In this study. Patients received BLV 2 mg qd sc alone or in combination with PEG-IFNα once weekly according to physician’s choice. All patients received at least 3 months of BLV 2 mg. In case of poor responses according to the physician, BLV was switched from 2 mg to 10 mg. The duration of 10 mg (at least 3 months) was related to the availability of the drug since in January 2022, BLV 2 mg was no longer available.

**Results:** No specific side-effects were reported. At Day 0 of BLV 10 mg, median HDV RNA was 6.08 log10 IU/ml and median ALT level 63.5 IU/L (2/14 patients had ALT level <40 IU/L). 13 patients received BLV 10 mg monotherapy and 2 patients received BLV 10 mg plus PEG-IFNα. Main results (per protocol analysis) are indicated in Table. At M3, M6 and M9 or M12, median HDV RNA was 5.29, 3.94, and 5.46 log10 IU/ml. Only one patient (no cirrhosis) had long-term undetectable HDV-RNA. His viral load was 5.15 log10 IU/ml when he started BLV 2 mg and 3.43 log10 IU/ml when he started BLV 10 mg. Two patients switched from 10 to 2 mg when 10 mg was no longer available. No variation of viral load was observed after this switch.

<table>
<thead>
<tr>
<th>Month</th>
<th>BLV 10 mg</th>
<th>Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>M3</td>
<td>30% (3/10)</td>
<td>37.5% (3/8)</td>
</tr>
<tr>
<td>M6</td>
<td>25% (2/8)</td>
<td>33.3% (3/9)</td>
</tr>
<tr>
<td>M9</td>
<td>9.1% (1/11)</td>
<td>9.1% (1/11)</td>
</tr>
</tbody>
</table>

**Conclusion:** In this first real-world cohort of HDV patients, daily administration of BLV 10 mg in poor responder patients to 2 mg was safe and well tolerated. Unfortunately, no significant virologic effect observed.
was observed after at least 6 months of treatment, even in patients receiving PEG-IFN.

SAT-185
Treatment with Bulevirtide, with or without PEG-interferon, in HIV-HBV/HDV co-infected patients in a real-life setting

Background and aims: Significant HDV RNA decline was observed in HBV/HDV patients who received 48 weeks of Bulevirtide (BLV) in monotherapy or in combination with PEG-interferon α2a (PEG-IFNα2a) in the French early access program and ANRS HD EP01 BuleDelta cohort. However, no data are available in HIV co-infected patients. The aim of this analysis was to evaluate the efficacy and safety of BLV in HIV patients (male 71.4%, mean age 48.8 years, cirrhosis).

Method: 28 HIV patients (male 71.4%, mean age 48.8 years, cirrhosis 53.6%, median HDV-RNA 6.5 log (IU/ml), median HIV RNA 30 copies/ml, median CD4 620 cells/mm3) with chronic HBV/HDV infection were included in the French early access program and ANRS Buledelta cohort. Patients received BLV 2 mg daily with or without PEG-IFNα2a for 12 months in HIV/HBV/HDV patients.

Results: Twelve (50%) patients had detectable HIV-RNA at day 0 (all <100 cp/ml). At M12/EOT, median CD4 was 602/mm3, and 3 patients had detectable HIV-RNA (all <100 cp/ml). Early discontinuation (before or at M12) was observed in 10 (35.7%) patients (1 (10%) adverse event, 3 (30%) lost to follow-up or patient decision, 6 (60%) other reason). HDV-RNA declined overtime as follow: D0 6.5 log (IU/ml), M3 2.4 log (IU/ml), M6 3.8 log (IU/ml), M9 3.5 log (IU/ml), M12/EOT 3.4 log (IU/ml). At M3, undetectable or HDV-RNA decline >2 log from baseline was observed in 3 (20%) or 8 patients (88.9%) treated with BLV or BLV + PEG-IFN, respectively. Main results at M12 or EOT are presented in Figure 1. Serious adverse events were observed in 7 (26.9 µmol/L, respectively). Study drug was well tolerated, with no serious AEs or deaths. Half the HVs each at the 30 mg dose and 100 mg dose completed the study. Most were male 11 (69%) and White 11 (69%), with age and body mass index ranging from 20 to 61 years and 19–30 kg/m², respectively. Study drug was well tolerated, with no serious AEs or deaths. Half the HVs each at the 30 mg dose and 100 mg dose.
(4334 or PBO recipients) reported an AE—7 Grade 1 and 1 Grade 2 (gastroenteritis). The most frequently reported AE was headache, with all cases being Grade 1. None of the AEs were considered related to the study drug. There were no Grade 3 or 4 lab abnormalities. 4334 was rapidly absorbed, with median t_{max} of 2 hrs, and exposure increased proportionally between the 30 mg and 100 mg single doses. Mean C_{max} and AUC_{0-24} values, respectively, were 446 ng/ml and 2503 h·ng/ml after the 30 mg dose, and 1376 ng/ml and 8772 h·ng/ml after the 100 mg dose (Figure). The projected C_{min} values for once daily administration at the 30 mg and 100 mg doses are in multiple-fold excess of protein-adjusted EC_{50}'s for HBV DNA and cccDNA formation.

**Conclusion:** 4334, a novel next-generation core inhibitor, was well tolerated in SAD cohorts when administered orally up to 100 mg. Plasma concentrations were higher than predicted by non-clinical models and exceeded in vitro EC_{50} values for the inhibition of cccDNA formation. Potent inhibition of HBV with daily dosing is projected.

**SAT-187**

**Frequency of bepiroviren binding site nucleotide polymorphisms at baseline and impact on end of tmt (EOT) hepatitis B surface antigen (HBsAg) serum level reduction.**

**Background and aims:** Bepirovirsen (BPV; GSK3228836) is an antisense oligonucleotide that targets a conserved 20-nucleotide sequence within HBV pregenomic RNA and mRNAs. B-Clear is a Phase 2b study (NCT04449029) assessing the efficacy and safety of 12 or 24 wks of BPV treatment (tmt) in patients (pts) with chronic hepatitis B (CHB). This analysis assessed the frequency of pre-existing BPV binding site single nucleotide polymorphism (SNP) at baseline and the impact on end of tmt (EOT) hepatitis B surface antigen (HBsAg) serum level reduction.

**Method:** Multicentre, randomised, partial-blind study in pts with CHB who were either receiving concomitant stable nucleos (t)ide analogue therapy (on-NA) or were not receiving NA (not-on-NA). Pts were randomised (3:3:3:1) to receive BPV 300 mg weekly either for 24 wks (Arm 1); for 12 wks then 150 mg for 12 wks (Arm 2); for 12 wks then placebo (PBO) for 12 wks (Arm 3); or PBO for 12 wks then BPV 300 mg for 12 wks (Arm 4). A loading dose of BPV (Arms 1–3) or PBO (Arm 4) was given on days 4 and 11. Next-generation sequencing was used to sequence HBV DNA or RNA at baseline. A SNP was reported if the frequency was ≥5% compared with wild type.

**Results:** Not-on-NA: Baseline sequence information was available for 219/229 pts. Thirteen pts (13/219, 5.9%) had SNPs detected at a frequency of ≥5%. The most common BPV binding site SNPs were C9A (n = 4/13, 31%) and T10G/C/A (n = 6/13, 46%). Pts w/or w/o baseline SNPs had similar mean baseline HBsAg levels (3.605 vs 3.714 log10 IU/ml). On-NA: Baseline sequence information was available for 90/226 pts. Nine pts (9/90, 10%) had a SNP detected at a frequency of ≥5%. The most common SNP detected was A13G (n = 2/9, 22%). Pts w/or w/o a baseline SNP had similar mean baseline HBsAg levels (3.370 vs 3.344 log10 IU/ml). EOT response: The mean log10 reductions in HBsAg levels were lower in pts with a BPV binding site SNP; however, reductions were observed regardless of SNP (Table; tmt arms pooled) and 4 pts with SNP achieved HBsAg <0.05 IU/ml. These 4 pts had SNPs detected at a frequency between 5.417% and 99.943% over wild-type.

**Conclusion:** SNPs within the BPV binding site were infrequent across tmt arms. Although the HBsAg reduction was lower in the presence of BPV binding site SNPs, reductions were observed, and some pts with SNPs achieved HBsAg <0.05 IU/ml at EOT. Larger studies are needed to confirm these findings.

**Funding:** GSK (209668) [on behalf of the B-Clear study group]

**SAT-188**

**Safety, pharmacokinetics, and antiviral activity of single ascending doses of ALG-125755, a GalNAc-conjugated small interfering RNA, in subjects with chronic hepatitis B.**

**Background and aims:** To evaluate the safety, pharmacokinetics (PK) and antiviral activity of ALG-125755, a small interfering RNA (siRNA) designed to reduce hepatitis B surface antigen (HBsAg) in subjects with chronic hepatitis B (CHB).

**Method:** Study ALG-125755-501 (NCT05561530) is a three-part, double-blind, randomized, placebo-controlled phase 1a/1b study. It

| Table. Reduction in HBsAg at end of BPV treatment for patients with or without a BPV binding site SNP at Day 1 (pooled treatment arms) |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|
| **Not-on-NA (n=220)**           | **SNP**         | **No SNP**      | **SNP**         | **No SNP**      |
| Patients, n (%)                 | 13 (6)          | 206 (94)        | 13 (6)          | 206 (94)        |
| Baseline HBsAg level (log10 IU/mL) | 3.605           | 3.714           | 3.605           | 3.714           |
| Mean HBsAg reduction (log10 IU/mL) | -1.734          | -2.302          | -1.734          | -2.302          |
| Median HBsAg reduction (log10 IU/mL) | -1.608          | -2.060          | -1.608          | -2.060          |
| Min to Max HBsAg reduction (log10 IU/mL) | -0.11 to -4.11  | 0.01 to -5.98   | -0.11 to -4.11  | 0.01 to -5.98   |
| **On-NA therapy (n=90)**        | **SNP**         | **No SNP**      | **SNP**         | **No SNP**      |
| Patients, n (%)                 | 9 (10)          | 81 (90)         | 9 (10)          | 81 (90)         |
| Baseline HBsAg level (log10 IU/mL) | 3.370           | 3.344           | 3.370           | 3.344           |
| Mean HBsAg reduction (log10 IU/mL) | -1.629          | -2.093          | -1.629          | -2.093          |
| Median HBsAg reduction (log10 IU/mL) | -2.391          | -1.567          | -2.391          | -1.567          |
| Min to Max HBsAg reduction (log10 IU/mL) | -0.19 to -3.40  | 0.04 to -5.50   | -0.19 to -3.40  | 0.04 to -5.50   |

Figure: (abstract: SAT-187).
is evaluating the safety, tolerability, PK and pharmacodynamics of single doses of ALG-125755 in healthy volunteers (HV; Part 1) and single (Part 2) and multiple (Part 3) doses of ALG-125755 in CHB patients. In Part 1, single subcutaneous (SC) doses of ALG-125755 up to 200 mg were well tolerated with linear PK in HVs (Gane et al, APASL 2023). In each cohort in Part 2, which is ongoing, 8 CHB subjects are being randomized 3:1 to receive single SC doses of ALG-125755 or placebo. Safety assessments (adverse events (AEs), vital signs, physical examination, ECG, and laboratories), viral markers (Parts 2 and 3), and plasma and urine PK samples are being collected throughout study conduct. Preliminary blinded results from the first cohort of Part 2 are reported here. Additional available data, including HBsAg, will be presented at the conference.

Results: 8 virologically suppressed hepatitis B e-antigen (HBeAg) negative CHB subjects received a single 50 mg SC dose of ALG-125755 or placebo in Cohort 1. Subjects were mainly female (62.5%), with a mean (SD) age of 58 (2.3) years, mean BMI (SD) of 30.4 (1.3) kg/m2, and baseline HBsAg of 2.11 to 4.14 log10 IU/ml. There have been no serious AEs or dose-limiting toxicities. All treatment emergent AEs (TEAEs) were mild (Grade 1) except for one Grade 2 back pain. Other than headache (N = 2), no TEAEs have been reported in more than one subject. No clinically concerning laboratory, physical examinations, vital sign, or ECG abnormalities have been reported. There was low inter-subject variability for ALG-125755 exposures, which were generally similar to those observed in healthy volunteers after dose and body weight adjustment.

Conclusion: Single SC doses of 50 mg ALG-125755 have been well tolerated to date in HBeAg negative CHB subjects with a safety and PK profile supporting further evaluation of higher dose levels.

SAT-189
Efficacy and safety of celecoxib add on nucleos (t)ide analogues on the hepatitis B surface antigen of virally suppressed patients with chronic hepatitis B - interim analysis
Feng Xue1,2, Yingying Li3, Jing Zhang4, Qing Ye5, Huiying Rao6, Zhenhuan Cao4, Jun Li5, Xiaohe Li6, Lai Wei1,2, 1Beijing Tsinghua Changgung Hospital, Tsinghua University, China; 2School of Clinical Medicine, Tsinghua University, China; 3HolyHaid Artificial Intelligence Drug Development Limited Company, China; 4Beijing Youan Hospital, Capital Medical University, China; 5Tianjin Third Central Hospital, China; 6Peking University People’s Hospital, China
Email: weilai@mail.tsinghua.edu.cn

Background and aims: Hepatitis B surface antigen (HBsAg) loss is considered as function cure of chronic hepatitis B (CHB). We found that celecoxib treatment is likely associated with HBsAg loss via artificial intelligence drug screening and has been validated by cytology, in vitro tests and real-world retrospective study. This proof-of-concept study (NCT05256823) is aiming to investigate if celecoxib add on nucleos (t)ide analogues (NUCs) can induce HBsAg loss in virally suppressed patients with CHB.

Method: Virally suppressed patients were defined as patients with CHB taking NUCs for more than 1 year with HBV DNA below the lower limit of quantification. This multi-center, randomized, open-labelled trial was beginning in February, 2022. Patients who were treated with NUCs for more than 1 year with 100 IU/ml < HBsAg < 1500 IU/ml and HBV DNA < 20 IU/ml were recruited. Participants were randomly assigned (in a 3:1 ratio) to receive either celecoxib at a dose of 200 mg twice a day add on NUCs (experimental group) or NUCs continue (control group) for 48 weeks and then followed for another 24 weeks. The primary end points were the ratio of HBsAg loss and the reduction of HBsAg after treatment for 48 weeks and discontinuation for 24 weeks. The safety of celecoxib treatment was evaluated throughout the study. The interim analysis of data for patients by January 11, 2022. All statistical analyses were performed using SAS software (version 9.4), and P < 0.05 was considered significant.

Results: A total of 47 patients participated in this study. 35 participants in the experimental group and 12 participants in the control group. Baseline data were comparable for the two groups. To date, 2 patients withdrew from the study gave no reason. All 45 participants had completed 24 weeks of follow-up and 19 participants completed 36 weeks of follow-up. At week 24, the HBsAg was decreased in 51.5% (17/33) of the patients in the experimental group.

The multivariate linear regression analysis suggested the subgroup of patients with HBsAg levels at 200–500 IU/ml was more likely to respond to celecoxib in HBsAg decline. The coefficient is −0.01 compared to reference group. One patient in the experimental group had HBsAg levels of 344.85 IU/ml at baseline, which decreased to 292.29 IU/ml at 12 weeks, to 147.05 IU/ml at 24 weeks and to 79.45 IU/ml at 36 weeks. The incidence of adverse events (AEs) in the experimental group and control group was 91.43% and 91.67%, respectively. The incidence of AEs related to celecoxib treatment was 60%. All AEs were mild or moderate, with no serious adverse events reported.

Figure 1. The change of HBsAg level in 200-500 IU subgroup

<table>
<thead>
<tr>
<th>Factor</th>
<th>coefficient</th>
<th>95% CI</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBsAg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100-1500 IU/ml</td>
<td>0.02</td>
<td>-0.14, 0.17</td>
<td>0.840</td>
</tr>
<tr>
<td>500-1000 IU/ml</td>
<td>0.05</td>
<td>-0.06, 0.18</td>
<td>0.446</td>
</tr>
<tr>
<td>200-500 IU/ml</td>
<td>-0.10</td>
<td>-0.26, 0.05</td>
<td>0.168</td>
</tr>
<tr>
<td>100-200 IU/ml</td>
<td>0.07</td>
<td>-0.14, 0.27</td>
<td>0.478</td>
</tr>
</tbody>
</table>

Multivariate Linear Regression Analysis of HBsAg decline
SAT-190
Quantification of serum HDV RNA in untreated and Bulevirtide-treated patients with CHD: a comparison between Robogene 2.0 and Eurobioplex

Maria Paola Anolli1, Sara Colonia Uceda Renteria2, Elisabetta Degasperi1, Dani Sambarino1, Marta Borghi1, Floriana Facchetti1, Riccardo Perbellini1, Roberta Soffredini1, Sara Monico1, Ferruccio Ceriotti2, Pietro Lampertico1,2,1. Foundation IRCCS Ca’ Granda Ospedale Maggiore Policlinico, Department of Gastroenterology and Hepatology, Milan, Italy; 2. Foundation IRCCS Ca’ Granda Ospedale Maggiore Policlinico, Virology unit, Milan, Italy; 3. CRC “A.M. and A. Migliavacca” Center for Liver Disease, Department of Pathophysiology and Transplantation, University of Milan, Milan, Italy. Email: maria.anolli@unimi.it

Background and aim: Diagnosis and management of chronic hepatitis Delta (CHD) largely relies on HDV RNA quantification but a significant variability between different assays does exist. Aim of the study was to compare two different methods to quantify serum HDV RNA in untreated and Bulevirtide (BLV)-treated CHD patients.

Method: Frozen plasma from consecutive untreated and BLV-treated CHD patients were tested in a single-center retrospective study for HDV RNA levels by using two different quantification methods: Robogene 2.0 (Roboscreen GmbH, Leipzig, Germany; LOD 6 IU/ml) and Eurobioplex (HDV qRT-PCR, Eurobio, France, LLOQ 100 IU/ml). RNA extraction was performed manually for both assays according to manufacturer indications: INSTANT Virus RNA/DNA kit (Analytik Jena AG, Jena, Germany) for Robogene and NucleoSpin® Dx Virus Kit (Macherey-Nagel, Düren, Germany) for Eurobioplex.

Results: A total of 165 plasma samples collected from 123 CHD (88 untreated and 35 BLV-treated) patients were analyzed: median age was 53 (21–78) years, 57% males, 89% of European origin, 61% with cirrhosis, 78% under NUC treatment, 97% HDV genotype 1, ALT were 743 (0.5 and 4.6) Log IU/ml, 91% HBeAg negative, 73% HBV DNA undetectable. Over all, median HDV RNA levels were 2.96 (0.30–7.36) vs. 3.03 (1.52–8.19) Log IU/ml by Robogene vs. Eurobioplex (p < 0.0001). Compared to the Robogene test, Eurobioplex reported similar HDV RNA levels (Δ ± 0.5 Log) in 56 (34%) patients, higher in 102 (62%) [Δ between +0.5 and +1 Log in 41; Δ between +1 and +2 Log in 55; Δ ≥ 2 in 6] and lower in 7 (4%) [Δ between –0.5 and – 1 Log in all 7 cases]. Of the 45 (27%) samples that were target not detected (TND) with Robogene, 73% tested TND with Eurobioplex, 13% <LLOQ, while 13% tested positive (>100 IU/ml). Of the 10 (6%) samples <LOD with Robogene, 80% were TND with Eurobioplex, 10% were <LLOQ and 10% positive. Overall, 55 (33%) of samples tested TND or <LOD with Robogene and 64 (39%) with Eurobioplex (p < 0.0001). When setting Robogene as the reference standard, Eurobioplex had a Sensitivity of 86% and a specificity of 87% in detecting HDV viral load. In BLV treated patients, virological response rates differed according to the assay: the proportion of patients achieving HDV RNA <LOD/LLOQ was 20% with Robogene and 42% with Eurobioplex. 13% of Robogene negative patients tested positive with Eurobioplex while 59% of those negative with Eurobioplex tested positive with Robogene.

Conclusion: Quantification of HDV RNA is significantly influenced by the quantification method, and this could influence clinical management of patients with CHD, being viral load a surrogate treatment end point in CHD.
Background and aims: To evaluate the safety, pharmacokinetics (PK), and antiviral activity of ALG-000184, an oral prodrug of ALG-001075, a novel, pan-genotypic capsid assembly modulator-empty (CAM-E) with picomolar potency.

Method: ALG-000184-201 is a multi-part, multi-center, double-blind, randomized, placebo-controlled study (NCT04536337). Part 4 is evaluating the safety, PK, and antiviral activity of daily doses of ALG-000184 for up to 48 weeks in currently not treated subjects with chronic hepatitis B (CHB). Subjects in Cohorts 1 and 2 were randomized in a 4:1 ratio to ALG-000184 plus entecavir (ETV) or placebo plus ETV for 12 weeks followed by 36 weeks of ALG-000184 plus ETV. Cohorts 1 and 2 evaluated 100 mg and 300 mg of ALG-000184, respectively. A third cohort evaluating open label monotherapy of 300 mg ALG-000184 is also being evaluated. Available data from all three cohorts will be presented at the conference.

Results: To date, 25 subjects have enrolled in Cohorts 1 (100 mg, N = 11) and 2 (300 mg, N = 14) and have dosed for up to 24 and 16 weeks, respectively. All subjects are Asian, most female (52%), mean age 33.2 years, BMI 22.3 kg/m² and HBV genotype B or C. At baseline (BL), error! unknown field.

Conclusion: Dosing with ALG-000184 plus ETV for up to 24 weeks was well tolerated, exhibited predictable PK and resulted in dose-dependent, clinically relevant declines in HBsAg, suggesting a potential role of ALG-000184 in combination regimens for functional cure.

S1165

Efficacy and prediction analysis of pegylated interferon alpha-2b in treatment-naive HBeAg negative chronic hepatitis B patients with normal ALT: a multicenter real-world study (Ice-breaking Project in China)-Interim analysis

Chong Zhang1,2, Da-Wu Zeng2, Da-Chuan Cai2, Xin-Lan Xue3, Ling-Yi Zhang2, Bao-Jun Song6, Yu-Feng Gao7, Yan Huang8, Jia Shang9, Xiao-Feng Wu10, Ying Zhang11, Hua Jin12, Hui Chen13, Hong Tang14

Background and aims: In China, the proportion of HBeAg negative chronic hepatitis B (CHB) patients is gradually increasing, which is related to the pre-C region mutation of long-term HBV infection. The disease progression of Hepatitis B e antigen (HBeAg) negative CHB patients is fast, a large proportion of them have moderate or advanced liver inflammation or fibrosis, even if alanine aminotransferase (ALT) is normal, which requires timely antiviral treatment. The purpose of this study was to analyze the efficacy of pegylated interferon alpha-2b (PegIFN alpha-2b) in HBeAg negative CHB patients with normal ALT, and to explore the predictive factors of virological and serological responses.

Method: This is a multi-center, prospective, non-intervenive, real-world clinical study conducted in China, involving 20 hospitals in 12 provinces or municipalities, which enrolled CHB patients with age of 18–60 years, Hepatitis B surface antigen (HBsAg) positive for more than 6 months, HBeAg negative, HBV DNA >20 IU/ml and normal ALT, without antivirus treatment history. PegIFN alpha-2b 180 µg/week was applied on a voluntary basis. The treatment strategy is adjusted according to the virological and serological response every 24 weeks, the total treatment course is not exceed 96 weeks.

Results: A total of 200 patients were planned to be enrolled in the project, which have been completed. Up to now, 75 (37.5%), 95 (47.5%) and 30 (15.0%) patients has completed 48, 72 and 96 weeks of treatment. 53 patients with complete data collection have been summarized for 24 weeks of treatment, and the remaining data are being collected. 35 (66.0%) were male, with an average age of 38.04 ± 7.19 years. HBV DNA levels were unchanged with ETV, but declined to a maximum of 0.7 log10 IU/ml with 100 mg ALG-000184 plus ETV for at least 22 weeks, and to a maximum of 1.0 log10 IU/ml with 300 mg ALG-000184 plus ETV for at least 14 weeks.

Conclusion: Dosing with ALG-000184 plus ETV for at least 22 weeks was well tolerated, exhibited predictable PK and resulted in substantial reductions in HBV DNA and HBsAg compared to ETV alone. Importantly, dosing with ALG-000184 plus ETV resulted in dose-dependent, clinically relevant declines in HBsAg, suggesting a potential role of ALG-000184 in combination regimens for functional cure.

S1193

SAT-193

Efficacy and prediction analysis of pegylated interferon alpha-2b in treatment-naive HBeAg negative chronic hepatitis B patients with normal ALT: a multicenter real-world study (Ice-breaking Project in China)-Interim analysis

Chong Zhang1,2, Da-Wu Zeng2, Da-Chuan Cai2, Xin-Lan Xue4, Ling-Yi Zhang2, Bao-Jun Song6, Yu-Feng Gao7, Yan Huang8, Jia Shang9, Xiao-Feng Wu10, Ying Zhang11, Hua Jin12, Hui Chen13, Hong Tang14, Xiaobo Lu15, Yujuan Guan16, Feng Min17, Liang Xu18, Gang Li19, Zhen-Guang Wang20, Xiaoguang Dou21, Shaoting Yang22, Zengqiang Wang23, Shengjing Hospital of China Medical University, China; 2The First Affiliated Hospital of Fujian Medical University, China; 3The First Affiliated Hospital of Xinjiang Medical University, China; 4The First Affiliated Hospital of Xi'an Jiaotong University, China; 5Lanzhou University Second Hospital, China; 6The Sixth People's Hospital of Fushun, China; 7The First Affiliated Hospital of Anhui Medical University, China; 8Xiangya Hospital Central South University, China; 9Henan Provincial People's Hospital, China; 10The Sixth People's Hospital of Shenyang, China; 11Dalian Public Health Medical Center, China; 12The Sixth People's Hospital of Bengbu, China; 13Hepatobiliary Hospital of Jilin, China; 14West China Hospital of Sichuan University, China; 15The First Affiliated Hospital of Xining Medical University, China; 16Guangzhou Eighth People's Hospital Guangzhou Medical University, China; 17Army Seventy-three Army Hospital, China; 18Tianjin Second People's Hospital, China; 19Liaocheng Ollfield General Hospital, China; 20Anshan City Hospital For Infectious Disease, China

Background and aims: To evaluate the safety, pharmacokinetics (PK), and antiviral activity of ALG-000184, an oral prodrug of ALG-001075, a novel, pan-genotypic capsid assembly modulator-empty (CAM-E) with picomolar potency.

Method: ALG-000184-201 is a multi-part, multi-center, double-blind, randomized, placebo-controlled study (NCT04536337). Part 4 is evaluating the safety, PK, and antiviral activity of daily doses of ALG-000184 for up to 48 weeks in currently not treated subjects with chronic hepatitis B (CHB). Subjects in Cohorts 1 and 2 were randomized in a 4:1 ratio to ALG-000184 plus entecavir (ETV) or placebo plus ETV for 12 weeks followed by 36 weeks of ALG-000184 plus ETV. Cohorts 1 and 2 evaluated 100 mg and 300 mg of ALG-000184, respectively. A third cohort evaluating open label monotherapy of 300 mg ALG-000184 is also being evaluated. Available data from all three cohorts will be presented at the conference.

Results: To date, 25 subjects have enrolled in Cohorts 1 (100 mg, N = 11) and 2 (300 mg, N = 14) and have dosed for up to 24 and 16 weeks, respectively. All subjects are Asian, most female (52%), mean age 33.2 years, BMI 22.3 kg/m² and HBV genotype B or C. At baseline (BL), most subjects had an ALT less than 1.2 x ULN. Study drug was well tolerated; there were no serious adverse events (AEs) and no discontinuations due to an AE. All treatment emergent AEs were Grade 1 or 2, except for one Grade 4 AE of ALT elevation, which improved despite continuing dosing, and was assessed by the ALT Flare Committee as not due to drug toxicity. No clinically concerning laboratory, ECG, or vital sign findings were reported. The Day 1 PK profile is consistent with earlier findings in healthy volunteers.

Conclusion: Dosing with ALG-000184 plus ETV for up to 24 weeks was well tolerated, exhibited predictable PK and resulted in substantial reductions in HBV DNA and HBsAg shown in the table.

<table>
<thead>
<tr>
<th>Variable</th>
<th>BL (mean SEM)</th>
<th>CFB (mean SEM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBV DNA</td>
<td>ALG-000184</td>
<td>ALG-000184</td>
</tr>
<tr>
<td>100 mg + ETV</td>
<td>N = 8</td>
<td>N = 6</td>
</tr>
<tr>
<td>300 mg + ETV</td>
<td>N = 11</td>
<td>N = 6</td>
</tr>
<tr>
<td>ETV</td>
<td>N = 6</td>
<td>N = 6</td>
</tr>
<tr>
<td>ALG-000184</td>
<td>N = 6</td>
<td>N = 6</td>
</tr>
<tr>
<td>100 mg + ETV</td>
<td>N = 8</td>
<td>N = 6</td>
</tr>
<tr>
<td>300 mg + ETV</td>
<td>N = 11</td>
<td>N = 6</td>
</tr>
<tr>
<td>ETV</td>
<td>N = 6</td>
<td>N = 6</td>
</tr>
</tbody>
</table>

Only 71.1% in patients with baseline HBsAg >1500 IU/ml (p = 0.036).

Figure: (abstract: SAT-192).
Conclusion: For HBeAg negative CHB patients with normal ALT, PegIFN alpha-2b treatment for 24 weeks can achieve a high rate of HBV DNA negative and significant HBsAg decrease, even HBsAg loss. The baseline HBsAg level is related to HBV DNA negative at 24 weeks, and the rate of HBV DNA negative was higher in patients with HBsAg $\leq 1500$ IU/ml.

SAT-194
The safety and efficacy of hepalatide (L47) treatment combined with pegylated interferon-alpha 2a in patients with chronic hepatitis B: the preliminary data from a double-blind, RCT phase II trial
Junliang Fu1, Qing Mao2, Qinglong Jin3, Hui Cheng4, Yongqian Cheng5, Xiaolu Tang5, Hongli Liu5, Fu-Sheng Wang1.
1Senior Department of Infectious Diseases, The Fifth Medical Center of Chinese PLA General Hospital, National Clinical Research Center for Infectious Diseases, Beijing, China; 2Department of Infectious Diseases, Southwest Hospital, Army Medical University, Chongqing, China; 3Department of Hepatology, The First Hospital of Jilin University, Jilin University, Changchun, China; 4Department of Hepatitis, Hepatobiliary hospital of Jilin, Changchun, China; 5Shanghai HEP Pharma Co. Ltd., Shanghai, China
Email: fswang302@163.com

Background and aims: Hepalatide (L47), a 47aa synthetic peptide derived from Hepatitis B virus (HBV) Pre-S1, can blocks HBV entry into hepatocytes by competitively binding to HBV entry receptor sodium taurocholate co-transporting polypeptide (NTCP) on the surface of hepatocytes. The aims of this study were to explore the safety and efficacy of hepalatide in the treatment-naive patients with chronic hepatitis B (CHB).

Method: This randomized, placebo-controlled, double-blind phase 2 clinical trial (NCT 04426968) was planned to enroll 96 treatment-naive CHB patients with HBV DNA $\geq 20000$ IU/ml, 2 $\times$ ULN $\leq$ ALT $\leq 10 \times$ ULN from 12 hospitals in China. The CHB patients were randomly assigned to three groups with different open-label L47 doses (group A 2.10 mg, group B 4.20 mg, and group C 6.30 mg). In each group, patients were double-blindedly randomized to receive L47 or placebo treatment in a 3:1 ratio. All patients received subcutaneous injections of pegylated interferon-alpha 2a (PegIFN) (180μg/Week) for 24 weeks, then followed up for 24 weeks with PegIFN treatment alone. The primary end point is HBV DNA loss (cut-off value 20 IU/ml at the end of 24 weeks).

Results: As of December 26, 2022, 22 enrolled patients (including 19 patients with HBeAg positive and 3 patients with HBeAg negative) have completed 24-week combination treatment (group A, n = 7; group B n = 8; group C, n = 7). The uncovered preliminary data showed that, in all groups, the adverse events (AEs) were generally grade 1 or 2, and most were identified to be related to PegIFN, such as fever, headache, fatigue, leukocytosis, neutropenia. No treatment-related serious AEs were reported. The baseline HBV DNA levels in the three groups were 8.29 ± 0.61 log IU/ml, 7.34 ± 1.42 log IU/ml and 7.69 ± 0.58 log IU/ml, respectively. At 12 weeks of treatment, the HBV DNA levels were declined by 2.39 ± 1.28 log IU/ml in group A, 2.21 ± 1.53 log IU/ml in group B and 4.23 ± 1.8 log IU/ml in group C, respectively. At the end of 24-week treatment, the HBV DNA levels were further declined by 3.70 ± 2.02 log IU/ml, 2.82 ± 1.71 log IU/ml, 4.54 ± 1.62 log IU/ml in the three groups, respectively. One patient in group A and one patient in group B reached primary end point. The levels of quantitative hepatitis B surface antigen (qHBsAg) were declined from baseline by 7.09 ± 0.99 log IU/ml, 0.79 ± 0.79 log IU/ml, 0.70 ± 0.76 log IU/ml in the three groups at the end of 24-week treatment, respectively. And one patient achieved HBsAg loss (below 0.05 IU/ml) with presence of hepatitis B surface antibody, one patient achieved HBeAg seroconversion. The ALT normalization rate was 28.6%, 37.5% and 57.1% in the three groups at the end of 24-week treatment, respectively.

Figure: (abstract: SAT-193): a. Baseline HBV DNA viral load distribution; b. Baseline HBsAg level distribution; c. HBV DNA viral load after 24 weeks of PegIFN alpha-2b treatment; d. HBsAg level after 24 weeks of PegIFN alpha-2b treatment.
Conclusion: Though the study is not complete, the preliminary data show a good safety and well-tolerance of L47 treatment in combination with Peg-IFN. Importantly, the HBV DNA levels were declined rapidly in a L47 dose-dependent manner, highlighting its therapeutic potential in anti-HBV treatment.

SAT-195
A novel class of orally-available small molecules potently inhibiting hepatitis B and D virus entry
Nuruddin Unchwaniwala1, Heidi Contreras1, Jinghu Carl Li1, Dinara Azimova1, Joseph Tan1, Lida Guo1, Nuruddin Unchwaniwala, Heidi Contreras, Jinghu Carl Li, Dinara Azimova, Joseph Tan, Lida Guo (PHHs) by ELISA. Protein-adjusted HBV EC50s were determined in infected HepG2-NTCP cells and primary human hepatocytes – 233 nM), as well as HDV (EC50 21 nM) and in PHHs (EC50 124 nM). The tested small molecules showed high metabolic stability in rodent LMs (mouse LM CLpred 5–9 ml/min/kg and rat LM CLpred 2–11 ml/min/kg), non-rodent LMs (dog LM 6–8 ml/min/kg and NHP LM 0.6–6 ml/min/kg), and human LMs (CLpred 0.4–1.8 ml/min/kg). Good oral bioavailability was observed in all preclinical species (F = 100% in mice, rats, and NHPs and 76%-100% in dogs) with terminal half-lives of 3.2–3.4 hours in mice, 3.4–5.7 hours in rats, 5–13 hours in dogs, and 7.6–11 hours in NHPs. Conclusion: We have identified a novel class of highly-potent, orally-bioavailable HBV and HDV entry inhibitors with good drug-like properties, potentially compatible with once-daily dosing in human. Lead optimization of this series of compounds is in progress, with a focus on nominating an investigational clinical development candidate for HDV and HBV therapy in 2023.

SAT-196
Cell-mediated immunity analysis to assess the characteristics of immune response to bepivirsen: Examples from the B-Clear study
Jennifer Singh1, Bruno Salaun2, Shihyun You1, Stephen Corson3, Melanie Fai1, Dickens Theodore4, 1GSK, Collegeville, United States; 2GSK, Rixensart, Belgium; 3Phastar, United Kingdom; 4GSK, Research Triangle Park, United States
Email: jennifer.m.singh@gsk.com

Background and aims: Approximately 296 and 12 million patients worldwide are chronically infected with hepatitis B virus (HBV) and hepatitis D virus (HDV), respectively. HDV is a small RNA satellite virus that requires HBV envelope proteins to form its own virions. HDV/HBV co-infection is considered the most severe form of chronic viral hepatitis due to faster liver disease progression. Bulevirtide (BLV), a peptide binding to sodium taurocholate co-transporting polypeptide (NTCP), the entry receptor for HBV and HDV, was conditionally approved in Europe for the treatment of chronic HDV. Although clinical trials demonstrated safety and efficacy, BLV requires inconvenient daily injections. Here we describe the preclinical profiling of a novel class of orally-available small molecules that potently inhibit HBV and HDV entry.

Method: EC50s for extracellular hepatitis B e antigen were measured in infected HepG2-NTCP cells and primary human hepatocytes (PHHS) by ELISA. Protein-adjusted HBV EC50s were determined in infected HepG2-NTCP cells cultured with physiologic concentrations of human serum albumin and alpha acidic glycoprotein. EC50s for extracellular hepatitis B e antigen were measured in infected HepG2-NTCP cells. The impact on NTCP-dependent bile acid uptake and HBV preS-binding competition were determined in HEK293 cells by measuring fluorescence-labeled bile acid uptake and fluorescence-conjugated preS-binding, respectively. Metabolic stability was evaluated in human, non-human primate (NHP), dog, and rodent liver microsomes (LMs). Pharmacokinetic studies were performed in rodents, dogs, and NHPs.

Results: Three structurally-related compounds potently inhibited HBV in HepG2-NTCP cells (EC50 4–12 nM) and in PHHS (EC50 124–233 nM), as well as HDV (EC50 21–28 nM). A reduction of anti-HBV potency (27– to 36-fold) was observed in a functional serum shift assay. The compounds inhibited preS-binding (IC50 22–50 nM) and NTCP-dependent bile acid uptake (NTCP IC50 8–13 nM). The tested small molecules showed high metabolic stability in rodent LMs (mouse LM CLpred 5–9 ml/min/kg and rat LM CLpred 2–11 ml/min/kg), non-rodent LMs (dog LM 6–8 ml/min/kg and NHP LM 0.6–6 ml/min/kg), and human LMs (CLpred 0.4–1.8 ml/min/kg). Good oral bioavailability was observed in all preclinical species (F = 100% in mice, rats, and NHPs and 76%-100% in dogs) with terminal half-lives of 3.2–3.4 hours in mice, 3.4–5.7 hours in rats, 5–13 hours in dogs, and 7.6–11 hours in NHPs. Conclusion: We have identified a novel class of highly-potent, orally-bioavailable HBV and HDV entry inhibitors with good drug-like properties, potentially compatible with once-daily dosing in human. Lead optimization of this series of compounds is in progress, with a focus on nominating an investigational clinical development candidate for HDV and HBV therapy in 2023.
Expression of activation markers was analyzed by flow cytometry and used to quantify frequencies of polypositive CD4 and CD8 HBV-specific T-cells (expressing ≥2 markers including ≥1 cytokine among CD40L, 4-1BB, IFN-γ, TNF-α, IL-2, IL-13 and IL-17).

Results: Here we show individual pt-level example datasets from pts who developed or exhibited core- or polymerase-specific CD4+ or CD8+ T-cells. None of these example pts exhibited surface-specific CD4+ or CD8+ T-cells. Overall, 159 and 224 pts had CD4+ or CD8+ T-cell data available at any timepoint; 42 pts had at least one CD4+ or CD8+ T-cell value above LLOQ (590 polypositive per million cells) at any timepoint; however, the lack of longitudinal data across the whole dataset due to poor sample quality limited comprehensive

Figure: (abstract: SAT-196).
Therapeutic vaccine candidate CLB-3000 (CLB-405 and CLB-505 adjuvanted with Alhydrogel): a Good Laboratory Practice (GLP)-compliant 15-week intramuscular toxicity study in rabbits with a 4-week recovery

Aileen Rubio1, Bharat Dixit2, Laurie Iciek3. 1ClearB Therapeutics, Inc, Executive, Concord, United States; 2ClearB Therapeutics, Inc, Concord, United States; 3ClearB Therapeutics, Inc, Concord, United States
Email: arubio@clearbtherapeutics.com

Background and aims: ClearB Therapeutics is developing a therapeutic vaccine candidate, CLB-3000, designed to drive functional cure of HBV in patients with chronic Hepatitis B (CHB).

Results: All animals survived to the scheduled necropsy. CLB-3000 was well tolerated at doses up to 500 µg antigen (250 µg CLB-405 and 250 µg CLB-505) with no adverse systemic effects noted. CLB-3000-related clinical pathology changes at ≥80 µg included increases in fibrinogen, CRP, and/or creatine kinase, suggestive of an inflammatory response and muscle damage due to injection site reactions. Microscopic changes including granulomas, macrophage infiltrates, and/or mixed cell inflammation at the injection sites generally occurred at a higher incidence and/or severity in animals administered ≥80 µg CLB-3000. These findings are consistent with expected findings in a vaccine study formulated with adjuvant, did not result in clinical impairment, exhibited some degree of reversibility, and are not considered adverse. CLB-3000 was immunogenic, confirming pharmacologic activity in NZW rabbits.

Conclusion: Repeat IM injection of CLB-3000 was well tolerated at doses up to 500 µg antigen (250 µg CLB-405 and 250 µg CLB-505) with no systemic adverse effects. The safety profile of CLB-3000 in NZW rabbits supports further investigation for the treatment of CHB patients.
controlled CHB patients, and was administered with no concerning treatment-related SAEs or safety signal observed.

**SAT-199**  
**Kinetics of hepatitis B core related antigen in patients with compensated HDV cirrhosis treated with bulevirtide monotherapy for 72 weeks: a single-center study**  
Elisabetta Degasperi, Maria Paola Anelli, Dana Sambarino, Floriana Facchetti, Caroline Scholtes, Sara Colonia Uceda Renteria, Alberto Perego, Corinna Orsini, Caroline Charre, Marie-Laure Plissonnier, Ferruccio Ceriotti, Sara Monico, Barbara Testoni, Massimo Levero, Fabien Zoulmi, Pietro Lampertico.  
Foundation IRCCS Ca' Granda Ospedale Maggiore Policlinico, Italy; Institute of Virology, Lyon, France; Institute of Virology, Lyon, France; Hospices Civils de Lyon, France; Foundation IRCCS Ca’ Granda Ospedale Maggiore Policlinico, Italy; Institute of Virology, Lyon, France; Fujirebio Italia Pomezia-Rome, Italy; Hospices Civils de Lyon, France; CRC “A.M. and A. Migliavacca” Center for Liver disease, Departments of Pathophysiology and Transplantation, university of Milan, Milan, Italy.

**Background and aims:** Serum Hepatitis B Core Related Antigen (HBcrAg) has been proposed as a useful biomarker in naïve and treated HBV patients, however its role and kinetics in HBV patients receiving Bulevirtide (BLV) treatment is still unknown.

**Method:** Consecutive HDV cirrhotic patients treated with BLV 2 mg/day monotherapy for 72 weeks were enrolled in a single-centre study. Clinical/virological characteristics were collected at baseline and every 8 weeks. HDV RNA was quantified by Robogene 2.0 (LOD 6 IU/ml), HBcrAg levels were measured using LUMIPULSE® G HBcrAg assay (Fujirebio Europe, LOD 30 U/ml).

**Results:** Overall, 49 HDV patients were enrolled: median age 52 (29–77) years, 59% males, platelets 78 (17–217) x 10^3/mm³, liver stiffness measurement 17.3 (6.4–66.1) kPa, ALT 97 (30–1074) U/L, HBsAg 3.7 (0.8–4.4) LogIU/ml, HDV RNA 5.2 (2.4–6.9) LogIU/ml, HBcAg 4.1 (3.0–5.2) U/ml. At baseline, HBcrAg was detectable (>3 U/ml) in 86% of patients and showed a direct correlation with HBsAg levels (r = 0.33, p = 0.03), while no association with HDV RNA or ALT levels was observed. Following 72 weeks of BLV monotherapy, HDV RNA declined by 2.8 (0.2–5.3) LogIU/ml (p < 0.001 vs. baseline), becoming undetectable in 33% of patients. Virological response (undetectable or at least 2 Log HDV RNA decline vs. baseline) was achieved by 78% of patients, a biochemical response (ALT<40 U/L) was observed in 72% and a combined response (biochemical + virological) in 56%. During BLV treatment, patients testing HBcAg positive declined from 86% to 70%, however the difference was not significant (p = 0.21). In HBcAg positive patients, HBcAg levels significantly declined from 4.1 (3.0–5.2) U/ml at baseline to 3.9 (3.1–4.7) U/ml at week 72 (p = 0.03), while no change in HBsAg levels was observed: from 3.7 (0.8–4.4) to 3.6 (2.5–4.3) LogIU/ml (p = 0.77). In HBcAg positive patients, HBcAg levels at week 72 were associated with biochemical response (OR 5.2, p = 0.03), while week 24 (OR 3.9, p = 0.04) and week 48 HBcAg levels (OR 5.4, p = 0.01) were associated with combined response. Conversely, neither baseline nor on-treatment HBcAg levels correlated with HDV RNA levels or virological response rates.

**Conclusion:** In cirrhotic HDV patients treated with BLV monotherapy for 72 weeks, HBcAg tested positive in most of the patients, being associated with baseline HBsAg levels. During BLV treatment, HBcAg levels significantly declined and were associated with biochemical and combined response rates.

**SAT-200**  
**Modeling-based response-guided therapy with bulevirtide monotherapy for chronic hepatitis D to identify patients for finite treatment duration**  
Sarah Duehren, Louis Shekhtman, Scott Cotler, Stephan Aberle, Thomas Reiberger, Peter Ferenci, Harel Dahari. Loyola University Chicago, Program for Experimental and Theoretical Modeling, Division of Hepatology, Department of Medicine, Stritch School of Medicine, United States; Northeastern University, Network Science Institute, United States; Medical University Vienna, Center of Virology, Austria; Medical University Vienna, Division of Gastroenterology and Hepatology, Department of Medicine III, Austria; Medical University Vienna, Rare Liver Disease (RALID) Center of the European Reference Network for Rare Hepatological Diseases (ERN RARE-LIVER), Austria.

**Background and aims:** Bulevirtide (BLV) is a novel antiviral drug against hepatitis D virus (HDV) that was conditionally approved in Europe in 2020. While it recently was suggested that BLV treatment discontinuation may be considered for patients who achieve long-term HDV RNA suppression (PMID:35514008), a computational approach may help to define the required duration of BLV therapy. Here we analyze HDV RNA kinetics in 7 patients undergoing BLV therapy and examine whether mathematical modeling could potentially be used to predict a finite duration of BLV therapy.

**Method:** Seven chronic HDV-infected patients receiving BLV mono-therapy at two clinics in Vienna were included. HDV RNA was quantified by a sensitive PCR assay throughout treatment. ALT and HBsAg data were frequently collected in 7/7 and 3/7 patients, respectively. A recently developed mathematical model (AASLD 2022: late breaking abstract 5031) accounting for HDV RNA, HBsAg and ALT dynamics during BLV treatment was used to predict the time to reach <1 virus copy in the entire extracellular body fluid (BF).

**Results:** Median pre-treatment HDV RNA, ALT, and HBsAg were 5.0 log IU/ml [interquartile range, IQR 1.7], 44 U/L [IQR 69.5], and 3.1 log IU/ml [IQR 1.0], respectively. Two patients had normal ALT levels at pre-treatment. A delay in HDV RNA decline was seen in 4/7 patients at the beginning of therapy, lasting between 2 and 7 weeks. All 7 patients experienced a rapid phase of HDV decline (median of 0.11 log/week [IQR 0.09]) with a median duration of 14.7 weeks [IQR 13.3] and median magnitude of decline of 2.2 log cp/ml [IQR 0.8]. Thereafter, 2 patients experienced a 2nd slower phase of HDV decline (termed biphasic) of whom only one patient reached HDV undetectable (Fig. 1a). In the remaining 5 patients HDV RNA levels dropped to a subsequent lower viral plateau (termed flat partial response) throughout therapy (Fig. 1b). The two biphasic patients were both young [29 and 30 years old] without cirrhosis, while all flat-partial patients had a median age of 51 [IQR 14] and had cirrhosis. ALT normalized (Female<35 U/L; Male<50 U/L) in all but one (biphasic) patient during therapy. Five patients had normal ALT levels by week 24, and one patient by week 36. In 5/6 of these patients, HDV viral load declined ≥ 2 log from pre-treatment levels before ALT normalization. HBsAg remained at pre-treatment levels. In the mathematical model, the predicted values fit well the measured values (Fig. 1). In the biphasic patient who achieved undetectable HDV RNA levels, the model accurately predicted that a duration of ~100 weeks is required to achieve <1 virus copy in the BF (Fig. 1a).
Background and aims: ASC42 is a novel farnesoid X receptor (FXR) agonist, in combination with PEGylated interferon (PEG-IFN) and entecavir (ETV) in chronic hepatitis B patients with 12-week treatment. Jinlin Hou1, Qianguo Mao2, Jing Yuan3, Guoxin Hu4, Yao Xie5, Handan He6, Jinzi Wu7, Nengfeng Hospital of Southern Medical University, China; 2Xiamen Hospital of Traditional Chinese Medicine, China; 3The third People’s Hospital of Shenzhen, China; 4Peking University Shenzhen hospital, China; 5Beijing Ditan Hospital Capital Medical University, China; 6Ascleis BioScience Co., Ltd., China Email: jlhousmu@163.com

Method: This Phase 2 trial (NCT05107778) was a multi-center, randomized, single-blind, placebo-controlled study conducted in China. Forty-three subjects with CHB were enrolled and randomized into 3 cohorts of 10 mg ASC42 (n = 15), 15 mg ASC42 (n = 14) or matching placebo (n = 14) orally once daily (QD) in combination with ETV (0.5 mg, orally QD) and PEG-IFN-α-2a and ETV, was safe and well-tolerated and showed minimum and mild pruritus (13.3%) in Chinese CHB patients with a 4-fold safety margin and better efficacy biomarker 7-hydroxy-4-cholesten-3-one (C4) inhibition (67%) than obeticholic acid (OCA) at 10–50 mg (40.1–47.3%).

S1171

Figure 1. Representative viral kinetic patterns and mathematical modeling: (a) Biphasic (n=2); (b) Flat Partial Response (n=5). LoD, HDV RNA limit of detection (8 IU/ml).

Conclusion: The developed viral kinetic model provides an initial step toward to guide individualized BLV therapy allowing finite treatment durations in patients with HDV.

SAT-202

Hepatitis B virus core protein variant profiles observed in chronic hepatitis B patients treated with capsid inhibitor AB-836

Christine L. Espiritu1, Nagraj Mani2, Timothy Eley3, Andrzej Ardzinski4, Kim Stever4, Joanne Brown5, Karen Sims5, Gaston Picchio6, Angela M Lam7, Michael J. Sofia8, Emily P. Thi1. 1Arbutus Biopharma, Immunology and Biomarkers Research, Warminster, United States; 2Arbutus Biopharma, Biology, United States; 3Arbutus Biopharma, Clinical Pharmacology, United States; 4Arbutus Biopharma, Clinical Operations, United States; 5Arbutus Biopharma, Clinical Development, United States; 6Arbutus Biopharma, United States

Background and aims: Current treatments for chronic Hepatitis B virus (HBV) infection are limited to nucleos (t)ide analogs (NA) or pegIFNα which have low cure rates and often necessitate life-long treatment. AB-836 is an oral, pan-genotypic, CAM-E (empty) capsid inhibitor that inhibits HBV pre-genomic RNA (pgRNA) encapsidation by binding to HBV core protein and accelerating capsid assembly. In previously described results from the first-in-human clinical study AB-836-001, AB-836 resulted in robust HBV DNA log10 declines of −2.66 (50 mg), −3.04 (100 mg), and −3.55 (200 mg), respectively. Herein we report the prevalence and impact of HBV core protein variants on virologic response to AB-836 treatment. AB-836 is no longer in development.

Method: HBV DNA was extracted from plasma collected from 48 subjects enrolled in AB-836-001 (randomized 10:2 per cohort PBO cohorts, respectively, and most AEs (94.4%) were mild (grade 1) or moderate (grade 2) in severity. One subject in 15 mg ASC42 cohort experienced a grade 3 serious AE (SAE) of liver function injury with a final outcome of recovered. AEs of pruritus were reported in 2 (2/15, 13.3%), 9 (9/14, 64.3%) and 0 (0%) subjects in 10 mg, 15 mg ASC42 and PBO cohorts, respectively. ASC42 exposure measures (Cmax and AUC0-24h) in 10 mg cohort is 4 times lower than those in 15 mg cohort (Cmax: 106 versus 441 [ng/ml]; AUC0-24h: 13.3%), 9 (9/14, 64.3%) and 0 (0%) subjects in 10 mg, 15 mg ASC42 and PBO cohorts, respectively. ASC42 exposure measures (Cmax and AUC0-24h) in 10 mg cohort is 4 times lower than those in 15 mg cohort (Cmax: 106 versus 441 [ng/ml]; AUC0-24h: 13.3%) and 0 (0%) subjects in 10 mg, 15 mg ASC42 and PBO cohorts, respectively. ASC42 exposure measures (Cmax and AUC0-24h) in 10 mg cohort is 4 times lower than those in 15 mg cohort (Cmax: 106 versus 441 [ng/ml]; AUC0-24h: 13.3%). There was no accumulation following multiple doses. No significant changes of HBV specific biomarkers from baseline at end of intervention or follow-up were observed among these 3 cohorts.

Conclusion: As a novel FXR agonist, 10 mg ASC42 in combination of PEG-IFN-α-2a and ETV, was safe and well-tolerated and showed a 4-fold safety margin and better efficacy biomarker 7-hydroxy-4-cholesten-3-one (C4) inhibition (67%) than obeticholic acid (OCA) at 10–50 mg (40.1–47.3%).
AB-836:placebo) who were administered AB-836 at either 50 mg, 100 mg, or 200 mg QD for 28 days. Extracted DNA samples underwent HBV-specific PCR amplification followed by Illumina MiSeq next generation sequencing. HBV core protein variant viral fitness and sensitivity to HBV inhibitors was determined using a cell-based in vitro system where single point mutations were introduced by site-directed-mutagenesis into an HBV replicating plasmid and then transfected into HepG2 cells. **Results:** None of the subjects undergoing AB-836 dosing experienced on-treatment viral rebound. HBV core variants with frequencies of >1% at 31 amino acid sites located in and proximal to the AB-836 binding site were analyzed. No enrichment of core variants was observed between baseline and Day 28 (end of treatment). Higher frequency variants were identified at amino acid sites Y38, 64, 48, 42, 20, 8, and 3, respectively. Testing of an expanded panel of core variants, including Y38F/H, I105V, T109M/I/S, T114I, Y118F, Y132F, and the Y38F+T109S double variant, showed no effect on AB-836 activity. **Conclusion:** No viral breakthrough or enrichment of HBV core protein resistant variants was observed in subjects receiving AB-836 for 28 days. Multiple core protein variants at amino acid positions Y38, I105, T109, T114, and Y118 were observed to occur at higher frequencies, suggesting viral plasticity at these sites.
Conclusion: DAAs could achieve a high SVR rate in BCLC B HCC patients even with active HCC. The novel model can be applied to predict survivals after DAAs therapy.

THU-164
The PNPLA3 genotype is the main driver of weight gain after the hepatitis C cure
Veronika Pitova1, Sona Frankova1, Mikolas Holinka1, Magdalena Neroldova1, Milan Jirsa1, Jan Sperl1.
1Institute for Clinical and Experimental Medicine, Czech Republic
Email: sona.frankova@ikem.cz

Background and aims: The cure of chronic hepatitis C (HCV) is associated with decreased risk of liver-related complications. Body weight gain is currently discussed as a negative consequence of the HCV cure. The aim of the study was to evaluate body weight gain and changes in serum lipid levels, the presence of diabetes mellitus, hypertension and the genotype of PNPLA3, HSD17B13 and IL28B gene in patients treated with direct-acting antiviral (DAA).

Method: We retrospectively evaluated data of 230 patients treated for HCV infection with DAAs who achieved sustained virologic response (127 males, 103 females), with an average age of 52 years. One hundred and seventy-nine (77.8%) were infected with HCV genotype 1, 45 (19.6%) with genotype 3 and 6 with other genotypes (2.6%). Sixty-eight patients (29.6%) had compensated liver cirrhosis. We recorded the body weight, clinical and laboratory data and assessed liver stiffness (LSM) and liver steatosis expressed as the Controlled Attenuation Parameter (CAP) by Fibroscan® before treatment and three years after the cure.

PNPLA3, HSD17B13 and IL28B genotypes were assessed by the TaqMan predesigned SNP genotyping assays using the Applied Biosystems ABI 7300 Real-Time PCR instrument (Thermo Fischer Scientific).

Results: The mean patients’ weight before treatment was 79.9 kg (46-130 kg). Three years after treatment, the mean body weight gain was 3 kg (p < 0.0001). Thirty-five patients (15.2%) gained more than 10% of their initial body weight. The weight gain did not differ between males and females and patients infected with HCV genotypes 1 and 3. The liver stiffness significantly decreased after the treatment, with a mean of 12.1 kPa (range 3.3–73.5 kPa) vs 8.1 kPa (range 1.9–75 kPa), p < 0.0001, but the CAP value did not change significantly (256 dB/m vs 261 dB/m, p = 0.74). There was also an increased proportion of patients with hypertension (68 vs 93, p < 0.03) and hypercholesterolemia (21 vs 48, p = 0.0006), but not with diabetes (24 vs 31, p = 0.39). The patients with newly diagnosed hypertension or hypercholesterolemia did not have a more pronounced weight gain than patients without the aforementioned (p = 0.14 and 0.14, respectively). The frequency of the genotypes was as follows: PNPLA3 CC 136 (59.1%), CG 85 (37.0%) and GG 9 (3.9%) patients, HSD17B13 TT 136 (59.1%), TTA 75 (32.6%) and TATA 19 (8.3%) patients, and IL28B CC 54 (23.5%), CT 132 (57.4%) and TT 44 (19.1%) patients. The weight gain was associated with the PNPLA3 G allele in the allelic model (CC vs CG+GG, + 3 kg vs + 0 kg, respectively, p = 0.0035). Dose-dependent effect of the PNPLA3 G allele on weight gain was apparent between different genotypes (CC + 0 kg, CG + 3 kg, GG + 7 kg). There was no association between HSD17B13 and IL28B genotypes and weight gain.

Conclusion: A significant weight gain is common in patients who achieve DAAs-induced HCV cure. PNPLA3 G allele carriage is a risk factor for weight gain after successful HCV therapy.

THU-165
MAFLD (metabolic associated fatty liver disease) outperforms ultrasonographic steatosis to stratify hepatocellular carcinoma risk in patients with advanced hepatitis C cured with direct antiviral agents
Serena Pelusi1, Cristiana Bianco1, Massimo Colombo2, Giuliana Cologni3, Paolo Del Poggio4, Tiziana Be5, Nicola Pugliese6, Daniele Prati1, Marie Graciella Pigozzi7, Pietro Lampertico1, Roberta D’Ambrosio1, Stefano Fagiuoli8, Luca Valenti1, 1Fondazione IRCCS Ca’ Granda Ospedale Maggiore Policlinico, Milan, Italy; 2San Raffaele Hospital, Milan, Italy; 3Papa Giovanni Hospital, Bergamo, Italy; 4Papa Giovanni Hospital, Zingonia, Italy; 5Legnano Hospital-ASST Milano Ovest, Milan, Italy; 6Humanitas Research Hospital, Milan, Italy; 7Spedali Civili Hospital, Brescia, Italy; 8Azienda Socio Sanitaria Territoriale Papa Giovanni XXIII, Bergamo, Italy
Email: serenapelusi@libero.it

Background and aims: Metabolic dysfunction associated fatty liver disease (MAFLD) has been proposed to identify individuals at risk of liver events irrespectively of the contemporary presence of other liver disease drivers. Aim of this study was to examine the impact of MAFLD in patients cured of chronic hepatitis C (CHC).
Method: We analyzed data from a real-life cohort of 2611 Italian patients cured of CHC with direct antiviral agents and advanced liver fibrosis, without HBV/HIV, transplantation and negative for hepatocellular carcinoma (HCC) history (age 61.4 ± 11.8 years, 63.9% males, median follow-up 34, i.q.r. 24–40 months). Information about ultrasonographic fatty liver disease (FLD) after sustained virological response was available in 1978.

Results: MAFLD affected 58% of patients, diagnosed due to the presence of diabetes (19%), overweight (37%), or multiple metabolic abnormalities (2%). MAFLD was more frequent than and not coincident with FLD (32% MAFLD-only, 23% MAFLD-FLD, 13% FLD-only). MAFLD was associated with higher liver stiffness (p < 0.05), particularly in patients with MAFLD-diabetes and MAFLD-only subgroups, comprising older individuals with more advanced metabolic and liver disease (p < 0.05). At Cox proportional hazard multivariable analysis, MAFLD was associated with increased risk of HCC (HR 1.97, 95% c.i. 1.27–3.04; p = 0.0023). Further classification according to diagnostic criteria improved risk stratification (p < 0.0001), with the highest risk in patients with MAFLD-diabetes. When considering MAFLD together with FLD, patients with MAFLD-only appeared at highest risk since the sustained virological response achievement (p = 0.008), with a later catch-up of those with combined MAFLD-FLD, whereas FLD-only was not associated with HCC (figure 1).

Background and aims: DAA therapy cures most HCV-patients. To reach micro-elimination, the focus has to be on most vulnerable patient groups. With the aim to improve patient care we characterize treatment outcomes and quality of life (QoL) of these patients in a large prospective real world cohort.

Method: The DHC-R is a national multicenter real-world registry including about 18,200 patients. The present analysis is based on 6849 patients with available data as of July 15, 2022 and comprises the following subgroups: active drug use (yes N = 478; no N = 6371), alcohol abuse (yes N = 650; no N = 6199), former/current homelessness (yes N = 81, no N = 6768) and prison experience (yes N = 140; no N = 6709). Data on homelessness and prison experience have been obtained since October 2020. One patient can belong to several subgroups. Baseline characteristics, sustained virological response (SVR) rates, QoL (36-Item Short Form Survey, SF-36) at baseline and 12 to 24 weeks after end of treatment (EOT) as well as safety data were analyzed.

Results: The majority of the patients with active drug use, alcohol abuse, former/current homelessness or prison experience were male (79–84%). Patients from these vulnerable subgroups were significantly younger than patients not belonging to these subgroups (p < 0.05). With 22 and 23%, respectively, significantly more patients with active drug abuse and alcohol abuse suffered from psychiatric disorders than those without drug or alcohol abuse (12 and 11.8%, respectively; p < 0.05). Lost-to-follow-up (LTFU) rates ranged between 31 and 46% in the vulnerable subgroups and where higher after EOT than before EOT. In vulnerable subgroups, Intention-to-treat SVR rates ranged between 61% (active drug abuse) and 67% (alcohol abuse) and was mainly affected by high LTFU rates. In Per-Protocol-Analysis, the SVR rates ranged between 93% (active drug abuse) and 97% (alcohol abuse). According to all SF-36 scales, all vulnerable subgroups benefited significantly from DAA therapy (p < 0.05; Figure 1). Of note, the QoL of patients with former/current homelessness improved the most. Adverse events were documented for 19% (prison experience) to 32% (active drug abuse) of the patients. Serious adverse events occurred in a maximum of 5% in each patient group.

Conclusion: Active drug users, people with alcohol abuse, prison experience and former/current homelessness as most vulnerable patient groups respond well to DAA therapy but still need special attention shown by higher rates of LTFU. Although often living in precarious circumstances all these patients gain quality of life from baseline up to 24 weeks after EOT which is a good argument to make efforts to grant access to DAA therapy for the most vulnerable patient groups.
Background and aims: The prevalence of hepatitis C virus (HCV) in the prison population is high, and diagnosis and treatment of this group is vital to achieving elimination. Universal offering of blood borne virus (BBV) testing was established in all North-East of England (NEE) prisons in March 2016, and data is collected by the prison service. The aim of the study was to review the frequency of HCV among people incarcerated in prison.

Method: Data was collected from three NEE prisons (two male [1 remand, 1 medium sentence], one female). BBV testing offer and screening rates were reviewed for all new inmates between July 2017 and June 2022. HCV antibody (HCV-Ab) and HCV-RNA positivity rates were assessed per quarter. HCV-Ab tests taken within six months of another test were excluded.

Results: There were 39,652 new receptions into prison during the data collection period. 35,906 new receptions (90.6%) were offered BBV testing and 17,068 (47.5%) accepted testing at reception. BBV offer and testing rates over 5 years are shown in Fig. A. Testing rates fell during the COVID-19 pandemic. Despite this, reception testing rate, in June 2022, 77.0% of inmates had had BBV testing in 12 months. 3014 tests (17.7%) were HCV-Ab positive and 1249 (7.3%) were HCV-RNA positive (median 238/year). Over time, there was an increase in HCV-Ab frequency from 14% to 17% (Fig. B). There was also an increase in the number of HCV-Ab positive results during the pandemic, suggesting that BBV testing may have been more targeted in the period. Overall, the HCV-RNA positivity rate as a proportion of the total number screened reduced from 7% to 6% during the study period (Fig. C). HCV-RNA prevalence was higher in the female prison than the male prisons (14% vs. 6%). The HCV-RNA positivity rate in HCV-Ab positive individuals fell from 50% to 34% during the study period (Fig. D).

Conclusion: Overall, prevalence of HCV-Ab positivity has increased in NEE prisons over 5 years, but rates of HCV-RNA positivity are falling suggesting that robust testing and treatment programmes are having a meaningful impact. However, the number of individuals with active hepatitis C in prison remains worryingly high. Further work is needed to increase uptake of testing and treatment in this high-prevalence population.
THU-168
Results of the hepatitis B and C screening within the “Check-Up 35+” in the German primary care setting one year after implementation by the federal joint committee

Olaf Bätz1, David Petroff², Anna Joachim-Richter³, Katrin Jedrysiak¹, Ingrid Wolfram³, Thomas Berg³, Jan Kramer¹, Johannes Wiegand⁴.
¹LADR Laboratory Group Dr Kramer and Colleagues, Germany; ²University of Leipzig, Clinical Trial Center, Germany; ³General Practitioner Paderborn, Germany; ⁴University of Leipzig, Division of Hepatology, Germany
Email: johannes.wiegand@medizin.uni-leipzig.de

Background and aims: The World Health Organization proposed a strategy to eliminate chronic hepatitis C virus (HCV) infection by the year 2030, which was adapted with the BIS2030 program in Germany. One part of this program is adequate screening for hepatitis B virus (HBV) and HCV infection. Therefore, the Federal Joint Committee decided to include a hepatitis B and C screening in the preventive medical examination named “Check-Up 35+,” which is performed in patients of at least 35 years at the primary care level. We investigated the results one year after implementation of the structured screening program.

Method: Analysis of the database of the LADR laboratory group which covers 11 ambulatory health care centers. HBsAg and anti-HCV screenings were identified by the billing categories GOP 01865. The codes GOP 01866 and 01867 were used for HBV-DNA and HCV-RNA (PCR) results in case of positive HBsAg and anti-HCV screening tests.

Results: Between 01 October 2021 and 30 September 2022, 286,192 laboratory requisitions were analyzed (56% females, median (SD) age 61.2 (14.0) years). HBsAg and anti-HCV prevalence were 0.54% and 0.78%, respectively. 73% of HBsAg positive patients were HBV-DNA positive (prevalence of HBV-DNA: 0.39% (total), 0.48% (male), 0.33% (female)), 16% of anti-HCV positive cases were HCV-RNA positive (HCV-RNA prevalence 0.13% (total), 0.15% (male), 0.11% (female)). Age and sex specific prevalences of HBsAg, HBV-DNA, anti-HCV, and HCV-RNA are provided in the figure. The highest HCV-RNA prevalence was observed in young men and was 2.4–3 times higher than in young women.

Conclusion: A structured hepatitis screening program at the primary care level could be successfully established and leads to a large number of tests within the first year of implementation.

<table>
<thead>
<tr>
<th>Age category (years)</th>
<th>HBsAg Male (%)</th>
<th>HBsAg Female (%)</th>
<th>HBV DNA Male (%)</th>
<th>HBV DNA Female (%)</th>
<th>Anti-HCV Male (%)</th>
<th>Anti-HCV Female (%)</th>
<th>HCV-RNA Male (%)</th>
<th>HCV-RNA Female (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>35-44</td>
<td>1.00</td>
<td>0.66</td>
<td>0.86</td>
<td>0.52</td>
<td>1.11</td>
<td>0.58</td>
<td>0.24</td>
<td>0.08</td>
</tr>
<tr>
<td>45-54</td>
<td>0.88</td>
<td>0.55</td>
<td>0.66</td>
<td>0.43</td>
<td>1.19</td>
<td>0.70</td>
<td>0.24</td>
<td>0.10</td>
</tr>
<tr>
<td>55-64</td>
<td>0.61</td>
<td>0.43</td>
<td>0.45</td>
<td>0.30</td>
<td>1.00</td>
<td>0.76</td>
<td>0.14</td>
<td>0.10</td>
</tr>
<tr>
<td>65-74</td>
<td>0.55</td>
<td>0.47</td>
<td>0.36</td>
<td>0.33</td>
<td>0.73</td>
<td>0.67</td>
<td>0.09</td>
<td>0.10</td>
</tr>
<tr>
<td>75-84</td>
<td>0.26</td>
<td>0.32</td>
<td>0.16</td>
<td>0.17</td>
<td>0.53</td>
<td>0.64</td>
<td>0.10</td>
<td>0.11</td>
</tr>
<tr>
<td>&gt;84</td>
<td>0.17</td>
<td>0.21</td>
<td>0.07</td>
<td>0.11</td>
<td>0.46</td>
<td>0.77</td>
<td>0.04</td>
<td>0.21</td>
</tr>
</tbody>
</table>

Figure: (abstract: THU-168): Prevalence of HBsAg, HBV-DNA, anti-HCV, and HCV-RNA.
THU-169
Clinical outcomes after therapy with direct acting antiviral in patients with HCV-related B-cell Non-Hodgkin lymphomas and/or mixed cryoglobulinemia
Marco Tizzani1, Roberta Lasco1, Rosa Claudia Stasio1, Elisabetta Bretto1, Yulia Troshina1,2, Giacomo Scaioli3, Alessia Ciancio1,2, Giorgio Maria Saracco1,2, Fabrizia Pittaluga4, Maria Saracco1,2. 1S.C. Gastroenterology U-A.O.U. Città della Salute e della Scienza, Turin, Italy; 2Department of public health sciences and pediatrics, University of Turin, Italy; 3Department of Medical Sciences, University of Turin, Italy; 4S.C. Microbiology and virology-AOU Città della Salute e della Scienza, Turin, Italy
Email: marco.tizzani91@gmail.com

Background and aims: Extrahepatic manifestations have always been a difficult-to-manage problem, complicating clinical outcome of Hepatitis C virus (HCV)-infected patients. Direct acting antivirals (DAAs) have significantly changed the history of HCV infection, inducing high rates of sustained virologic response (SVR). The aim of this study is to evaluate the outcomes of patients affected by mixed cryoglobulinemia (MC) and/or B-cell Non-Hodgkin Lymphomas (B-NHL) and HCV after eradication with DAAs.

Method: Virological and haematological end points have been analyzed in 151 patients (62 Male/89 Female, mean age 70.4 (± 13.1)) with MC and/or B-NHL treated with DAAs between February 2015 and March 2022 at 3 months (T1), 6 months (T2) and at their most recent hepatologic/haematologic examination (T3) after SVR12. HCV genotype 1a has been found in 8.2% of patients, 1b in 51.4%, 2 in 27.4%, 3 in 9.6%, 4 in 2.7%, 5 in 0.7%. Ninety-five patients were naive, 34 non-responder and 22 relapser to INF-based therapy. Fifty patients were cirrhotic (33.8%). Symptomatic MC (neuropathy, nephropathy, vasculitis) was present in 57 out of 88 (64.7%) patients and in 13 of them MC was associated with a B-NHL, while asymptomatic MC was present in 31 patients (35.2%). Seventy-three patients had B-NHL: diffuse large B-cell (21), marginal zone (13), follicular (9), mantle (1), others were indolent B cell-NHL not otherwise specified.

Results: SVR12 has been obtained in all 151 patients (100%). Preliminary data showed that, among patients with symptomatic MC, 17 (29.8%) at T1, 16 (28%) at T2 and 26 (45%) at T3 had improvement and/or remission from clinical symptoms, with higher rate among vasculitis symptoms. Cryoglobulines resulted undetectable in 10 (11%), 14 (16%) and 38 (43%) patients at T1, T2 and T3 respectively. Five patients (8.7%), instead, had worsening of symptoms at T3. Among patients with B-NHL, 5 patients had disease progression and 2 of them died during follow-up because of haematological complications, 39 (54.9%) had or stayed in complete remission at T2, while the others had partial haematological regression or disease stability.

Conclusion: HCV eradication with DAAs is safe in patients with MCs and/or B-NHL, and it is associated with clinical improvement and haematological response or stability. Data collection is still ongoing in order to evaluate longer term outcomes.

THU-170
Analysis of mortality rate in the patients after hepatitis C virus elimination using direct acting antivirals and comparison with the general population
Satoshi Miuma1, Hisamitsu Miyaaki1, Naota Taura1, Yasuhiyo Nakao1, Masanori Fukushima1, Ryu Sasaki1, Tatsuki Ichikawa2, Kazuhiro Nakao1, 1Nagasaki university hospital, Department of Gastroenterology and Hepatology, Japan; 2Nagasaki Harbor Medical Center, Department of Gastroenterology, Japan
Email: miuma1002@gmail.com

Background and aims: Direct acting antivirals (DAAs) therapy has enabled the achievement of sustained virologic response (SVR) in many patients with chronic hepatitis C and cirrhosis (post-SVR patients). There have been many studies on the outcomes of post-SVR patients treated with interferon (IFN)-based therapy. However, the outcomes of post-SVR patients treated with DAAs therapy may be different, because patients may be intolerant and refractory to IFN-based therapy, such as older patients and those with liver cirrhosis. In this study, we analyzed the mortality rate and cause of death in post-

Figure 1. Evolution of lymphoma after HCV eradication during the follow up.

Figure: (abstract: THU-169).
Impact of direct-acting antiviral therapy on survival in patients with liver cirrhosis and ascites. Data from the hepa-C registry

Álvaro Hidalgo Romero1, Sabela Lens2, Beatriz Mateos Muñoz3, Maria Teresa Ferrer4, Marta Hernandez Conde4, Manuel Rodríguez5, Jose Castellote7, Joaquín Cabezas8, Jordi Llaneras9, José María Moreno Planas11, José Antonio Carrión12, Xavier Torras13, Esther Badia-Aranda14, Esther Molina15, Mercedes Serrano16, Xavier Torras13, Esther Badia-Aranda14, Esther Molina15, Mercedes Serrano16, Juan Turnes17, Paula Fernandez Alvarez18, Manuel Hernández Guerra19, Olga Hernandez1, Pablo Bellot Garcia20, Inmaculada Fernández Vázquez1,2,12 de Octubre University Hospital, Hepatology Unit, Digestive System Department, Madrid, Spain; 2Department of Hepatology, Clinic Hospital Barcelona, Spain; 3Department Digestive System, Ramón y Cajal University Hospital, Madrid, Spain; 4Clinical Management Unit of the Digestive System, Virgen del Rocio University Hospital, Sevilla, Spain; 5Digestive System Department, Puerta de Hierro University Hospital, Madrid, Spain; 6Hepatology Unit, Digestive System Department, Asturias Central University Hospital, Spain; 7Bellvitge University Hospital, Barcelona, Spain; 8Instituto de Investigación Sanitaria de la Vall d’Hebron, Barcelona, Spain; 9Hepatology Unit, Vall d’Hebron Hospital, Barcelona, Spain; 10Hepatology Unit, Digestive System Department, Gregorio Marañón University Hospital, Madrid, Spain; 11Digestive System Department, Albacete University Hospital Complex, Spain; 12Digestive System Department, Del Mar Hospital, Barcelona, Spain; 13Department of Digestive System, Sant Pau University Hospital, Barcelona, Spain; 14Digestive System Department, Burgos University Hospital, Spain; 15Digestive System Department, Santiago de Compostela University Hospital, Spain; 16Department of Digestive System, Hospital of Valme, Sevilla, Spain; 17Digestive System Department, Pontevedra University Hospital Complex, Spain; 18Digestive System Department, Virgen de la Macarena University Hospital Complex, Spain; 19Digestive System Department, Canarias University Hospital, Spain; 20Digestive System Department, Alicante General University Hospital, Spain

Email: alvarohr90@gmail.com

Background and aims: Direct-acting antivirals (DAAs) have changed the natural history of hepatitis C patients with compensated HCV cirrhosis. However, we do not know the long-term impact on liver function and survival in patients with decompensated cirrhosis. Our aim was to evaluate the long-term benefits of DAAs in patients with cirrhosis and ascites.

Method: Observational, multicentre and retrospective study including patients with HCV cirrhosis and ascites, prior or concurrent to treatment with DAAs, who started therapy between 2014-November 2018. We assessed liver function parameters, survival and need for transplantation at 5 years of follow-up. STATA software was used for the analysis, with Cox regression for categorical variables and survival analysis using Kaplan-Meier and log-rank test.

Results: 289 patients were included, 274 (94.8%) with a history of ascites and 132 (45.7%) with ascites at baseline. Mean age was 56 years (50–66), 64% male. Liver function: 144 (49%) Child A and 128 (44%) Child B, mean MELD 11.8 (9–14). Overall survival at 5 years was 77.8%, with negative predictive factors being hypoalbuminaemia (p: 0.048) and advanced age (p: 0.001). Overall, 43 patients (15%) received a liver transplant. The 5-year transplant-free survival was 84.8%, with hyperbilirubinaemia (p: 0.000), MELD (p: 0.006) and Child-Pugh classification (p: 0.000) being negative predictors. There was a long-term reduction of 2 points in Child (p < 0.001), with improvement in bilirubin (p < 0.001) and albumin (p < 0.001).

Conclusion: Treatment with DAA improves long-term liver function parameters even in patients with ascites, making survival at 5-year follow-up of these patients high compared to that expected based on the natural history of hepatitis C without treatment.
HCV elimination: reengagement of previously diagnosed but unlinked patients with chronic hepatitis C to initiate treatment

Maria Guerra Veloz, Kate Childs, Teresa Bowyer, Kathryn Oakes, Esra Derin, Claire Mannion, Mary D Cannon, Geoffrey Dusheiko, Kosh Agarwal. 1King’s College Hospital, Institute of Liver Studies, London, United Kingdom; 2King’s College Hospital, Sexual Health and HIV, United Kingdom

Background and aims: Hepatitis C elimination requires multiple complex approaches in groups with high-risk factors. Identifying patients with known chronic hepatitis C virus (HCV) infection who have not engaged with the health care system and not been successfully cured has proved to be an effective strategy in many different countries. The aim of this project was to identify viraemic HCV-infected patients who have been lost in the HCV test and treat care cascade in South-East London, and link them to care.

Method: All laboratory-positive HCV RNA tests from 2010 to 2020, (but with undocumented SVR status in either the National Hepatitis C registry or the local Kings College Hospital viral hepatitis laboratory data) were included. In the first phase, each HCV RNA test result was linked with national primary care medical records or with the relevant local London hospital record in order to identify whether or not the HCV care cascade was completed. In the second phase, subjects who remained without known SVR status were contacted by telephone a maximum of 5 times on different days/months (with voicemails being left) before being sent an appointment reminder by post when contact by telephone was unsuccessful. Subjects were referred to a one-stop clinic at King’s, their local viral hepatitis team, or their local outreach service, according to the subject’s preference and address.

Results: 1,254 HCV RNA-positive tests (from viremic patients) with unknown SVR status were included. After reviewing their medical records, 446 subject had not completed the HCV care cascade, and so were eligible for recall. 192/446 individuals were located and 86% (166/192) accepted relevant information and were linked with medical care. 108/166 (65%) initiated direct acting antiviral treatment; 96/108 (89%) completed treatment and 40/96 (42%) attended a post treatment appointment to confirm a SVR. At the end of the project SVR was achieved in 24% (26/108) of those who initiated treatment (Figure 1).

Conclusion: This simple administrative exercise identified 1,254 HCV viraemic patients and used staff resources already present within the team. Large-scale testing projects are logistically challenging but seldom identify more than a small number of viraemic patients whereas our project proved to be more effective as it identified over 30% of viraemic patients who were previously tested but not linked with treatment. Initiation and treatment completion were high in this project however, there is still a high proportion of non-attendance to confirm HCV cure. This could mean that the treatment initiation rate could be a sensible goal in populations who it is difficult to engage with the system.

Acknowledgements: The authors want to thank the multidisciplinary team involved in this project especially the administrative team, data manager and viral clinical nurse specialists at Kings College Hospital for all of their assistance and efforts to enable the project to be concluded in an efficient manner.
HCV screening rates in reproductive age women after universal screening guidelines

Roshni Singh1, Breanne Biondi2, Rachel Epstein3,4, Benjamin Linas4.
1Boston Medical Center, Department of Medicine, United States; 2Boston University School of Public Health, Department of Health Law, Policy and Management, United States; 3Boston University School Chobanian and Avedisian of Medicine, Department of Pediatrics, Section of Infectious Disease, United States; 4Boston University School Chobanian and Avedisian of Medicine, Department of Medicine, Section of Infectious Disease, United States

Email: roshni.singh@bmc.org

Background and aims: In 2020, the US Preventative Services Task Force (USPSTF) and the US Centers for Disease Control and Prevention (CDC) recommended screening all asymptomatic adults, including pregnant persons, for hepatitis C virus (HCV) at least once in their lifetime (by CDC guidelines, only if local HCV prevalence is ≥0.1% and also during each pregnancy). Yet few studies describe changes in HCV screening since these recommendations, which occurred at the onset of the COVID-19 pandemic. This study aims to compare HCV screening occurring in women with and without a recent pregnancy, before and after the 2020 CDC/USPSTF guidelines.

Method: Using TriNetX, a national electronic medical records database, we calculated HCV screening rates from 2014 to 2022 in 6-month intervals for females of reproductive age (15–44 years old) with and without an encounter for a delivery (ICD10 codes O80-O82) over the study. We counted one HCV antibody test per women, and censored follow-up at the time of the first HCV screening. We compared the change in HCV screening rates between the two groups before and after the universal screening guidelines using a difference-in-differences model with a 6-month washout period (January-June 2020) to account for the onset of the COVID-19 pandemic and publication and dissemination of the revised guidelines. We used year fixed effects and robust standard errors.

Results: Of 17,799,141 females 15–44 years old with a visit at a TriNetX US Collaborative Network health care organization between 2014 and 2022, 704,929 had an encounter for a delivery during that period. The HCV screening rate increased for all women over the study period, but more steeply for those with a recent delivery: from 7.3 screens/1000 person years (PY) in 2014 to 126 screens/1000 PY in 2022 for women without a delivery and from 22.7 to 237 screens/1000 PY for women with a delivery. After the 2020 guidelines, women with a delivery had a 59% increase in HCV screening rate compared to those without a delivery (95% CI 31–88%, p < 0.001; Figure).

Conclusion: Despite interruptions of the COVID-19 pandemic, HCV testing has increased among reproductive age women since the 2020 CDC/USPSTF universal screening recommendations, with a significantly higher increase among women experiencing a recent delivery. These data highlight that pregnancy is a valuable time to capture individuals for healthcare interventions and suggest that perinatal care could be a key venue to test and treat to achieve national HCV elimination goals.

THU-174
The impact of HCV cure on glycemic indices in patients using glecaprevir/pibrentasvir from nationwide Taiwan HCV registry


1Hepatobiliary Division, Department of Internal Medicine and Hepatits Center, Kaohsiung Medical University Hospital, Kaohsiung Medical University, Kaohsiung, Taiwan; 2Division of Gastroenterology and Hepatology, Department of Internal Medicine, Chi Mei Medical Center, Tainan, Taiwan; 3Division of Hepatogastroenterology, Department of Internal Medicine, Chia Yi Chang Gung Memorial Hospital and College of Medicine, Chang Gung University, Taoyuan, Taiwan; 4Division of Gastroenterology, Department of Internal Medicine, St. Martin De Porres Hospital, Chiayi, Taiwan; 5Division of Gastroenterology, Kaohsiung Armed Forces General Hospital, Kaohsiung, Taiwan; 6Division of Gastroenterology and Gastroenterology, Department of Internal Medicine, Shin Kong Wu Ho-Su Memorial Hospital, Taipei, Taiwan; 7School of Medicine, Fu-Jen Catholic University, New Taipei City, Taiwan; 8Division of Gastroenterology and Hepatology, Department of Internal Medicine, National Cheng Kung University Hospital, College of Medicine, National Cheng Kung University, Tainan, Taiwan; 9Department of Internal Medicine, Kaohsiung Municipal
Background and aims: Hepatitis C virus (HCV) infection impairs insulin signalling and increases the risk of type 2 diabetes mellitus (T2DM). Several studies have shown that the benefits of HCV cure using direct-acting antivirals (DAAs) might improve glycemic indices in chronic hepatitis C (CHC) patients. To further validate the data in the real-world setting, this study aimed to measure the effect of HCV cure by glecaprevir/pibrentasvir (G/P) on glucose parameters in diabetes and non-diabetes patients between baseline and at the time of assessment of sustained virological response at 12 weeks (SVR12) after end of treatment in TASL HCV Registry (TACR).

Method: The TACR is an ongoing nationwide registry program organized and supervised by Taiwan Association for the Study of the Liver (TASL), which aims to setup a database and biobank of patients with CHC in Taiwan. Data was analyzed as of 30 September 2022 for CHC patients treated with G/P. The definition of diabetes are patients documented with diabetes and treated with oral hypoglycemic agents and/or insulin or fulfilled the criteria of fasting plasma glucose (FPG) ≥126 (mg/dl) or glycosylated hemoglobin A1C (HbA1c) >6.5%. In this analysis, the laboratory changes for diabetes and non-diabetes patients between baseline and at SVR12 are presented.

Results: Of the 7,520 patients achieving SVR with G/P, 1,171 were diabetes patients and 6,349 were non-diabetes patients. Overall, the HbA1c (N = 1,473, 6.0 ± 1.3 vs 5.9 ± 1.0, p <0.001) demonstrated a significant decrease at SVR12 compared to their baseline level. However, the FPG (N = 1,375, 112.0 ± 39.6 vs 112.2 ± 40.3, p = 0.461) did not show the significance. For diabetes patients, the HbA1c (N = 582, 7.4 ± 1.7 vs 7.0 ± 1.3, p <0.001) and FPG (N = 513, 148.7 ± 66.7 mg/dl vs 141.0 ± 59.0 mg/dl, p = 0.017) at SVR12 decreased significantly compared to their baseline level. For non-diabetes patients, the HbA1c (N = 1,806, 5.6 ± 0.7% vs 5.5 ± 0.5%, p = 0.005) at SVR12 showed a significant improvement compared to their baseline level. However, the FPG did not change significantly (N = 1,713, 100.1

Figure: (abstract: THU-174): Changes in glycemic parameters FPG, HbA1c at baseline (BL) and post-treatment follow-up at week 12 (PTW12) in all SVR, SVR-DM and SVR-nonDM patients using G/P.

Journal of Hepatology 2023 vol. 78(S1) | S100–S1212

S1181
THU-175
Predicting vertical transmission of hepatitis C in pregnant women using a composite score: a multicenter study
Paul Wasuwanich1, Joshua So1, Brett Pressnell2, Robert Egerman3, Tony Wen4, Wikrom Karnsakul1. 1University of Florida College of Medicine, Gainesville, United States; 2University of Florida, Department of Statistics, Gainesville, United States; 3University of Florida College of Medicine, Gainesville, United States; 4University of Florida College of Medicine, Division of Pediatric Gastroenterology, Hepatology, and Nutrition, Department of Pediatrics, Baltimore, United States
Email: p.wasuwanich@ufl.edu

Background and aims: Prevention of vertical transmission of hepatitis C virus (HCV) presents an obstetric challenge. We aimed to create a composite score to accurately isolate a population of pregnant women with HCV who will have a high rate of vertical transmission.

Method: In a retrospective, multicenter, cohort study, we identified pregnant women with hepatitis C with linked data to their infants who have had HCV RNA or HCV antibody testing. Demographic data including age and race/ethnicity as well as clinical and laboratory data including tobacco/alcohol history, infection history, liver function tests, HCV RNA titer, HCV genotype, absolute lymphocyte count, and platelet count were collected. Data were analyzed by logistic regression and receiver operating characteristic (ROC).

Results: We identified 157 pregnant women and 163 corresponding infants. The median maternal delivery age was 29 (IQR: 25–33) years, and the majority (141, or 89.8%) were White. Higher HCV RNA titer (OR = 5.18; 95% CI = 1.95–17.00; p < 0.001), higher absolute lymphocyte count (OR = 3.74; 95% CI = 1.24–12.70; p = 0.020), and higher platelet count (OR = 2.42; 95% CI = 1.07–5.70; p = 0.034) were associated with vertical transmission. Alcohol or tobacco use during pregnancy, diabetes, high BMI, vaginal bleeding, placental previa, history of abnormal pap smear, history of chlamydia/gonorrhea infection, previous cesarean section, ABO blood type, Rh type, white blood cell count, absolute monocyte count, albumin, alanine aminotransferase, aspartate aminotransferase, alkaline phosphatase, total bilirubin, direct bilirubin, HCV genotype, hepatitis B virus infection, HIV infection, and herpes simplex infection were not associated with HCV vertical transmission (p > 0.05). A composite score combining the three significant risk factors had an AUROC of 0.902 (95% CI = 0.840–0.964), superior to any of the three risk factors individually. The sensitivity, specificity, and positive predictive value, and negative predictive value were 100.0%, 85.24%, and 40.9%, and 100.0% respectively.

Conclusion: A composite score combining risk factors HCV vertical transmission can isolate a population of pregnant women where the rate of vertical transmission is high, allowing for potential interventions during antepartum or intrapartum care. The risk-benefit analysis of using antiviral treatment during pregnancy could be determined in selective group of pregnant women with higher probabilities of transmitting HCV to the fetus. Further investigation with larger cohort will be needed to refine the composite score and validate its components.

THU-176
Achieving hepatitis C micro-eliminating in 4 female prisons through a nurse led test and treat approach of pathway optimisation and whole prison testing
Nichola Royal1, Arran Ludlow-Rhodes3, Julie Henderson1, Rob Cheetham1, Julia Sheehan1, Andrew Milner3, Louise Missen1, Andrew Jones3. 1Practice Plus Group, Health In Justice, Reading, United Kingdom; 2Hepatitis C Trust, London, United Kingdom; 3Gilead Sciences Ltd, Medical, London, United Kingdom
Email: andy.jones@gilead.com

Background and aims: Drug dependence among incarcerated women has been found to be higher than men which correlates to the higher HCV prevalence observed in female prisons. Women only represent approximately 5% of the prison population in England and Wales but research shows they typically enter prison with more acute mental health and substance misuse profiles requiring services to be adapted to their needs. Prisons are an important setting for National Health Service England’s plans to eliminate Hepatitis C (HCV) in England by 2025, both in terms of diagnosis and treatment and in understanding prevalence.

Method: In May 2019, a partnership between Gilead Sciences, Practice Plus Group (PPG) and the Hepatitis C Trust (HCT) was formed with the aim of eliminating HCV by 2024 in PPG prisons. This partnership included 4 female prisons where the healthcare was provided by PPG. Regional BBV Lead Nurses, Gilead Medical Scientists and HCT peers worked with prison and HCV stakeholders to optimise test and treat pathways for new prison admissions. HCT peers engaged with staff and residents with the aim of raising awareness and reducing stigma. In the first quarter of 2020, whole prison HCV Intensive Test and Treat events (HITTs) were run in all 4 prisons to ensure testing of residents who were incarcerated before these optimisations were implemented.

Results: In January 2019, 24% of women were screened for HCV within the first 7 days of admission compared to 91% in December 2022, a 279% increase. HITTs were run in February and March of 2020 where 1,096 (98.3%) of the total 1,115 population were tested, with 37 residents being diagnosed as HCV RNA+ and 34 being initiated on DAA therapy. In the final 3 months of 2022, the network of prisons achieved the micro-elimination target of ≥95% of residents having been tested in the previous 12 months and ≥90% of diagnosed patients having been initiated on treatment with results being 95% and 97% respectively.

RNA prevalence observed in new prison admissions has reduced from 9.1% in quarter 1 of 2019 to 3.5% in quarter 2 of 2022 (figure 1), a 62% reduction despite antibody rates increasing from 12.6% to 14.6 from 9.1% in quarter 1 of 2019 to 3.5% in quarter 2 of 2022 (figure 1), a 62% reduction despite antibody rates increasing from 12.6% to 14.6 from 9.1% in quarter 1 of 2019 to 3.5% in quarter 2 of 2022 (figure 1), a 62% reduction despite antibody rates increasing from 12.6% to 14.6 from 9.1% in quarter 1 of 2019 to 3.5% in quarter 2 of 2022 (figure 1), a 62%

Conclusion: Test and treatment optimisation in combination with whole prisons testing has demonstrated that it is feasible to effectively micro-eliminate HCV in this high-risk population. The
62% reduction in HCV RNA prevalence also demonstrates the effectiveness of England’s elimination strategy of optimising HCV services such as those in drug treatment services and prisons.

**THU-177**

**Post-treatment liver function, but not baseline liver function, predicts survival in hepatitis C virus patients with decompensated cirrhosis after direct-acting antiviral treatment**

Yuki Tahata1, Hayato Hikita1, Satoshi Mochida2, Nobuyuki Enomoto3, Akio Ido4, Hidekatsu Kuroda4, Daiki Miki5, Masayuki Kurosaki6, Yoichi Hisaia2, Ryotaro Sakamori1, Norifumi Kawada5, Taro Yamashita10, Goki Suda11, Hiroshi Yatsuhashi12, Hitoshi Yoshiji13, Naoya Kato14, Taro Takami15, Kazuhiko Nakao16, Kentaro Matsuura17, Yasuhiro Ashahina18, Yoshihito Itoh19, Ryousesuke Tateishi20, Yasunari Nakamoto21, Eiji Kakazu22, Shuji Terai23, Masahito Shimizu24, Yoshiyuki Ueno25, Norio Akuta26, Takahiro Kodama1, Tomohide Tatsumi1, Tomomi Yamada27, Tetsuo Takekara1, 1Osaka University Graduate School of Medicine, Japan; 2Saitama Medical University, Japan; 3University of Yamanashi, Japan; 4Kagoshima University Graduate School of Medicine, Japan; 5Iwate Medical University, Japan; 6Hiroshima University, Japan; 7Musashino Red Cross Hospital, Japan; 8Ehime University Graduate School of Medicine, Japan; 9Osaka Metropolitan University, Japan; 10Kanazawa University, Japan; 11Hokkaido University, Japan; 12National Hospital Organization Nagasaki Medical Center, Japan; 13Nara Medical University, Japan; 14Chiba University Graduate School of Medicine, Japan; 15Yamaguchi University Graduate School of Medicine, Japan; 16Nagasaki University Hospital, Japan; 17Nagoya City University Graduate School of Medical Sciences, Japan; 18Tokyo Medical and Dental University, Japan; 19Kyoto Prefectural University of Medicine, Japan; 20The University of Tokyo, Japan; 21University of Fukui, Japan; 22National Center for Global Health and Medicine, Japan; 23Niigata University, Japan; 24Gifu University Graduate School of Medicine, Japan; 25Yamagata University Faculty of Medicine, Japan; 26Toranomon Hospital, Japan; 27Osaka University Hospital, Japan

Email: yuki.tahata@gh.med.osaka-u.ac.jp

**Background and aims:** Direct-acting antiviral (DAA) treatment has enabled SVR rates of around 90% in patients with hepatitis C virus (HCV)-related decompensated cirrhosis. However, the factors associated with survival after DAA treatment in patients with decompensated cirrhosis are unclear.

**Method:** A total of 206 patients with HCV-related decompensated cirrhosis who started DAA treatment between February 2019 and December 2021 at 31 Japanese hospitals was enrolled. Decompensated cirrhosis was defined as Child-Pugh (CP) class B or C or CP class A with previous decompensating events. SVR was defined as undetectable serum HCV-RNA at 12 or 24 weeks after the end of treatment (EOT). We examined the factors associated with liver transplantation (LT)-free survival after DAA treatment in patients with decompensated cirrhosis.

**Results:** The median age was 68, and 52% of patients were male. The distribution of patients with CP class A, B and C was 10% (20/206), 76% (156/206) and 15% (30/206), respectively. In ITT analysis, the SVR rate was 91.3% (188/206). Six patients had a virological relapse, one had non-response, five died and six were missing. During the median observation period of 28.1 months, 26 patients died (the most common cause of death was liver failure), and two patients underwent LT. LT-free survival rates at 2 and 3 years were 90.0% and 83.2%. Next, we examined the factors associated with LT-free survival by Cox proportional hazard analyses excluding five patients who died by 12 weeks after the EOT to evaluate the impact of post-treatment liver function on LT-free survival. In these analyses, we used 2 models, including either CP class (Model 1) or MELD score (Model 2). In multivariate analysis, serum alanine aminotransferase level ($p = 0.046$), serum creatinine level ($p = 0.003$) and CP class at 12 weeks after the EOT ($p = 0.001$) in Model 1, the presence of hepatic encephalopathy ($p = 0.014$) and MELD score at 12 weeks after the EOT ($p = 0.007$) in Model 2 were identified as significant factors. In these analyses, baseline CP class and MELD score were not significant factors. LT-free survival rates at 3 years were 91.0%, 86.4% and 51.8% in patients with CP class A ($n = 76$), CP class B ($n = 97$) and CP class C ($n = 18$) at 12 weeks after the EOT, respectively. The LT-free survival rates of patients with CP class C at 12 weeks after the EOT were significantly lower than the other two groups. On the other hand, the LT-free survival rate of patients with CP class C at baseline was not significantly lower than the other two groups, whether analyzed with or without the patients who died before 12 weeks after the EOT.

**Conclusion:** In patients with decompensated cirrhosis treated with DAA, post-treatment liver function but not baseline liver function were predictors for survival.
THU-178
Network transmission of hepatitis C genotype 2c and 4d in men who have sex with men in Cape Town, South Africa
Mark Sonderup1, Ziyaad Valley-Omar2, Heidi Smuts2, Stephen Korsman2, Diana Hardie2, Wendy Spearman1. 1University of Cape Town Faculty of Health Sciences, Division of Hepatology, Cape Town, South Africa; 2University of Cape Town Faculty of Health Sciences and NHLS, Division of Medical Virology, Cape Town, South Africa
Email: msonderup@samedical.co.za

Background and aims: Men who have sex with men (MSM) are at risk for sexual transmission of hepatitis C virus (HCV). Concomitant HIV infection enhances this risk. Network HCV transmission has been reported in Europe, Canada and more recently, Mexico. South Africa is an HCV pan-genotypic region, with genotype (GT) 1 and 5 dominant, followed by GT, 3, 4 and 2, though GT 2c and 4d are infrequent subtypes. We observed a pattern of mostly MSM with HCV 2c or 4d subtype infection presenting for HCV care and investigated for possible HCV network transmission.

Method: All clinical and demographic data of those with the 2 HCV subtypes, and self-identified as MSM, were captured. HCV genotype was determined by sequencing the NS5B gene. Nested NS5B amplification was performed using pan-genotypic primers and sequenced directly with the BigDye terminator cycle. Genotype assignment used the geno2pheno algorithm and aligned with reference sequences from the GenBank database using BioEdit version 7.2.5. Phylogenetic trees were constructed in MEGA 6.06 using the maximum-likelihood algorithm with 1000 bootstrap resamplings to evaluate phylogenetic relatedness within HCV 2c and HCV 4d clusters.

Results: 30 patients, n = 16 GT 2c and n = 14 GT 4d, were evaluated. Median overall age was 50 years [IQR 41–54], with no significant difference in age between GT 2c (52 years) and 4d (47 years) patients, p = 0.08. 73% (n = 22) were HIV infected, with 3% (n = 3) previously or currently having used injecting drugs. All noted casual sex partners and 43% (n = 13) confirmed recreational, non-injecting drug use during sex. Overall, median baseline HCV viral load was 6.2 [IQR 5.4–6.6] log_{10} IU/ml; baseline ALT was 71 U/L [IQR 60–153]; 50% had F1, 44% F2 and 6% F3 fibrosis. All HIV positive patients were virally suppressed and 90% (n = 27) have completed HCV treatment: 38% (n = 10 with SOF/Daclatasvir), 33% (n = 5 with SOF/Ribavirin); 19% (n = 9 with SOF/Ledipasvir) and 10% (n = 3 with SOF/Velpatasvir), with a 100% SVR rate. Maximum-likelihood trees (fig. 1) support the phylogenetic relatedness within the GT 2c and 4d clusters.

Conclusion: Demonstrated for the first time in South Africa, phylogenetic analysis strongly suggests a network transmission of 2 HCV GT subtypes in MSM in Cape Town. This data emphasizes the need for an important policy focus in the local viral hepatitis strategy for a micro-elimination, targeted education, prevention, and treatment program within this key population. Treatment outcomes to date are excellent.

THU-179
Direct-acting antivirals reduce disease burden in patients with chronic hepatitis C: a Korean nationwide, multicentre, retrospective cohort study
Won Sohn1, Sang Hoon Ahn2, Young Seok Kim3, Seung Up Kim2. 1Kangbuk Samsung Hospital, Sungkyunkwan University School of Medicine, Korea, Rep. of South; 2Severance Hospital, Yonsei University College of Medicine, Korea, Rep. of South; 3Soonchunhyang University, Bucheon Hospital, Korea, Rep. of South
Email: ksukorea@yuhs.ac

Background and aims: Direct-acting antivirals (DAAs) improve the prognosis of patients with chronic hepatitis C (CHC). This study investigated whether DAA treatment improves the disease burden by ameliorating the fibrotic burden in CHC patients.

Method: A nationwide, multicentre, retrospective cohort study was conducted that included patients with CHC recruited from 29 tertiary academic institutes in South Korea. The primary outcome was disease burden, assessed using the measure disability-adjusted life years (DALYs), with age weighting and discounting in untreated and DAA-
treated groups. Improvement of fibrotic burden after DAA treatment was assessed using the APRI score and FIB-4 index. The clinical outcomes were hepatocellular carcinoma, liver transplantation, decompensation, or death.

**Results:** Between January 2007 and December 2022, data from 11,726 patients with CHC, including 8,464 (72%) treated with DAAs, were analysed. During the follow-up period (median 27.5 months), 469 patients died (353 [10.8%] in the untreated group, 116 [1.4%] in the DAA-treated group), 586 developed hepatocellular carcinoma (343 [10.5%] in the untreated group, 243 [2.9%] in the DAA-treated group), 580 developed decompensation (372 [11.4%] in the untreated group, 208 [2.5%] in the DAA-treated group), and 18 underwent liver transplantation (8 [0.2%] in the untreated group, 10 [0.1%] in the DAA-treated group). The multivariable analyses showed that DAA-treated group significantly reduced mortality, HCC risk, and decompensation development compared to the untreated group (hazard ratio [HR] = 0.22, 95% confidence interval [CI] 0.17–0.27; HR = 0.47, 95% CI 0.39–0.58; and HR = 0.31, 95% CI 0.26–0.37, respectively) (all p < 0.001). The APRI-based DALY estimate was significantly lower in the DAA-treated group than in the untreated group (mean 5.0 ± 2.9 vs. 5.9 ± 3.8 years, p < 0.001), as was the FIB-4-based DAL estimate (mean 5.7 ± 2.7 vs. 6.3 ± 3.5 years, p < 0.001). The difference between the two groups with respect to either the APRI- or FIB-4-based DALYs was highest in patients 40–60 years of age.

**Conclusion:** DAA treatment significantly improved the clinical outcomes of CHC patients and reduced the disease burden, by improving the fibrotic burden after DAA treatment.

**THU-180**

**Hepatitis C micro-elimination program in Zhuhai: a concerted citywide effort to eliminate hepatitis C by 2030**

Jinyu Xia1, Zhongsi Hong1, Xinchun Zheng1, Xiaoyan Ye1, Mengdang Ou1, Ying Li1.

1The Fifth Affiliated Hospital of Sun Yat-Sen University, China

Email: xiajinyu@mail.sysu.edu.cn

**Background and aims:** To support the World Health Organization’s goal of eliminating hepatitis C by 2030, we established a collaborative model called “Lucky Star Program” (LSP) in Zhuhai, Guangdong Province in China and evaluated its effectiveness in screening, treatment and follow-up for HCV infection.

**Method:** Under the leadership of the Zhuhai Infectious Disease Medical Quality Control Center (ZMQCC), we provide an import platform in bridging the gap between the government, different-level hospitals and communities, a homogeneous mode of Hepatitis C micro-elimination–LSP. ZMQCC is responsible for training and patient network management. Designated hospitals and community hospitals are responsible for HCV antibody (HCV-Ab) screening and activate cascade referral system when necessary. Patients with HCV-Ab positive are referred to a designated hospital for HCV RNA testing, where the positive patients receive standard treatment. We have dedicated staff to supervise and use unique referral QR codes citywide to make the process uniform and minimize patient attrition. Meanwhile, KPI evaluation will be conducted for hepatitis C management in designated hospitals to facilitate the implementation of the program.

**Results:** LSP kicked off in May 2021. 96,035 in-patients before LSP (from December 2019 to May 2021) and 39,502 in-patients after LSP (from May 2022 to December 2022) were screened in the Fifth Affiliated Hospital of Sun Yat-Sen University. The seropositive rate of HCV-Ab was 0.43% (410/96,035) before LSP and 0.70% (275/39,502) after LSP, the HCV RNA positive rate were 50% (122/244) before LSP and 86.3% (226/262) after LSP in hospital population. The treatment rate of patients with HCV RNA positive increased from 32.0% (39/122) to 88.1% (199/226) since set up dedicated staff to supervise the whole process. During 2022, 1,175 patients with HIV infection, 36 patients from methadone clinic and 1,571 people from community were screened, the seropositive rate of HCV-Ab were 2.64% (31/1,175), 94.4% (34/36) and 1.02% (16/1,571), the HCV RNA positive rate were 100% (31/31), 52.9% (18/34) and 62.5% (10/16), the DAA treatment rate were 93.5% (29/31), 55.6% (10/18), 80% (8/10) in the HIV-infected, methadone clinic and community population, respectively. SVR12 was greater than 97.0% in all patients with SOF/VEL.

**Conclusion:** Zhuhai’s LSP has already achieved its initial objectives. The successful experience of the pilot hospital should be extended to other designated hospitals citywide. It could improve treatment rates for CHC through focusing on key populations and enhancing follow-up both in the hospitals and in the community.

**Figure:** (abstract: THU-180).
Real-world data on long-term quality of life after Glecaprevir/Pibrentasvir therapy: data from the German hepatitis C registry (DHC-R)

Markus Cornberg1, Albrecht Stoehr2, Dennis Hidde3, Gerd Klausen4, Willibald Schütelholz2, Lutz Thomas5, Manfred Nowak2, Michelle Collins8, Karl-Georg Simon9. 1Hannover Medical School, Department of Gastroenterology, Hepatology and Endocrinology, Hannover, Germany; 2IFI Medizin GmbH, Hamburg, Germany; 3AbbVie Germany GmbH and Co, Wiesbaden, Germany; 4Schwerpunktpraxis für Infektionsmedizin am Oranienburger Tor, Berlin, Germany; 5Gastroenterologische Schwerpunktpraxis, Augsburg, Germany; 6Infektiologikum, Frankfurt am Main, Germany; 7Therapieverband Ludwigsmühl, Schwerpunktpraxis, Landau in der Pfalz, Germany; 8AbbVie Inc, Mettawa, United States; 9MVZ Dres Eisenbach/Simon/Schwarz/Gbr, Leverkusen, Germany

Email: cornberg.markus@mh-hannover.de

Background and aims: Globally, 58 million people are infected with hepatitis C virus (HCV) many of whom have comorbidities such as injection drug use. Some HCV-infected patients may be motivated by benefits beyond virologic cure; insights into patient-reported outcomes associated with treatment may help efforts to improve linkage to care. This study used data from the German Hepatitis C registry (DHC-R) to evaluate the real-world effect of glecaprevir/pibrentasvir (G/P) on quality of life (QoL) 1-year posttreatment.

Method: The DHC-R is an ongoing, prospective, observational cohort study of patients being treated for chronic HCV infection. Patients were recruited from 159 sites between August 2, 2017, and February 10, 2021, the data cut off for this analysis was November 17, 2021. Patients had HCV genotype (GT) 1–6 and were treated with on-label G/P. Mean short-form 36 health survey questionnaire (SF-36) scores at baseline (BL), posttreatment Week 12 (PTW12) and 1-year posttreatment were reported. Patients achieving sustained virologic response at PTW12 (SVR12), safety and tolerability were also assessed.

Results: The analysis included 2727 patients. Most were treatment-naïve (91.2%) and noncirrhotic (85.4%). Reported BL comorbidities included opioid substitution therapy (OST; 27.0%), active drug use (6.3%), psychiatric disorders (13.1%), alcohol abuse (8.5%) and HIV coinfection (6.0%). In patients with valid BL, PTW12 and 1-year posttreatment data (n = 119), mean SF-36 physical component score (PCS) and mental component scores (MCS) were improved and maintained in the overall population. Similar improvements were observed for all patient populations, excluding those with alcohol abuse (PCS and MCS scores) and HIV coinfection (MCS score), which showed no improvement. The biggest improvement in MCS scores were seen in patients receiving OST at BL and the biggest different in PCS scores were seen in patients with psychiatric disorders and those receiving OST at BL (Figure 1). The intention to treat (ITT) SVR12 rate was 96.2% (2083/2166) and the modified ITT (mITT) rate was 99.0% (2083/2103). There were no new or unexpected safety signals.

Conclusion: On-label treatment with G/P was highly effective and well-tolerated in routine clinical practice. Improvements in patient QoL were consistent and pronounced across all comorbidities studied, particularly when related to mental components, further supporting the use of G/P in real-world patient populations.

Acknowledgments: Glecaprevir was identified by AbbVie and Enanta. Medical writing support was provided by Laura Whiteley, PhD, and Tom Owen, PhD, of Fishawack Health, funded by AbbVie.

Disclosures: AbbVie sponsored the study; contributed to its design; and participated in the collection, analysis, and interpretation of the data and in the writing, reviewing, and approval of the abstract. All authors had access to relevant data, and participated in the writing, review, and approval of the final abstract.
THU-182
What is the impact of a Hepatitis C ‘test and trace’ pilot using peer workers?
Caroline Allsop¹, Kate Mcque¹, Mark Roberts², Suzanne Murphy², Carrie Richardson², Yusri Taha³, Stuart Mcpherson¹, ² The Newcastle upon Tyne Hospitals NHS Foundation Trust, Liver unit, United Kingdom; ² Hepatitis C Trust, United Kingdom; ³ The Newcastle upon Tyne Hospitals NHS Foundation Trust, Virology, United Kingdom; ⁴ Newcastle University, Translational and Clinical Research Institute, United Kingdom Email: stuart.mcpherson2@nhs.net

Background and aims: Chronic Hepatitis C virus (HCV) infection is a major cause of morbidity and deaths worldwide. HCV treating teams in England have made steady progress towards the goal of eliminating HCV by 2025. However, HCV reinfection rates are high, particularly in North-East England, suggesting a significant reservoir of untreated infections. Contact tracing, a tool successfully used to identify and treat cases in other infectious diseases, is not routine practice in HCV. Here we present the outcomes of an “HCV Test and Trace” pilot scheme.

Method: Individuals with recently acquired HCV infection or reinfection were invited to participate when they presented to our service for treatment. For those who agreed to participate, a Hepatitis C Trust peer worker approached them to invite potential contacts for HCV test using “dry blood spot.” To encourage participation, incentives (vouchers for a food outlet) were given to index individuals and contacts upon HCV testing. We collected data on uptake, HCV test results, treatment rates and reasons for declining.

Results: Between April 2022 and Jan 2023 (9 months), 241 individuals were invited to participate, of whom 118 (49%) agreed. The overall interim outcomes of the pilot are summarised in Fig. 1. To date, 24 (10% of all, 20% of those agreeing) have brought forward contacts for testing. A total of 88 contacts were identified and tested, averaging 3 or more contacts per participant. Of these, 33 (38%) were HCV RNA positive indicating active HCV. Of these, 16 were new infections and 17 were known cases (7 never seen by HCV services, 10 had treatment prescribed previously, including 5 reinfections). To date, 10 have started antiviral treatment and 14 are awaiting assessment or treatment initiation. The most common reason for individuals declining participation was that they were no longer in contact with at risk individuals (65%).

Conclusion: Overall, about half of individuals with recent HCV infection or reinfection agreed to participate in a test and trace pilot scheme, but to date only 20% actually brought contacts forward. However, the frequency of active HCV among the contacts appears to be high at 38%. Work is ongoing to refine the pathway to increase uptake, and testing and treatment rate.

THU-183
Evaluation of the follow-up in patients with advanced fibrosis after achieve sustained viral response with direct-acting antivirals. Screening and risk of hepatocellular carcinoma
Belén Julian¹, Diego Casas-Deza¹, ², Silvia Espina¹, ², Luis Javier Lamuela³, Olivia Sierra¹, Carmen Yagüe¹, Sara Lorente Perez⁴, ⁵, Trinidad Serrano⁴, ⁵, Jose M Arbones Mainar², ⁶, ⁷, Vanesa Bernal Monterde¹, ². ¹ Miguel Servet University Hospital, Zaragoza, Spain; ² IIS Aragon. Unidad de Investigación Clínica HUMS, Zaragoza, Spain; ³ Hospital General San Jorge, Huesca, Spain; ⁴ Hospital Clínico Universitario Lozano Blesa, Zaragoza, Spain; ⁵ IIS Aragon, Spain; ⁶ Instituto Aragonés de Ciencias de la Salud, Zaragoza, Spain; ⁷ Carlos III Health Institute, Madrid, Spain Email: vbernalm@gmail.com

Background and aims: The risk of developing hepatocellular carcinoma (HCC) persists in patients with hepatitis C virus (HCV) and cirrhosis who achieve sustained viral response (SVR) with direct-acting antivirals. Screening and risk of hepatocellular carcinoma after achieve sustained viral response with direct-acting antivirals. Screening and risk of hepatocellular carcinoma

Figure: (abstract: THU-182).
Hepatitis C Virus (HCV) infection and neurocognitive impairment in subjects with mild liver disease: the role of neuropsychological and cognitive provoked P300 tests

Marcia Maria Amendola Pires¹, Rafael Espindula², Jefferson Abrantes², Carlos Brandão-Mello¹, ¹Gastrointestinal and Liver Unit, Gaffrée e Guiné University Hospital, Internal Medicine, Rio de Janeiro, Brazil; ²Postgraduate Program in Neurology, Department of Neurology, Neurology, Rio de Janeiro, Brazil

Email: cedubrandao@gmail.com

Background and aims: Hepatitis C virus (HCV) infection is one of the leading causes of liver cirrhosis, hepatocellular carcinoma, and liver-related deaths. It is estimated that 40%–74% of HCV subjects will experience at least one extra-hepatic manifestation within their lifetime, including neurocognitive deficits. Cognitive changes are well documented in patients with chronic liver disease, most often as a result of decompensated liver cirrhosis; alcoholism or use of illicit drugs; formal education less than 4 years; complete deafness and subjects over 80 years old. The mean normal value of P300 latency and amplitude was 348.2 milliseconds and 8.9 microvolts, respectively, as described by Torres, Abrantes and Brandão-Mello, 2020.

Method: Observational study conducted at the Liver Unit of Gaffrée e Guiné University Hospital (HUGG), from November 2019 through March 2020. All HCV-infected subjects (anti-HCV and HCV-RNA detectable) over 18 years old were considered eligible for investigation. Only HCV subjects with compensated liver disease were included. Liver fibrosis assessment by liver stiffness as well genotyping (sequencing) and HCV-RNA viral load (RT-PCR) were performed. Patients were tested in a single day with cognitive evoked potential and neuropsychological tests (random letter test, form A and B trail test, direct, reverse order digit test and code test). We excluded coinfection with HIV, HBV and syphilis; hypothyroidism or psychiatric illness; neurological diseases that affect the cognition, mainly neurodegenerative diseases; decompensated liver cirrhosis; alcoholism or use of illicit drugs; formal education less than 4 years; complete deafness and subjects over 80 years old. The mean normal value of P300 latency and amplitude was 348.2 milliseconds and 8.9 microvolts, respectively, as described by Torres, Abrantes and Brandão-Mello, 2020.

Results: A total of 124 patients were analysed and 91 excluded according to exclusion criteria. Thus 33 HCV subjects (51.5% male) were enrolled. Mild liver fibrosis (F0-F2) was identified in 72.8% of patients. Genotype was predominately 1 (72%). The neuropsychological and P300 results are displayed in table 1. Of the 33 patients with HCV, 57.6% had changes in P300 latency and 60.6% in amplitude, that is, more than 50% globally detectable changes in this complementary method. There was no significant correlation between P300 latency and amplitude and demographic and virological characteristics of HCV subjects, such as gender, education level, age, viral load and liver fibrosis.

Conclusion: In conclusion, HCV subjects with mild or no fibrosis, presented cognitive deficits in more than 50% in the tests applied to assess working memory and attention. Thus, we suggest that triage for HCV-infection must be included in the list of screening tests in patients who exhibit cognitive decline.
THU-185
A prospective, pragmatic post-authorisation safety study of early recurrence of hepatocellular carcinoma in hepatitis C virus-infected patients after direct-acting antiviral (DAA) therapy: DAA-PASS

Amrit Singh1, Michael Fried2, Massimo Colombo3, Roniel Cabrera4, Katie Kelley5, Neil Mehta6, Bruno Sangro7, 1UT Southwestern, United States; 2Target RWE, United States; 3Humanitas Hospital, Italy; 4University of Florida, United States; 5University of California San Francisco, United States; 6Clinica Universidad de Navarra, Spain

Email: bsangro@unav.es

Background and aims: Early reports of DAA therapy for chronic hepatitis C (HCV) after successful treatment of hepatocellular carcinoma (HCC) raised concerns about an increased risk of early and aggressive HCC recurrence. The European Commission recommended that DAA marketing authorisation holders should perform a prospective observational study to assess risk of early recurrence of previously treated HCC after DAA therapy.

Method: A prospective, pragmatic, multinational observational study was designed to estimate the risk of HCC recurrence, after successful treatment of early-stage HCC, associated with DAA therapy exposure during routine clinical care. Patients were eligible if they had HCV mono-infection, no prior DAA therapy, and had radiologically confirmed successful treatment for Barcelona Clinic Liver Cancer (BCLC) stage A HCC. Treatment modalities for HCC and choice/timing of DAA therapy for HCV were at the discretion of investigators. Patients were followed at regular intervals for evidence of HCC recurrence on imaging, beginning from first cross-sectional imaging study (index date) demonstrating complete response to HCC treatment for up to 24 months.

Results: The planned prospective sample size of 600 patients (n = 122 expected HCC recurrences) was not achieved due to the evolving global landscape of DAA therapy resulting in slower than expected enrollment. Of 222 patients screened, 142 were screen failures and 32 did not meet the enrollment criteria. Of the 42 patients enrolled (33 U.S., 9 Italy), median age at HCC diagnosis was 62 (IQR: 8.0) yrs with 79% male and 74% White. Nearly all (95%) had cirrhosis, with 45% with evidence of hepatic decompensation. Treatment for HCC recurrence was not achieved due to the evolving landscape of DAA therapy for HCV treatment. However, a median follow-up of 5.02 weeks. During follow-up, 13% (16/123) of cACLD patients developed complications: first decompensation in 5% (6/123) and HCC in 8% (10/123). All these 16 patients had LSM > 15 kPa or clinical/imaging elements of CSPH, and the majority (14/16) had platelet count < 150 x 10^9. The mortality rate was 3% (4/123). In dACLD patients, we observed clinical recompensation in 21% (5/24), HCC in 17% (4/24), with a global mortality rate of 8% (2/24).

Conclusion: In this cohort of patients with ALC and cured hepatitis C, the medium-term clinical evolution was globally favorable, with emphasis on clinical recompensation of about 25% of dACLD patients. However, HCC remains a major concern, especially in decompensated ALCD, but also in compensated patients. Adverse events occurred only in patients with pre-treatment LSM > 15 kPa, the majority with platelet counts < 150 x 10^9. These cut-offs, with an established role in ALC stratification, could perhaps redefine follow-up surveillance in compensated patients. The impact of other confounders, such as alcohol and obesity, in the development of complications, needs to be further evaluated.

THU-186
Clinical outcomes after hepatitis C treatment in patients with advanced chronic liver disease

Fabio Correia1,2, Gonçalo Alexandrino1, Mariana Cardoso1, Joana Branco2, Mariana Costa1, Rita Carvalho1, Alexandra Martins1.
1Hospital Professor Doutor Fernando Fonseca, Portugal
Email: fabiocorreia@gmail.com

Background and aims: Patients with advanced chronic liver disease (ACLD) and chronic hepatitis C at high risk of developing clinically significant portal hypertension (CSPH) and its complications. Direct-acting antivirals have radically changed the outcomes of hepatitis C treatment. However, data on the impact of cured hepatitis C on the medium-term clinical evolution of patients with ALCD has only recently emerged. We aimed to evaluate the outcomes related to hepatic decompensation, hepato cellular carcinoma (HCC) and mortality in a cohort of patients with ALCD and cured hepatitis C with sustained virologic response (SVR).

Method: Prospective, single-centre study, in patients with ALCD and chronic hepatitis C with SVR, treated since February 2015 and with a minimum follow-up (FU) of 2 years. The definition of ALCD was based on liver biopsy or Baveno VII’s concepts: liver stiffness measurement (LSM) > 10 kPa and/or clinical/imaging elements of CSPH. During FU, hepatic decompensation (ascites, variceal bleeding, and hepatic encephalopathy) unrelated to HCC, development of HCC mortality were recorded. In decompensated ALCD, the recompensation rate was also evaluated.

Results: We included 147 patients (78.2% male, mean age of 59 years old). At baseline, 84% (123/147) had compensated ALCD (cACLD), 16% (24/147) had decompensated ALCD (dACLD) and none had suspicious liver nodules. Among patients with cACLD with baseline LSM evaluation (97/123), 65% (63/97) had a LSM > 15 kPa. The median follow-up was 52 months. During follow-up, 13% (16/123) of cACLD patients developed complications: first decompensation in 5% (6/123) and HCC in 8% (10/123). All these 16 patients had LSM > 15 kPa or clinical/imaging elements of CSPH, and the majority (14/16) had platelet count < 150 x 10^9. The mortality rate was 3% (4/123). In dACLD patients, we observed clinical recompensation in 21% (5/24), HCC in 17% (4/24), with a global mortality rate of 8% (2/24).

Conclusion: In this cohort of patients with ALCD and cured hepatitis C, the medium-term clinical evolution was globally favorable, with emphasis on clinical recompensation of about 25% of dACLD patients. However, HCC remains a major concern, especially in decompensated ALCD, but also in compensated patients. Adverse events occurred only in patients with pre-treatment LSM > 15 kPa, the majority with platelet counts < 150 x 10^9. These cut-offs, with an established role in ALC stratification, could perhaps redefine follow-up surveillance in compensated patients. The impact of other confounders, such as alcohol and obesity, in the development of complications, needs to be further evaluated.
proportional hazard modeling to assess the effect of HIV co-infection on all-cause, liver-, drug-, and non-liver, non-drug-related mortality.

**Results:** There were 12,150 people who achieved SVR following direct-acting antiviral treatment. PWHI: n = 9,707, person-years (PY) = 3,188.5, deaths = 171; PWHC: n = 11,180, PY = 36,905.3, deaths = 1,146. Median follow-up time was 3.2 years (interquartile range 1.9–4.5; maximum = 7.4). All-cause, liver-, drug- and non-liver, non-drug-related mortality rate among PWHI and PWHC was 53.6 vs. 31.1/1,000PY, 6.0 vs. 8.2/1,000PY, 24.4 vs. 6.5/1,000PY, 23.2 vs. 16.3/1,000PY, respectively. In the multivariable model, HCV/HIV co-infection was associated with higher all-cause (adjusted hazards ratio (AHR): 1.43, 95%CI: 1.20–1.78), drug-related (AHR: 1.57, 95%CI: 1.17–2.10) and non-liver, non-drug-related mortality (AHR: 1.39, 95% CI: 1.07–1.80), while risk of liver-related mortality (AHR: 0.90, 95%CI: 0.54–1.51) was not significantly different compared to HCV mono-infection.

**Conclusion:** After successful HCV treatment, people with HCV/HIV co-infection have similar liver-related mortality as people with HCV mono-infection, but have higher all-cause, drug- and non-liver, non-drug-related mortality. Higher drug-related and non-liver, non-drug-related mortality indicate tailoring services based on syndemic conditions co-occurring with HIV and HCV infections, such as substance use and mental health support and care for chronic non-communicable conditions.

**THU-188**

**Cholestatic HCV-related cryoglobulinemia, a new clinical and pathological entity: a case-control study**

Sara Romeo1, Andrea Dalben1, Serena Amendola2, Filippo Cattazzo1, Anna Tomézzoli1, David Sacerdotti3. 1University and Azienda Ospedaliera Universitaria Integrata di Verona, Division of General Medicine C, Department of Medicine, Verona, Italy; 2University and Azienda Ospedaliera Universitaria Integrata di Verona, Department of Diagnostics and Public Health, Section of Pathology, Verona, Italy; 3University and Azienda Ospedaliera Universitaria Integrata di Verona, Liver Unit, Department of Medicine, Verona, Italy

Email: sara.romeo26@yahoo.it

**Background and aims:** Mixed cryoglobulinemia (MC), the most common extrahepatic manifestation in chronic hepatitis C virus (CHC), persisting even after virus eradication with direct-acting antiviral agents, can manifest clinically as a systemic vasculitis with manifestations ranging from purpura, arthralgia, and weakness to more severe neurological and kidney involvement and cirrhosis development. Up today, the relationship between MC and liver intrahepatic cholestasis is unknown. Our study aims to investigate a possible correlation between MC and intrahepatic cholestasis in CHC patients.

**Method:** 31 hepatitis C virus (HCV) + MC + patients were enrolled, matched for age, sex and genotype with 31 HCV + MC –. Patients with known autoimmune diseases were excluded. For each participant, cholestatic parameters (direct bilirubin, alkaline phosphatase and gamma-glutamyl transferase), HCV-RNA, genotype, plasma MC were measured; liver histology and plasma cells (aggregation and distribution), observed blinded by two different operators, were analyzed. Results were evaluated by the Mann-Whitney U test, Fisher’s exact test and by stepwise multivariate analysis (p ≤0.05).

**Results:** 62 participants (mean age 57.3 ± 11.1 years; males = 50%) with CHC were enrolled. Serum cholestasis (2 or more increased cholestatic parameters) was significantly higher in MC + group (p = 0.02) and correlated in univariate analysis with cryoglobulinemia (OR 6.9; p = 0.02). Plasma cells on liver histology were found in a significantly higher number in MC + group (p = 0.01) and tended to form aggregates more than in the control group (p = 0.05). In stepwise multivariate analysis with genotype, HCV-RNA, steatosis, gender and age, cholestasis was only related to MC + (OR 13.57; p = 0.01).

**Conclusion:** Our study identified for the first time a correlation between MC, cholestasis and intrahepatic plasma cells in patients with chronic CHC. Future studies are needed to understand how MC causes cholestasis.

**THU-189**

**Hospitalisation-missing an opportunity to link to hepatitis C care: a retrospective study at a regional Australian health service**

Christine Roder1,2,3, Carl Cosgrave4, Kathryn Mackie1,5, Bridgette McNamara1, Joseph Doyle1,6, Amanda Wade1,2,3, Barwon Health, Barwon South West Public Health Unit, Geelong, Australia; Deakin University, Centre for Innovation in Infectious Disease and Immunology Research (CIIDIR), Geelong, Australia; Burnet Institute, Disease Elimination Program, Melbourne, Australia; Barwon Health, University Hospital Geelong, Geelong, Australia; Alfred Health, Pharmacy Department, Melbourne, Australia; Alfred Health and Monash University, Department of Infectious Disease, Melbourne, Australia

Email: christine.roder@gmail.com

**Background and aims:** Western Victoria has the highest rate of hepatitis C treatment uptake in Australia. Key to achieving micro-elimination in Western Victoria is developing targeted, data driven strategies to increase testing and linkage to care. This study aimed to assess the proportion of inpatients and emergency department (ED) patients identified at risk of hepatitis C or living with hepatitis C who were tested and linked to care and treatment at University Hospital Geelong (UHG), a regional health service in Victoria, Australia.

**Method:** A retrospective study was performed of adults admitted as hospital or ED inpatients from November 2018 to November 2021. Data were collected from the following databases: hospital admissions (International Classification of Disease, Tenth revision (ICD–10) coded separations), Australian Clinical Labs (pathology), the hospital pharmacy (direct acting antiviral (DAA) scripts), and Liver Clinic (UHG) outpatient service. Separations were selected if they had a code that indicated intravenous drug use (IDU) or hepatitis C.

**Results:** There were 1370 patients with IDU coded separations and 628 patients with hepatitis C coded separations (total n = 1917 patients). 16.8% (323/1917) had a documented antibody test and 7.7% (148/1917) had a documented RNA test, 2.2% (43/1917) had a DAA script either dispensed by the hospital pharmacy or prescribed through the Liver Clinic, and 1% (20/1917) had documented cure. Antibody positivity was 65% (210/323) and of those who had an RNA test, RNA was detected in 57.4% (85/148). Of the patients with detectable RNA, 50.6% (43/85) received DAA therapy and 23.5% (20/85) achieved a sustained virologic response (SVR). For hepatitis C coded separations, antibody testing rates were highest in general
medical units (57.1%), and lowest in ED (29.6%). Follow-up RNA testing rates for antibody positivity was similar for all hospital units (67%–73%). For IDU coded separations, antibody testing rates were lower than hepatitis C coded separations, with the highest being hepatitis specialist units (37.5%), and the lowest ED (6.9%). Follow-up RNA testing rates for antibody positivity varied across units (61.5% to 100%).

**Conclusion:** A targeted intervention that increases hepatitis C antibody testing of people with a history of IDU whilst hospital inpatients is likely to improve linkage to hepatitis C care at our health service, and contribute to micro-elimination.

**THU-190**  
**Hepatitis C virus infection follow-up of people who use drugs in the Balearic Islands, Spain**

Andrea Herranz², Camila Picchio¹, Lucía Bonez², Marita Trelles², Alicia R Rubí³,leticia Martín³, Andreu Sansó⁵, María Victoria Moreno⁶, Ana María Sánchez⁶, Jerónima Serra⁶, María Soledad Velasco⁶, Rosa Joy⁶, Marina Lloves⁹, Nora Soria⁹, Maria Buti¹⁰¹¹, Àngels Vilella¹², Jeffrey Lazarus¹,², Bachelor Institute for Global Health (ISGlobal), Hospital Clinic, University of Barcelona, Barcelona, Spain; ²Department of Gastroenterology, Hospital Universitari Son Espases, Palma, Mallorca, Spain; ³Department of Gastroenterology, Hospital Comarcal d’Inca, Inca, Mallorca, Spain; ⁴Department of Gastroenterology, Hospital Can Misses, Eivissa, Mallorca, Spain; ⁵Department of Gastroenterology, Hospital de Manacor, Manacor, Mallorca, Spain; ⁶Unitat de Conductes Addictives Bons Aires (IBSsalut), Palma, Mallorca, Spain; ⁷Unitat de Conductes Addictives Ponent (IBSsalut), Palma, Mallorca, Spain; ⁸Centre Inclusió Social (IMAS), Palma, Mallorca, Spain; ⁹Unitat de Conductes Addictives Eivissa, Consell d’Eivissa, Eivissa, Spain; ¹⁰Liver Unit, Hospital Universitari Vall d’Hebron, Barcelona, Spain; ¹¹CIBER Hepatic and Digestive Diseases (CIBERehd), Instituto Carlos III, Madrid, Spain; ¹²Department of Gastroenterology, Hospital Universitari Son Llàtzer, Palma, Mallorca, Spain; ¹³Faculty of Medicine and Health Sciences, University of Barcelona, Barcelona, Spain

**Background and aims:** The hepatitis C virus (HCV) infection affects an estimated 56.8 million people and one of the most affected groups are people who use drugs (PWUD). Moreover, PWUD suffer from stigma and discrimination that make it difficult to access healthcare and eliminate HCV infection in this population. In Spain, the Hepatitis C Free Balears project was launched to simplify the existing hepatitis C virus (HCV) model of care for people who use drugs (PWUD) in addiction service centres in the Balearic Islands. This new model of care aims to facilitate treatment completion and monitors for reinfection in this population. The objective of this study is to understand if using simplified and decentralized methods for diagnosis, treatment and follow-up of HCV among PWUD is effective.

**Method:** This new model of care is being implemented in 21 addiction service centres in the Balearic Islands and includes four phases: 1) recruitment and HCV screening onsite via a point-of-care anti-HCV antibody (Oraquick®) and dried blood spot (DBS) testing or blood analysis to confirm viremia (HCV-RNA); 2) linkage to care; 3) treatment prescription via telemedicine; and 4) monitoring onsite of sustained virological response (SVR) at 12 weeks after treatment and monitoring for reinfection after a year, using DBS testing or standard phlebotomy.

**Results:** Since April 2021, 1251 participants have been recruited of which 409 (33%) were anti-HCV+ and 148 (12%) were HCV-RNA+. Of those, 82 (55%) reported active drug and alcohol use and 25 (17%) had an HIV co-infection.

Of those with active HCV infection, 128 (86%) initiated treatment and 107 (84%) have completed it. SVR12 monitoring was performed in 83 (72%) of those patients who completed treatment, of which 67 (81%) were done by DBS testing. The others (n = 24) did not undergo SVR12 monitoring because the date has not yet arrived (5, 21%) or because they did not show up for the appointment (19, 79%). Of those who were monitored for SVR12, 79 (95%) showed undetectable HCV-RNA. Of the participants screened a year ago or more (612), 70 (11%) have been screened again, using DBS testing in 97% of the cases. Three reinfections were detected in previously treated patients, and no new infections were detected in patients never infected with HCV.

**Conclusion:** DBS testing is an effective strategy to offer post-treatment and reinfection monitoring in decentralized settings, increasing testing for PWUD participants. With adapted and simplified care models, HCV care can be accessible to those at higher risk of suffering from the infection and facilitates HCV elimination.

![Figure](abstract: THU-190): Hepatitis C Free Balears project treatment cascade (n = 1251).
THU-191
Serum myostatin decreased after direct acting antivirals for cirrhotic patients
Tomoyuki Suehiro1, Kosuke Matsumoto1, Yuki Kugiyama1, Yasuhide Motoyoshi1, Akira Saeki1, Shinya Nagaoka1, Kazumi Yamasaki1, Atsumasa Komori1, Hiroshi Yatsuhashi1. 1Nagasaki Medical Center, Clinical Research Center, Japan
Email: chuntomo0902@gmail.com

Background and aims: Direct-acting antivirals (DAAs) can eradicate HCV even in patients with liver cirrhosis in older age. As cirrhosis itself is also a cause for secondarily sarcopenia, optimal and appropriate management of sarcopenia after sustained virological response (SVR) among older patients is of great importance. The purpose of this study is to clarify whether extermination of HCV contributes to the improvement of sarcopenia in patients with type C cirrhosis (LCC), with special attention to chronological changes in sarcopenia-associated molecules including myostatin, which negatively regulate the number and the function of skeletal muscle cells, after secreting from skeletal muscle.

Method: Ninety-nine patients with LCC were treated with DAAs. The median age was 73 (36–92) years. There were 69 patients with Child Pugh (CP)- grade A, and 30 patients with CP-grade B+C. We measured serum myostatin, decorin, follistatin, insulin like growth factor-1 (IGF-1), and skeletal muscle mass index (SMI) at baseline and at SVR 48.

Results: At baseline, patients with CP- B+C group showed significantly higher serum myostatin level than those with CP-A group (CP-B+C, 11409 (3445–26949) pg/dl vs CP-A, 5863 (2292–21795) pg/dl, p < 0.001). Multivariate analysis revealed that total bilirubin, prothrombin time, SMI, and M2BPGi were independent factors associated with serum myostatin. Serum myostatin levels were significantly decreased after DAA treatment (baseline 8257 pg/ml vs SVR 48 6394 pg/ml, p < 0.001). Though decorin showed similar decrease (baseline 12604 pg/ml vs SVR 48 7953 pg/ml), follistatin and IGF-1 increased significantly (follistatin: baseline 853 pg/ml vs SVR 48 1058 pg/ml, p < 0.001; IGF-1: baseline 16.1 ng/ml vs SVR 48 18.2 mg/ml, p = 0.005). SMI was restored significantly after DAA treatment (baseline 4.197 vs SVR 48 4.380, p = 0.009).

Conclusion: DAA treatment could contribute to improve sarcopenia for LCC patients, possibly by the modulation of sarcopenia-associated molecules.

THU-192
HCV micro-elimination strategy in a tertiary hospital: identification of lost cases and linkage to care
Maria Tomer1, Laura Muñoz Castillo1, Xavi Grau2, Ariadna Clos Parals1, Aroa Muñoz2, Alba Ardevol Ribalta1, Gema Fernández-Rivas3, Helena Massou1, Águeda Hernández2, Rosa López2, Pere Joan Cardona3, Lidia Carabias4, Elisa Martro2, Rosa M Morillas1. 1Germans Trias i Pujol Universitary Hospital, Hepatology, Badalona, Spain; 2Catalan Institute of Health, North Metropolitan Territorial Management Department, Barcelona province, Spain, Spain; 3Germans Trias i Pujol Universitary Hospital, Microbiology Department, Spain; 4Germans Trias i Pujol University Hospital, Pharmacy Department, Spain
Email: mariatrnrsm@gmail.com

Background and aims: Hepatitis C virus (HCV) elimination by 2030 is one of the main goals of the World Health Organization (WHO). The implementation of micro-elimination strategies in each area can help to achieve this goal. Among them, the identification of lost patients (meaning those with active HCV infection not visited and/or treated by a specialist) has been proved to be useful, advisable and cost-effective1,2.

Our aim was to identify patients with active HCV infection lost during the 2010–2022 period in the Northern Metropolitan area of Barcelona, from the Northern Metropolitan Clinical Laboratory (LCMN) registries, describing their characteristics and the success of their linkage to the health system.

Method: As part of an “HCV elimination program” in our area, we designed a strategy based on a computer search of positive HCV-RNA cases with no prior treatment or not cured and retrieval of test results and associated clinical information from clinical records of patients tested at the Microbiology Service of the LCMN, in coordination with the Hospital Information System. The second phase of the intervention focused on the comprehensive review of all clinical records by the Hepatology Unit and selection of candidates for contact, appointment and treatment.

Results: Among the 1461 viremic patients identified, 696 (47.6%) belonged to the area of influence of our tertiary care hospital. Among the latter, 121 (17.4%) were already dead (41.3% due to an hepatic cause). 29 patients (4.2%) had severe comorbidity/frailty and 499 (71.7%) were already under follow-up by an specialist or had already...
The influence of direct acting antiviral treatment in chronic hepatitis C virus infection on arterial stiffness

Mircea Istrate¹, Letitia Toma³, Elena Laura Iliescu¹, Razvan Rababoc¹.
¹Fondeni Clinical Institute, Department of Internal Medicine, Bucharest, Romania
Email: mircea.istrate@rez.umfcd.ro

Background and aims: Chronic hepatitis C virus infection represents an important factor of atherosclerosis, related to systemic inflammation and the presence of metabolic syndrome. The aim of this study was to determine the influence of direct acting antiviral treatment in chronic hepatitis C virus infection on arterial stiffness and subsequently on the risk of developing potential cardiovascular pathologies.

Method: We performed a prospective observational study including patients with chronic hepatitis C (all genotypes), without cirrhosis, previously naïve to antiviral therapies. The study was performed during January 2022-January 2023 and included 108 patients receiving Sofosbuvir (400 mg)/Velpatasvir (100 mg), for 12 weeks. Sustained virologic response was defined as undetectable viremia at 12 weeks after the end of therapy. Arterial stiffness was determined both before the initiation of antiviral therapy, as well as after achieving sustained virologic response using oscillometric technique, such as pulse wave velocity (PWV) and pulse wave analysis (PWA) of arterial wave forms. All patients were treated according to current national guidelines and signed informed consent forms regarding the use of their personal data for medical and scientific purposes under the condition of anonymization. Patients with HBV or HIV coinfection were excluded, as well as patients with cirrhosis, solid or hematologic malignancies.

Data analysed were age, sex, Aortic Pulse Wave Velocity (PWVao), Central Systolic Blood Pressure (SBPao) and Aortic Augmentation Index (AIxao). Statistical analysis was performed using IBM SPSS Statistics for Windows, version 26.0 (IBM Corp., Armonk, NY, USA).

Results: The study group included 69 women (69.68%) and 33 men (33.2%), with a mean age and standard deviation of 57.13 ± 8.8 years. Before initiation of antiviral therapy most of the patients had a mean Central Systolic Blood Pressure of 113.13 mmHg (± 10.51 mmHg), a mean Aortic Augmentation Index of 0.29% (± 0.09%) and a mean Aortic Pulse Wave Velocity of 5.27 m/s (± 0.42 m/s). After the 12 weeks of treatment all patients achieved Sustained virologic response and the mean values determined by oscilometric methods varied as follow: the medial Central Systolic Blood Pressure was 108.93 mmHg (± 8.8 mmHg), a mean Aortic Augmentation Index of 0.25% (±0.1%) and a mean Aortic Pulse Wave Velocity of 5.03 m/s (±0.35 m/s). While results are not statistically significant, we note a descending trend in arterial stiffness in patients with SVR after DAA.

Conclusion: Obtaining Sustained virologic response in patients with chronic infection with the hepatitis C virus, leads to a decrease in the mean values of Aortic Pulse Wave Velocity, Central Systolic Blood Pressure and Aortic Augmentation Index. The reduction of arterial stiffness merits further longitudinal study in larger cohorts in order to demonstrate the impact of SVR on the cardiovascular risk of HCV infected patients.

THU-194
One year of HCV/HBV/HIV screening in a psychiatric population consulting in the emergency room (Beaujon Hol/REVHEPAT)

Nathalie Boyer¹, Jamal Abdelkader², Matthieu Gay², Raphael Allali², Prabakar Vaittinadà, Cecilia De-Freitas², Murielle Brisson², Béatrice Monnier³, Tarik Asselah².¹Hôpital Beaujon, Service d’hépatologie, France; ²Hôpital Beaujon, France
Email: tarik.asselah@aphp.fr

Background and aims: Hepatitis C virus (HCV) chronic infection is thought to affect 5% of patients with psychiatric pathology. HCV screening in this population is part of the French elimination plan by 2025. In a “patient reach out” approach, seeking medical attention in the emergency room represents an opportunity for contact with care for this precarious population. The treatment of HCV can represent part of the treatment of psychiatric pathology (anxiety, depression). HBV vaccination is also recommended (risk factors, promiscuity). The objective of this pilot work is to evaluate HCV/HBV/HIV screening in the psychiatric population consulting in the emergency room.

Method: Emergency screening (SAU) at Beaujon Hospital (Clichy), of any patient admitted for a psychiatric and/or addiction reason, for whom a Psychiatric expertise is requested. After proposal by the psychiatrist and acceptance by the patient, a screening for the 3 viruses (HCV/HBV/HIV serologies) is carried out at the SAU. The results are collected by the Hepatology department, which makes the diagnosis announcement and ensures, with the REVHEPAT city hospital network, the management of patients tested positive. This collaboration demonstrates the essential role of the hepatologist in a psychiatric setting.

Results: Over 12 months (April 2021–March 2022) (Table in 665 patients, mean age: 43 years (16–97 years), 64% <50 years, with a F/M ratio of 47%/53%. On the available data, there are consumptions: of alcohol in 32% (189/588) of patients (severe in 54% and moderate in 46%); opiates in 8% (48/585); benzodiazepines = 18% (105/569); cannabis = 23% (131/582); psychostimulants = 10% (56/558). Psychiatric hospitalization was necessary in 50% of cases. Previous viral status was unknown for 90% (357/396) of patients. HCV 3.3% (19/586); HBV 1.6% (9/556); HIV 2.2% (12/558) patients. Among the 19 HCV Antibody positive patients: 10 patients contacted directly: 6 HCV RNA negative patients, 1 refusal of care, 3 appointments not honored; 9 could not be recontacted: 3 psy hospitalizations, 1 remand center, 5 letters to the attending physician. Two patients are co-infected with HIV and 42% patients are to be vaccinated with HBV. All had an unknown prior viral status. Among the 9 HBSAg positive patients: 5 patients have positive HBV DNA (4 F1 patients now followed; 1 PVD), 1 patient already followed by attending physician, 3 letters to the attending physician. Among the 547 HBSAg negative patients: 52% to be HBV vaccinated, 12% immunized and 36% already vaccinated.

Conclusions: HCV/HBV screening, by going to populations with psychiatric pathology, in particular during emergency contact with care, confirms the high prevalence of viral infection in these populations.
Background and aims: Hepatitis C Virus (HCV) infection is associated with a state of chronic inflammation. Patients infected with HCV present increased levels of soluble markers of endothelial dysfunction. We have evaluated the effect of HCV on several soluble markers of systemic inflammation and endothelial activation which favors the development inflammation and result in sustained liver damage in patients infected with HCV, as well as their evolution after long term HCV eradication with DAAs therapy.

Method: A total of 53 patients with chronic HCV infection treated with DAAs were subgroups as: HCV monoinfected (n = 14, group 1), HCV-infected liver transplant recipients (n = 17, group 2) and HIV/HCV coinfected patients (n = 22, group 3). Blood samples were collected from all subjects at baseline (pre-DAAs treatment), 12 weeks after the end of treatment when sustained virological response (SVR) was evaluated and 4.19 (± 0.55) years after the SVR. Liver stiffness (LS) assessed using a FibroScan®, and the results were expressed in kilopascals (kPa). The next cut-off LS were used: LS<7.1kPa F0-F1; 7.1–9.4 kPa F2; 9.5–12.4 kPa F3; and >12.5 kPa F4.

Results: Baseline LS was F4 in 45%, F2-F3 in 26% and F1 in 28% patients. F4 stage of LS was present in 80% patients of group 1, while only in 25% and 38% of patients of groups 2 and 3 respectively. Levels of ICAM-1, CXCL10, LS (Kpa), bilirubin, ALT, AST, GGT, AP and ICAM-1 and CXCL10 quantified by Cytometric Bead Array (CBA) were recorded at each time point. AST, GGT, AP) and ICAM-1 and CXCL10 quantified by Cytometric Bead Array (CBA) were recorded at each time point. AST, GGT, AP) and ICAM-1 and CXCL10 quantified by Cytometric Bead Array (CBA) were recorded at each time point.

Conclusion: Baseline LS was F4 in 45%, F2-F3 in 26% and F1 in 28% patients. F4 stage of LS was present in 80% patients of group 1, while only in 25% and 38% of patients of groups 2 and 3 respectively. Levels of ICAM-1, CXCL10, LS (Kpa), bilirubin, ALT, AST, GGT, AP and ICAM-1 and CXCL10 quantified by Cytometric Bead Array (CBA) were recorded at each time point. AST, GGT, AP) and ICAM-1 and CXCL10 quantified by Cytometric Bead Array (CBA) were recorded at each time point. AST, GGT, AP) and ICAM-1 and CXCL10 quantified by Cytometric Bead Array (CBA) were recorded at each time point. AST, GGT, AP) and ICAM-1 and CXCL10 quantified by Cytometric Bead Array (CBA) were recorded at each time point. AST, GGT, AP) and ICAM-1 and CXCL10 quantified by Cytometric Bead Array (CBA) were recorded at each time point. AST, GGT, AP) and ICAM-1 and CXCL10 quantified by Cytometric Bead Array (CBA) were recorded at each time point.

Background and aims: With the introduction of direct-antiviral medication (DAAs), eradication of HCV infection is considered now an achievable goal. While people with history of drug use (PWUD) form the most common population at risk for the infection, in Greece historically there has been a significant proportion of patients arising from the general population with no prior drug use. These two different subgroups exhibit different characteristics, that may be pertinent in the management of HCV infection and long-term follow-up. The aim of this study was to identify potential differences in the makeup of these two HCV patient subgroups.

Method: The HERACLIS cohort, is the largest national HCV registry of patients treated with DAAs in tertiary liver centers from 2015 until 2022. Clinical data and characteristics were obtained from medical records, while transient elastography (TE) measurements and APRI and FIB-4 score calculations were conducted at baseline. Patients were followed up initially for the duration of their treatment.

Results: 680 patients were included in the study. 70.9% (n = 482) of them were men with median age 50.8 years old and 13.6% of these had compensated liver disease at DAA initiation. 62% (n = 422) of this cohort were PWUD, while the rest had been infected in another manner (non-PWUD). When comparing these two populations, PWUD were younger in age (47.2 ± 9.8 vs 56.3 ± 12.8 years, p < 0.001) and with lower BMI (24.3 ± 4.2 vs 26.1 ± 4.6 kg/m2, p < 0.001). Non-PWUD cases had more often diabetes (4.9% vs 1.3%, p < 0.001), hypertension (10.7% vs 8.8%, p < 0.001) as well as decompensated liver disease (8.0% vs 5.6%, p < 0.001). This was also reflected by TE measurements (14.6 ± 11.1 vs 11.3 ± 7.9 kPa, p < 0.001) and FIB-4 score calculations (2.8 ± 2.6 vs 2.2 ± 4.0 vs, p < 0.001) but not by the APRI score. Moreover, PWUD patients tended to have been more often infected with genotype 3 (36.8% vs 8.8%, p < 0.001) while for other genotypes no such stark differences were observed. There was no significant variance observed regarding DAA regimen use but non-PWUD patients tended to suffer more often from adverse events secondary to DAA treatment (1.6% vs 0.3%, p < 0.001).

Conclusion: The Greek PWUD and non-PWUD populations of HCV patients seem to exhibit different baseline characteristics which may be relevant to treatment selection and long-term follow-up regimens. The main differences observed imply the concomitant presence of an element of metabolic syndrome in the non-PWUD cohort with a subsequent potential effect on the degree of underlying liver fibrosis.

THU-197 Incidence and associations of HCV reinfection in the era of direct-acting antivirals

Sofía Vasileiadí1, Kanellos Koustenis1, Maria Manolakopoulou1, Charalampos Karageorgos1, Anestis Goulas1, Hariklia Kranidioti1, Spyridon (Spyros) Siakavellas1, Melanie Deutsch1, Olga Anagnostou1, Spilios Manolakopoulos1, Geniko Nosokomeio Athinon "Ippokrateio", Hepatogastroenterology Unit, 2nd Academic Department of Internal Medicine, Athens, Greece
Email: s.siaxavellas@gmail.com

Background and aims: The introduction of highly effective direct-acting antivirals (DAAs) has dramatically changed our practice against HCV infection with high therapy uptake and high response rates; one may argue for higher reinfection rates. The reinfection rates especially in high-risk populations could become a significant barrier in the strategy of HCV elimination. Our aim is to explore the HCV reinfection rate after successful HCV therapy with DAAs in a cohort of people who use drugs (PWUD) and define factors associated with reinfection.

Method: We included patients with chronic compensated hepatitis C who had history of past or current illicit drug use. All had been treated successfully with DAAs in our tertiary center between 2014 and 2021. HCV cure was defined with serum HCV RNA no detectability 3–12
months after the end of treatment (SVR). All patients were contacted at least one year after the end of the treatment via phone call and were invited to a follow-up visit where HCV RNA levels, liver function tests and transient elastangraphy (TE) were performed. Parameters regarding their social-economic status and drug use habits, were also recorded. Serum HCV RNA detectable after SVR was defined as reinfection. This is a preliminary analysis of 174 patients who were called twice; 78 of them did not respond.

Results: 96 patients (82.3% men) were included in the study, with median age 53 (range 34–68) years. 24% (n = 23) had evidence of cirrhosis. 62.5% (n = 60) were unemployed, 66.7% (n = 64) were single and 22.8% (n = 21) had been incarcerated at some point in the past. Almost 60% (n = 57) attended a substitution or therapeutic community program for drug use, with 34.4% (n = 33) reporting drug use in the last 12 months, of which 36.4% (n = 12) shared syringes/other paraphernalia, while 39.4% (n = 13) reported intravenous drug use and 39.4% (n = 13) used drugs via the nasal route. We identified 7 HCV reinfections during 189 PV of follow-up, yielding a reinfection rate of 3.7/100 PY. We found that the reinfection group included younger (44 ± 5 vs 53 ± 8 years, p = 0.005) patients, the majority (n = 6, 85.7%) of them under the age of 50, and with a concomitant history of having been imprisoned (85.7% vs 20.2%, p < 0.001). Moreover, people in the reinfection group reported longer total history of intravenous drug use (24 ± 8 vs 15 ± 8 years, p = 0.012), more often active drug use in the past 12 months (100% vs 29.2%, p < 0.001), intravenous drug use (71.4% vs 9%, p < 0.001) and shared syringes/paraphernalia (85.7% vs 21.3%, p < 0.001). Reinfection was also significantly associated with HIV co-infection (42.9% vs 0%, p < 0.001) and cannabis consumption (85.7% vs 37.1%, p = 0.001). HCV genotypes in reinjected patients were different compared to baseline pretherapy ones.

Conclusion: HCV reinfection rates after SVR were higher among younger patients who continued high risk behaviors. These data underlined the importance of follow-up assessment for PWUD and the necessity of sustained linkage to health care services.

THU-198
Evaluation of patients treated with direct-acting anti-viral therapy for chronic hepatitis C and their risk of hepatocellular carcinoma in Hong Kong
Victor Yung Sin Chow1, Verónica Wing I Cheung1, 1Our Lady of Maryknoll Hospital, Hong Kong
Email: victor.chow06@gmail.com

Background and aims: To evaluate the risk of early hepatocellular carcinoma (HCC) and its risk factors in chronic hepatitis C patients treated with direct-acting antivirals (DAAs) in Hong Kong.

Method: 333 consecutive chronic hepatitis C patients treated with DAAs from two hospitals over the past 6 years were identified. Kaplan-Meier method was used to calculate cumulative HCC incidence. Cox regression was used to identify factors associated with HCC development. Receiver operating characteristic curve analysis was performed to determine the optimal cut-off levels of AFP for predicting HCC development.

Results: During a median follow-up of 23.4 months after DAA started, 15 (5.4%, 95% Confidence Interval 3.3%–8.7%) out of 279 total included patients developed HCC. The overall sustained virological response (SVR) rate was 98.9%. The 1-year cumulative incidence for de-novo HCC was 0.7% and 5.1%, respectively (log-rank test p = 0.036). Univariate analysis showed that significant factors without and with cirrhosis were 0.7% and 5.1%, respectively (log-rank test p = 0.001). In the univariate analysis we performed to determine the optimal cut-off levels of AFP at the start of DAA therapy for predicting HCC was 10.5 ng/ml (sensitivity 80%, specificity 84.2%, AUROC 0.868). The cumulative incidence of HCC development for the group with AFP level <10.5 ng/ml at the start of DAA therapy was significantly lower than that for the group with AFP level ≥10.5 ng/ml (log-rank test p < 0.001). The 1-year cumulative incidence of HCC were 0.6% (95% CI 0%–1.7%) and 11.8% (95% CI 2.8%–20.8%) for the groups with AFP level <5.6 ng/ml and ≥5.6 ng/ml at the end of DAA therapy, respectively.

Conclusion: Following DAA therapy and achieving SVR in the vast majority of chronic hepatitis C patients, the risk of early de-novo HCC development is low, but the risk of early HCC recurrence remains very high. Higher AFP levels, with cut-off at 10.5 ng/ml and 5.6 ng/ml, at the start and end of DAA therapy respectively, can be useful in stratifying the risk of HCC development.

THU-199
The prevalence of hepatitis C virus infection in high-risk patients with high normal alanine aminotransferase (ALT) in Israel: a biobank analysis
Amir Shlomai1, Daniella Beller2, Sapir Hadadi2, Galit Rimler4, Licitia Schreiber5, Gabriel Chodik6, Asaf Peretz7, 1Rabin Medical Center, Medicine D, Israel; 2KSM, Maccabi research and innovation institute, Israel; 3AbbVie Inc, Hod-Hasharon, Israel; 4Maccabi MEGA lab, Maccabi Healthcare Services, Israel; 5SM, Maccabi’s research and innovation institute, Israel
Email: shlomaiamir@gmail.com

Background and aims: Chronic hepatitis C virus (HCV) infection is a major worldwide problem. Direct antiviral agents (DAAs) are highly effective against HCV and result in nearly 100% cure rate. In Israel, the current prevalence of HCV is estimated at 2% among high-risk adult population, such as former union of soviet socialist republics (USSR) residents. However, the majority of HCV carriers in Israel remain unaware of their disease and are therefore untreated, despite the wide availability of DAAs that are included in the Israeli health-basket. In recent years, it became clear that “healthy” alanine
aminotransferase (ALT) values are even lower than previously thought and that a substantial fraction of people with “high normal” ALT might still have an underlying liver disease, including chronic HCV infection. The aim of this study is to determine the prevalence of chronic HCV infection in high-risk population with high-normal ALT.

**Method:** Adults that opt-in to the Maccabi Healthcare Services biobank and were never tested for HCV before were included. We assessed the prevalence of anti-HCV antibodies in patients who were tested for serum ALT in 2020. Based on inclusion criteria and based on ALT levels, fresh samples from biobank participants were tested for HCV antibodies by CMIA. In case of borderline results, immunoblotting was performed. RT-PCR for HCV RNA was performed on samples with positive HCV antibodies.

**Results:** The study was conducted in two stages: First, a total of 350 individuals with serum ALT >25 IU/L for women and >33 IU/L for men (mean age = 55 [19, 100]; 36% males; 21% (73/350) former USSR residents, mean ALT = 49.5 [26, 787]) were included in the analysis. Among them, five were positive for HCV antibodies, and only one female patient (0.29%; 95%CI: 0.01% to 1.58%), a former USSR resident with ALT = 30 IU/L, was confirmed positive by PCR. We next focused on former USSR residents with high-normal ALT. Of 202 samples (mean age 57, 39% males) who had high-normal ALT (>25 IU/L <50 IU/L for women, >33 IU/L <50 IU/L for men, mean level 34.3 [25, 50]) tested for anti-HCV antibodies, only 1 patient (0.5%) was found positive by RT-PCR.

**Conclusion:** The prevalence of HCV positivity in a large Israeli biobank setting is lower than expected. Focusing on high-risk adults with high normal ALT does not improve the yield of screening for HCV carriers in this setting.

**THU-200**

**HCV screening: shortening read time of point-of-care rapid diagnostic test does not effect detection rates of antibodies against hepatitis C virus**

Muhammad Nabeel Shafqat, Auj Chaudhry, Najam-us-sehar Saeed, Asad Choudhry, Muhammad Sohail Khan, Ghania Shafqat, Fatima Akram. 1District Headquarter Hospital-Gujranwala Medical College, Department of Gastroenterology, Gujranwala, Pakistan; 2PARSA Trust Liver Clinic, Al-Raee Hospital, Gujranwala, Pakistan; 3University of the Punjab, Institute of Business and Information Technology, Lahore, Pakistan

**Background and aims:** Hepatitis C virus (HCV) infection is a public health threat worldwide and Pakistan has one of the highest HCV prevalence in the world. The WHO has proposed the goal of eliminating viral hepatitis as a public health threat by 2030. This requires a massive scale-up in screening efforts. Simplification of point-of-care (POC) rapid diagnostic test (RDT) which detects anti-HCV antibodies would enhance overall linkage to care, particularly for mass screening and difficult-to-reach populations. Currently, the recommended read time of POC rapid diagnostic detection test to identify antibody positive samples is 20 min. A positive POC RDT result is then followed by a reflex HCV RNA testing to confirm active viremia. This study was conducted to determine whether a shorter read time of 5 minutes could be used to identify all anti-HCV antibody positive samples, and decrease the need for reflex testing by conducting HCV RNA test on the same sample to identify active viremia.

**Method:** The SD Bioline HCV POC RDT was used for the qualitative detection of antibodies specific to HCV. Any detectable band on RDT was counted as positive, regardless of band intensity. Samples were collected at two sites: a tertiary care hospital and through community screening. HCV screening was done on the mentioned kit at District Headquarter Hospital-Gujranwala Medical College and PARSA Trust Liver Clinic at Gujranwala, Pakistan. Blood samples were tested immediately after collection of whole blood, via finger prick. Two blinded observers, at both collection centres, separately recorded the time-to-positivity by continuous observation during the first 5 minutes, then each minute after, up to 10 minutes and then again at 15 and 20 minutes. The time-to-positivity on RDT was measured by using a stopwatch to note the exact duration of time from the point when sample was placed on RDT kit till the point a positive result appeared. A sample of HCV RNA by PCR was collected in all those who tested positive for anti-HCV antibodies.

**Results:** Of 1266 patients with a positive test result on anti-HCV antibody POC RDT test, there were 766 (61%) cases with active viremia. In participants with active viremia, 52.7% (404/766) females and 47.3% (362/766) males, the mean age (± SD) was 46.37 years (± 15.53). In viremic patients, the median time-to-positivity was 1.8 seconds.
minutes (range, 0.2–2.2 min). Out of all viremic cases, 62.01% of participants had a positive test result in between 60 and 90 seconds whereas 18.02% produced a positive result within 50–60 seconds. Less than 1% of patients with active viremia had a positive screening test within 120–300 seconds. All the patients with active viremia produced a positive result in the antibody RDT test within 5 minutes read time.

**Conclusion:** Reducing read time of SD bioline rapid antibody POC test from 20 minutes to 5 minutes causes no loss of antibody detection in patients with active viremia. Shortening read time could improve screening efficiency, decrease loss to follow-up rates and can potentially reduce the need for reflex HCV RNA testing. Further studies evaluating POC RDT should be undertaken to explore its utility in replacing HCV RNA by PCR test to detect active viremia in resource poor settings.

**THU-201**

**Digital pathology quantification of cirrhosis severity continuum in human HCV liver biopsies and its correspondence with Laennec and Beijing stages**

Louis Petitjean1, Xiaofei Zhang2, Thomas Schiano3, Mathieu Petitjean1, Maria Isabel Fiel4, PharmaNest, Inc, Princeton, United States; 2NYU Long Island School of Medicine, Department of Pathology, Mineola, United States; 3Icahn School of Medicine at Mount Sinai, Intestinal Transplantation, Liver Transplantation, Gastroenterology, New York, United States; 4Icahn School of Medicine at Mount Sinai, Department of Pathology, Molecular and Cell-Based Medicine, New York, United States

Email: mathieu.petitjean@pharmanest.com

**Background and aims:** Cirrhosis severity is defined histologically as a continuous process in which the normal anatomical lobules are replaced by architecturally abnormal nodules separated by fibrous tissue of different morphological phenotypes. The Laennec system, and more recently the Beijing classification, have been used to sub-classify various histological degrees of cirrhosis severity and activity. These methods lack intra-operator reproducibility and have poor detection thresholds. Here, we report on the development of an automated quantitative Digital Pathology and AI method (FibroNest) to quantify cirrhosis severity and activity and assess its correspondence with Laennec and Beijing scores.

**Method:** 20 consecutive hepatitis C (HCV) patients undergoing liver transplantation consented to participate in an IRB-approved protocol. 5 core biopsies were taken from five segments of the liver immediately after explantation. Formalin-fixed, paraffin embedded sections of the biopsies were stained with Masson trichrome and scanned at 20X for Digital Pathology. The Laennec system (4A–4C indicating increasing degrees of cirrhosis) and Beijing classification (P-progressive, I-indeterminate, R-regressive,) were assessed by an expert pathologist (MIF). This HCV cohort (n = 100) demonstrated a large variety of severity stages (doi 10.1038/s41379-021-00881-z). Quantitative image analysis was performed to extract single fiber quantitative traits (qFTs, N = 335) to describe the collagen, the fiber morphometric and fibrosis architectural phenotypic dimensions. Principal components of the qFT dataset were automatically identified to account for variability along the Laennec, and the Beijing stages, and then assembled into a normalized Cirrhosis Severity composite Score (CFS) and a Cirrhosis Activity composite Score (CAS).

**Results:** The AI-enabled CFS and CAS scores classify extreme stages (4A vs 4C, P vs R) with strong statistical significance (p = 0.001 and p = 0.0004 respectively) in contrast to earlier studies where the Collagen Proportional Area did not correlate with Laennec and Beijing histological scores (doi 10.1038/s41379-021-00881-z). The intermediate stages (4A vs 4B; 4B vs 4C; P vs I; I vs R) are classified with moderate performance (p values = 0.016; 0.082; 0.004; 0.042 respectively) but it is not clear if the uncertainty is driven by the computational method of the pathologist’s interpretation. All the three sub-phenotypic layers (for which specific sub-scores are also created) play complementary roles. For instance, the Architecture-CFS classifies 4A vs 4B groups with a p value of 0.001.

**Conclusion:** The automated quantification of multiple histological phenotypic traits resolves the complexity of the histological assessment of severity and the activity in the cirrhosis continuum with a performance that benchmarks pathologist assessments.

**THU-202**

**Prognostic factors of post-sustained virological response outcome in patients with chronic hepatitis C treated with direct-acting antivirals**

Won Sohn1, Sang Hoon Ahn2, Young Seok Kim3, Seung Up Kim4, Kangbuk Samsung Hospital, Sungkyunkwan University School of Medicine, Korea, Rep. of South; 2Severance Hospital, Yonsei University College of Medicine, Korea, Rep. of South; 3Soonchunhyang University, Bucheon Hospital, Korea, Rep. of South; 4Severance Hospital, Yonsei University College of Medicine, Korea, Rep. of South

Email: ksukorea@yuhs.ac

**Background and aims:** Direct acting antivirals (DAAs) is the mainstay of antiviral therapy for patients with chronic hepatitis C (CHC). We investigated prognostic factors for the post-sustained virological response (SVR) outcomes in patients with CHC treated DAAs.

---

Figure: (abstract: THU-201).
Method: This multicentre, retrospective, nationwide cohort study consisted of 1,248 patients with CHC who were seen at 29 expert hepatology centres in Korea from January 2015 to December 2022 and who achieved SVR after DAA therapy. The primary outcome was the development of liver-related events (LREs) after SVR, including all-cause death, hepatocellular carcinoma (HCC), decompensation, or liver transplantation. The fibrotic burden at baseline and at SVR was assessed using transient elastography (TE) and the FIB-4 index.

Results: The mean age of the patients was 59.8 years and 58% (n = 722) were male. The prevalence of genotypes 1 and 2 was 52% and 46%, respectively. The mean liver stiffness value was 11.6 ± 9.8 kPa at baseline and 8.8 ± 7.5 kPa at SVR. LREs developed in 77 (6.2%) patients and consisted of death in 13, HCC in 34, decompensation in 44 and liver transplantation in 2 patients. The multivariable analysis showed that TE-defined cirrhosis at baseline (liver stiffness ≥14.4 kPa; hazard ratio [HR] = 2.56; 95% confidence interval [CI] 1.30–5.07) and FIB-4-defined advanced fibrosis stage at SVR (>3.25) (HR = 3.24; 95% CI 1.45–7.22) were independently associated with an increased risk of developing LREs (all p < 0.05), together with male sex (HR = 1.99; 95% CI 1.26–3.14) and lower serum albumin level at SVR (<4.0 g/dL [HR = 1.87; 95% CI 1.12–3.13]) (all p < 0.05).

Conclusion: The fibrotic burden decreased in patients with CHC after DAA treatment. However, the risk of developing LREs remained even after SVR. Our study showed that an assessment of fibrotic burden before and after DAA treatment is required for predicting outcomes in patients with DAA-treated CHC who achieve SVR.

THU-203
Utilising peer support workers in hepatitis C screening in emergency departments: a pilot study
Alex Caulder1,2, Jane Gitahi1, Ann Archer1,3, Abigail Sellick1,2, Julie Marshall1, Kushala Abeyesekera1,4, Fiona Gordon1, 1University Hospitals Bristol and Weston NHS Foundation Trust, Liver Medicine, Bristol, United Kingdom; 2Hepatitis C Trust, London, United Kingdom; 3University of Bristol, Population Health Sciences, Bristol, United Kingdom
Email: alex.caulder@uhbw.nhs.uk

Background and aims: As widespread availability of directly acting antivirals (DAAs) for hepatitis C (HCV) has improved, engaging with hard-to-reach groups with higher HCV prevalence has become a major focus of public health strategy. People who inject drugs (PWIDs) and the homeless often have difficulty engaging with screening measures and subsequent treatment. Outcomes for patients with liver disease have been repeatedly demonstrated to be worse in those with greater social deprivation. Baseline HCV testing of PWIDs attending our ED was low (6.3%) with a local HCV RNA positive prevalence of 10% in patients who were current injectors (2022 unpublished NHS England data). Peer support workers (PSW) have been shown to have high acceptability amongst patients with HCV to facilitate community-based screening and treatment. We sought to embed a PSW in the emergency department (ED) to see if this impacted detection of HCV and treatment initiation amongst PWIDs and homeless patients.

Method: 9-month pilot conducted between Feb-Nov 2022. PWIDs and homeless patients attending Bristol Royal Infirmary ED who identified through ED triage nurses and electronic alert systems. Highlighted patients were screened with OraQuick™ antibody and/or capillary blood-borne virus (BBV) testing. HCV positive patients were reviewed by a PSW, supported with Homeless Health team and Drugs and Alcohol nurse specialist. All HCV RNA positive patients were referred for treatment unless declined.

Results: 135 patients (81 males; 60%) were offered HCV testing at 159,126 patient ED episodes during the study period, which was accepted by 113 patients (26 OraQuick™ antibody; 88 BBV testing). In total, 24% of patients offered screening were HCV RNA positive (n = 33/135). 18 of these patients were known HCV RNA positive but had not been treated (54%), whilst 8/53 (15%) HCV RNA negative patients had previously missed their SVR check post-treatment. 5 of the 33 HCV RNA positive patients (15%) had become re-infected post prior successful treatment. 25/33 HCV RNA positive patients were aided by PSW to start treatment, giving a treatment conversion rate of 76% (positive test to treatment initiation). SVR data will be presented.

Conclusion: PSWs embedded within ED encourage high levels of engagement from PWIDs and homeless patients with HCV screening and treatment. This targeted strategy in a hard-to-reach population with high HCV prevalence offers an alternative approach to opt-out BBV testing of ED blood samples.

THU-204
A large-scale, centralized viral hepatitis screening model in Hainan province of China during the COVID-19 pandemic
Tao Wu1, Biao Wu1, Feng Lin1, Jiao Wang1, Jianzhi Zhao2, Lan Chen3, Jinjie Li4, 1Hainan General Hospital, Haikou, China; 2Dongfang Municipal Health Commission, Dongfang, China; 3Dongfang People’s Hospital, Dongfang, China; 4Dongfang Center for Disease Control and Prevention, Dongfang, China
Email: wutao1_ren@163.com

Figure: (abstract: THU-203).
Background and aims: Hainan Province of China is on target to meet the 2030 WHO goal of viral hepatitis elimination by 2025. An increase in screening rates is required to meet this target. The Viral Hepatitis Elimination project kicked off in Jan. 2022. Dongfang city of Hainan Province is listed as a pilot. HBV/HCV screening should be considered a priority in this regard. And over the past year, we have also carried out regular screening for SARS-COVID-2, which means that all people can participate in the screening.

Method: Under the leadership of the Hainan government, the specialists from 3A hospitals in Hainan province worked with the primary doctors in Dongfang city on the training to increase the awareness of viral hepatitis. We have also worked with the staffs of community, who are trained to handle outbreak prevention and control, to conduct screening campaigns. We completed screening for HBV/HCV at one time in pilot areas in Dongfang.

Results: We conducted a daily public screening campaign in the pilot areas from Nov.11th, 2022 to Dec.8th, 2022. Totally, 22,137 people (>18y) were screened in the pilot area, and 38,774 of them were screened HCV at one time, 2.3% of them are HCV-Ab (+), 183,593 of them were screen HBV, 7.3% of them are HBsAg (+). The incidence rate of HBsAg (+) people is higher when they are >30 <70 years old, especially when they are 40–60 years old. There are more cases of HCV-Ab (+) in people over 30 years old, especially in people aged 41–50.

Conclusion: This is a model of government-led and multi-party collaboration to increase awareness about viral hepatitis and successfully conduct screening campaigns. When the resources are limited, it is more beneficial to improve the efficiency of screening by focusing on the screening of HBsAg and HCV-Ab for people over 30 years old. It would be a good model for contributing to viral hepatitis elimination.

THU-205
Usefulness of serum CCL20 as a post sustained viral response biomarker for HCV-associated liver fibrosis
Atsumasa Komori1, Kosuke Matsumoto2, Yuki Kugiyama2, Tomoyuki Suehiro2, Yasuhide Motoyoshi1, Akira Saeki2, Shinya Nagaoka2, Hiroshi Yatsuhashi2.
1National Hospital Organization Nagasaki Medical Center, Clinical Research Center, Omura, Japan;
2National Hospital Organization Nagasaki Medical Center, Hepatology, Omura, Japan
Email: atsuriko1027@yahoo.co.jp

Background and aims: CCL20 is one of the advanced fibrosis-associated genes, that were commonly up-regulated among livers in advanced HCV, HBV, and NASH patients (Komori et al. Hepatology; 68: 909A, 2018). We analysed the chronological changes of serum CCL20 after the treatment with direct acting agents (DAAs) among patients with HCV-associated advanced fibrosis, in order to evaluate its potential as a post sustained viral response (SVR) serum biomarker for liver fibrosis.

Method: A) Serum CCL20 were compared between healthy volunteers (HV, n = 8) and HCV-eradicated patients whose FIB-4 index at SVR24 were larger than 3.25 after DAA treatment (cohort 1, n = 15). B) Serum CCL20 among HCV infected patients whose pre-treatment (Pre) liver stiffness (LS) were larger than 12.5 kPa by transient elastography (FibroScan) (median: 18.1 kPa, range: 13.1–47.2, cohort 2, n = 52) were analysed chronologically at Pre, SVR24, and SVR72. Correlation between serum CCL20 and either LS or serum fibrosis-associated glycosylated marker M2BPGi (Yamasaki et al. Hapatology, 2014) was evaluated (Spearman). Measurement of serum CCL20 was performed with ELISA kit (Quantikine, RandD systems, U.S.A.)

Results: A) Even after SVR, serum CCL20 were higher in cohort 1 than in HV (mean; 33.6 vs. 9.88 pg/ml, p = 0.015) B) Before treatment in cohort 2, serum CCL20 was correlated with LS (rs = 0.5129, p = 0.019), but not with M2BPGi (rs = 0.086, p = 0.0002), but not with M2BPGi (rs = 0.086, p = 0.0002). Decrease value from Pre to SVR24 in serum CCL20 (ΔCCL20) was correlated with ΔM2BPGi (rs = 0.5129, p = 0.019), but not with ΔLS (rs = 0.2520, p = 0.1646). Serum CCL20 was significantly decreased from Pre to SVR24, but not from SVR24 to SVR72 (Wilcoxon, p < 0.00001 vs p = 0.12749). Cumulative incidence of hepatocellular carcinoma until the end of observation among patients whose CCL20 were increased from SVR24 to SVR72 (Rebounding, n = 19) was not different to those in decrease (n = 33) (p = 0.12749). 6 out of 19 Rebounding experienced non-HCC liver-related events (de novo AIH, alcohol liver disease, fatty liver; n = 2, ascites, and esophageal varix).

Conclusion: Serum CCL20 may be an alternative biomarker for liver fibrosis that is useful even after SVR, as is M2BPGi. Such integrated character may partly be explained by the literature in which CCL20 was identified as fibrosis and steatosis marker for non-alcoholic steatohepatitis (Govaere et al. Sci Trans Med 2020).
**THU-206**

**Hepatitis C and monoclonal gammopathy of undetermined significance: clinical and hematological outcome after eradication with direct acting antivirals**

Rosa Claudia Stasio1, Elisabetta Bretto1, Marco Tizzani1, Roberta Lasco1, Yulia Troshina1,2, Giacomo Scaioli3, Fabrizia Pittaluga4, Giorgio Maria Saracco1,2, Alessia Ciancio1,2, 1S.C. Gastroenterology U, AOU città della salute e della scienza, Turin, Italy; 2Departement of medical sciences, University of Turin, Italy; 3Departement of public health sciences and pediatrics, AOU città della salute e della scienza, Turin, Italy; 4S.C. Microbiology and virology, AOU città della salute e della scienza, Turin, Italy

**Email:** stasio.rosa.claudia@gmail.com

**Background and aims:** Monoclonal gammopathy of undetermined significance (MGUS) has previously been reported among extrahepatic manifestations of HCV. Currently, limited data are available about the impact of HCV eradication on MGUS progression. Hence, the aim of our study is to investigate the outcome of patients with MGUS and HCV after eradication with Direct acting antivirals (DAAs).

**Method:** Between February 2015 and March 2022, 2914 patients with HCV were treated with DAAs in our hospital. Among them, 62 patients (29 Male/33 Female, mean age 71.3 (+10.9)) presented MGUS before DAAs therapy. HCV genotype 1a has been found in 9 patients, 1b in 32, 2 in 14, 3 in 4, 4 in 2, 5 in 1 patient. Forty patients were naive, 16 non-responder and 6 relaper to INF-based therapy. Twenty patients were cirrhotic (32.8%). Virological and haematological end points have been retrospectively assessed at 3 months (T1), 6 months (T2) and at the most recent hepatologic/haematologic examination (T3) after sustained viral response (SVR12). MGUS progression was defined as development of symptomatic disease (CRAB criteria) and/or as an increase of monoclonal component (MC) ≥10%. Disease improvement was defined as reduction of MC ≥10%.

**Results:** Prevalence of MGUS in the selected cohort was 2.1%, similar to MGUS prevalence in the general population. SVR12 was obtained in all 62 patients (100%). MGUS improvement was reported in 20.3% of patients at T1, in 21% at T2 and in 19.6% at T3. Six patients (11.7%) showed MC regression at blood testing. Disease progression was reported in 1 patient (1.7%) at T1, in 2 (3.5%) at T2 and in 5 (9.8%) at T3. Only one of them progressed to Multiple myeloma (MM) at T3. All the others remained stable.

**Conclusion:** HCV eradication with DAAs is efficient and safe in patients with MGUS, and it is associated with very low rates of disease progression. Further studies are required to accurately reinforce their correlation.

---

**THU-207**

**Ethnic disparity in mortality related to extrahepatic manifestations among people with chronic HCV infection: a large, linked administrative population-based study in British Columbia, Canada**

Dahn Jeong1, Stanley Wong2, Mohammad Ehshanul Karim1,2, Amee Manjes1,2, Jean Damascene Makuza1, Hector Velasquez2, Prince Adu1, Sofia Bartlett2, Eric Yoshida1, Maria Alvarez1, Amanda Yu2, Mawuena Binka2, Alnoor Ramji3, Mel Krajden5

1The University of British Columbia, School of Population and Public Health, Canada; 2BC Centre for Disease Control, Canada; 3St. Paul’s Hospital, Centre for Health Evaluation and Outcome Sciences, Canada; 4The University of British Columbia, Division of Gastroenterology, Canada; 5The University of British Columbia, Department of Pathology and Laboratory Medicine, Canada

**Email:** dahn.jeong@bccdc.ca

**Background and aims:** Previous studies showed ethnic disparities in HCV-related clinical outcomes. Asian Americans living with HCV had higher cirrhosis and hepatocellular carcinoma. As for extrahepatic manifestations (EHM), Asians in US and Canada had a greater risk of diabetes than people of other ethnicities. Currently, there is little research on ethnic disparities in other EHM’s. This analysis assessed the ethnic disparity in EHM-related mortality in a large, population-based cohort.

---

**Figure 1:** Upper: Overall survival curves for people diagnosed with HCV in BC-HTC, by ethnicity and treatment status. Lower: EHM-related mortality rates for people diagnosed with HCV in BC-HTC, by ethnicity and treatment status.
Hepatitis C virus (HCV) infection and neurocognitive impairment

Background and aims: Hepatitis C virus (HCV) infection is one of the leading causes of liver cirrhosis, hepatocellular carcinoma, and liver-related deaths. It is estimated that 40%-74% of HCV subjects will experience at least one extra hepatic manifestation within their lifetime, including neurocognitive deficits. The finding of HCV-RNA sequences in post-mortem brain tissue raised the possibility that HCV infection may affect the central nervous system and be the source of subtle neuropsychological symptoms, even in non-cirrhotic patients. Our investigation aimed to evaluate whether untreated, asymptomatic, mild HCV-infected subjects showed cognitive disfunctions.

Method: In this case-control observational study conducted at the Liver Unit of Gaffrée e Güinle University Hospital (HUGG), from May 2019 through March 2020. All HCV-infected subjects (anti-HCV and HCV-RNA detectable) over 18 years old were considered eligible for investigation. Only HCV subjects with compensated liver disease were included in the patient group. The comparison group consisted of subjects HCV negative and who were over 18 years old and paired by age and Human Development Index (HDI). HCV[1] subjects and healthy controls were tested at the same moment using three neuropsychological instruments in a random sequence: Symbol Digit Modality Test (SDMT), COWAT and the Continuous Visual Attention test (CVAT). We performed depression screening by DSM-V, liver fibrosis assessment by liver stiffness and blood tests, as well as genotyping (sequencing) and HCV-RNA viral load (RT-PCR). A MANCOVA was performed to examine group differences (HCV vs. Healthy) in the six variables: OE (omission-errors), CE (commission-errors), reaction time (RT), variability of RT (VRT), SDMT, COWAT, using age, HDI and sex as covariates. Univariate ANCOVAs assess the effect of HCV on each one of the six neuropsychological variables. A discriminant analysis was performed to identify which variables effectively discriminate HCV-infected subjects and healthy controls.

Results: A sample of 48 subjects was initially evaluated. After applying the exclusion and inclusion criteria, 20 patients were excluded due to the following reasons: a) previous use of α-interferon: n = 8; b) cirrhosis: n = 3; c) type 2 mellitus diabetes: n = 3; d) depression: n = 2; e) patients without assessment of renal function: n = 2; f) hypothyroidism: n = 1 and g) bridging fibrosis (F3 fibrosis) subject with three abnormal liver enzymes; n = 1. Age and HDI did not differ among all groups. Mild fibrosis (F0-F2) was identified in 82.14%. Genotype was predominately 1 (82.14%). There were no differences in COWAT, (p = 0.614) and SDMT (p = 0.608) between the groups. Performance of HCV group was poorer than the controls based on the CVAT. The univariate analysis indicated specific significant differences in RT (p = 0.047) and VRT (p = 0.048). We found RT to have significant discriminant ability (71.7%).

Conclusion: EHM-related mortality was high among East and South Asians diagnosed with HCV, particularly among those who didn’t receive treatment. HCV treatment decreased the risk of EHM-related death across all ethnicities and reduced disparities in EHM-related mortality. Continued provider and patient engagement efforts for HCV treatment could reduce HCV-related disease burden.

THU-208
Hepatitis C virus (HCV) infection and neurocognitive impairment in subjects with mild liver disease
Carlos Brandão-Mello1, Marcia Maria Amendola Pires1, Max Fakoury1, Helen Rose Maia Salazar2, Silvia Bastos de Oliveira2, Sergio Schmidt2
1Gastrointestinal and Liver Unit, Gaffrée e Güinle University Hospital, Internal Medicine, Rio de Janeiro, Brazil; 2Postgraduate Program in Neurology, Department of Neurology, Rio de Janeiro, Brazil

Email: cedubrandao@gmail.com

Background and aims: Chronic hepatitis C and aging: search for cognitive changes
Carlos Brandão-Mello1, Max Fakoury1, Marcia Maria Amendola Pires1, Sergio Schmidt2
1Gastrointestinal and Liver Unit, Gaffrée e Güinle University Hospital, Internal Medicine, Rio de Janeiro, Brazil; 2Postgraduate Program in Neurology, Department of Neurology, Neurology, Rio de Janeiro, Brazil

Email: cedubrandao@gmail.com

Method: A sample of 48 subjects was initially evaluated. After applying the exclusion and inclusion criteria, 20 patients were excluded due to the following reasons: a) previous use of α-interferon: n = 8; b) cirrhosis: n = 3; c) type 2 mellitus diabetes: n = 3; d) depression: n = 2; e) patients without assessment of renal function: n = 2; f) hypothyroidism: n = 1 and g) bridging fibrosis (F3 fibrosis) subject with three abnormal liver enzymes; n = 1. Age and HDI did not differ among all groups. Mild fibrosis (F0-F2) was identified in 82.14%. Genotype was predominately 1 (82.14%). There were no differences in COWAT, (p = 0.614) and SDMT (p = 0.608) between the groups. Performance of HCV group was poorer than the controls based on the CVAT. The univariate analysis indicated specific significant differences in RT (p = 0.047) and VRT (p = 0.048). We found RT to have significant discriminant ability (71.7%).

Conclusion: HCV subjects with mild disease showed deficits in RT and intraindividual VRT as compared to healthy controls in CVAT. The higher VRT and RT exhibited by the HCV group might be explained by lapses in attention which affected the stability of response times and caused an increase in VRT. Our finding suggests that patients with mild HCV exhibit sustained attention problems and it may reflect deficits in the intrinsic alertness subdomain.

THU-209
Chronic hepatitis C and aging: search for cognitive changes
Carlos Brandão-Mello1, Max Fakoury1, Marcia Maria Amendola Pires1, Sergio Schmidt2
1Gastrointestinal and Liver Unit, Gaffrée e Güinle University Hospital, Internal Medicine, Rio de Janeiro, Brazil; 2Postgraduate Program in Neurology, Department of Neurology, Neurology, Rio de Janeiro, Brazil

Email: cedubrandao@gmail.com

Background and aims: Hepatitis C virus (HCV) exhibits neurotropism, including brain areas associated with cognitive impairment (CI). Therefore, HCV infection is a risk factor for CI, even without hepatic manifestations. Most infected elderly acquired HCV when they were young by parental route, and the disease remains asymptomatic. However, elderly chronically infected might be at a greater risk of CI. AIM: To investigate cognitive performance of asymptomatic elderly with HCV controlling for risk factors commonly associated with cognitive decline.

Method: Cross sectional observational study conducted between May 2018 to February 2020 at the Gastroenterology and Liver outpatient clinic of the Gaffrée e Güinle University Hospital (HUGG). The patients underwent a global health assessment, which provided information on the epidemiological and comorbidity profile, functionality and general well-being, in addition to data on liver function tests, grade of fibrosis (evaluated by liver stiffness), genotype (sequencing) and viral load (RT-PCR). Then, the study participants were subjected to a battery of neurocognitive tests, namely, the Minicog, Mini-Mental State Examination (MMSE), verbal fluency test (VFT) semantic category (animals), and clock drawing test (CDT). Elders uninfected (n = 41) and chronically HCV-infected (n = 41) were paired by age, sex, comorbidities, depression, lifestyle, and level of education. HCV-infection was confirmed by anti-HCV reactive and detectable HCV-RNA for more than six months. Participants coinfected with hepatitis B (HBV) or HIV were excluded. A MANCOVA tested whether HCV infection affected cognitive...
performance. The possible effect of each covariate and its respective interactions were analysed.

**Results:** There were not any significant differences between the two groups regarding age, sex, and educational level. However, schooling affected both groups. We found a highly significant main effect of education in relation to cognitive tests ($F = 4.42, 293 df = 4/73, P = 0.003, n_2 = 0.20$) and a main effect with no difference between groups, that is, nonsignificant effect of Group ($F = 1.31, df = 4/73, P = 0.27, n_2 = 0.07$). Based on the results of the MANCOVAs, in which education was the only one that had statistical significance in the analyses, we performed the ANCOVAs, where the univariate tests showed that education affected the performance of the MMSE scores ($F = 12.3, 299 df = 1/76, P = 0.001, n_2 = 0.14$) and VFT ($F = 11.1, df = 1/76, P = 0.001, n_2 = 0.13$). The difference in education level approached the significance level in the CDT ($F = 3.63, df = 1/76, P = 0.06, n_2 = 0.05$). In contrast, MINICOG did not differ between the two groups regarding years of formal education (Low and High). All other univariate measures did not reach significant results.

**Conclusion:** HCV infection did not influence performance of the cognitive screening tests in elderly subjects. Formal years of education (cognitive reserve) may have protected elderlies with HCV-infection. Future studies should be performed using specific tests associated with the brain regions affected by HCV.

**THU-210**

**Coadministration of hepatitis C direct-acting antivirals and enzyme-inducing antiepileptic drugs:** real-world experience from a multi-centre case series

Alison Boyle, Fiona Marra, Helen Boothman, Sonal Patel, Yun Jung Kim, Rachael Kamiri-Ngugi, Aimee Francisco, Rebecca Turley, NHS Greater Glasgow and Clyde, Pharmacy, United Kingdom; University of Liverpool, Pharmacology and Therapeutics, United Kingdom; St George’s University Hospitals NHS Foundation Trust, Pharmacy, United Kingdom; Guy’s and St Thomas’ NHS Foundation Trust, Pharmacy, United Kingdom; University Hospital Southampton NHS Foundation Trust, Pharmacy, United Kingdom; Royal Surrey NHS Foundation Trust, Pharmacy, United Kingdom; King’s College Hospital NHS Foundation Trust, Pharmacy, United Kingdom; Barking, Havering and Redbridge University Hospitals NHS Trust, Pharmacy, United Kingdom

**Background and aims:** Coadministration of enzyme-inducing antiepileptic drugs (eAEDs) and hepatitis C (HCV) direct-acting antivirals (DAAs) is not currently recommended due to potential drug-drug interaction (DDI) resulting in significantly reduced DAA levels and risk of treatment failure. This presents a significant barrier to HCV treatment for patients who are unable to stop or switch to alternative antiepileptic agents. There have been a small number of case reports published describing successful outcomes in patients receiving HCV DAA treatment while remaining on eAEDs. This has led to updated recommendations in the University of Liverpool DDI resource, www.hep-druginteractions.org, to allow consideration of HCV DAA treatment where coadministration is unavoidable. However, the lack of widespread clinical experience may still lead to hesitancy in prescribing in this patient cohort.

**Method:** A retrospective case series evaluating treatment outcomes of patients prescribed HCV DAAs in combination with eAEDs in 6 centres across the UK.

**Results:** A total of 11 patients with chronic, treatment-naïve HCV were treated with HCV DAAs in combination with eAEDs. Median age was 56 years (range 38-64 years), 8 (73%) patients were non-cirrhotic, 9 (82%) were male and 7 (64%) had GT1A HCV. HCV DAAs were prescribed at standard doses (12 weeks sofosbuvir/velpatasvir ($n = 6$), 8 weeks ledipasvir/sofosbuvir ($n = 3$), 8 weeks glecaprevir/pibrentasvir ($n = 2$)). Coadministered eAEDs included carbamazepine ($n = 6$), phenytoin ($n = 3$), oxcarbazepine ($n = 1$), phenobarbitaline ($n = 1$). High treatment adherence was reported for 10/11 individuals with 1 patient completing 50% of prescribed treatment course. On-treatment HCV PCR data was available for 7 (64%) patients; of those, 6 had an undetectable HCV PCR and 1 had HCV PCR 156 IU/ml within the first 4-6 weeks of treatment. End of treatment HCV PCR was available for 6 (55%) patients with all achieving undetectable levels. SVR 12 results are available for 3 patients so far with all achieving SVR 12. The remaining 8 patients are awaiting SVR 12 results. Full SVR data will be presented.

**Conclusion:** This is the largest single case series of coadministered eAEDs and DAAs. Preliminary data of treatment outcomes are very encouraging and support previously published real-world case reports. These results will help inform HCV treatment decisions in this cohort who continue to face challenges in accessing treatment.

**References:**


**THU-211**

**Impact of hepatitis C treatment on biochemical and metabolic parameters in HIV/HCV coinfected patient**

Lourdes Pedroza, Misael Osmar García Martín, Víctor Ahumada Topete, Karina Sevilla, Manuel Castillejos Lopez, Gustavo Reyes Teran, Andrea Carenas Ortega, Akio Murakami Ogasawara, Santiago Ávila Rios, Arturo Rodea Monroy, Instituto Nacional de Enfermedades Respiratorias, Gastroenterology and Endoscopy, Ciudad de México, Mexico; Instituto Nacional de Enfermedades Respiratorias, Hospital Epidemiology and Infectious Disease Unit, Ciudad de México, Mexico; CCINSNAE, principal of the coordinating commission of national health institutes and highly specialized hospitals, Ciudad de México, Mexico; Instituto Nacional de Enfermedades Respiratorias, infectious disease research center, Ciudad de México, Mexico

**Email:** drapedroza.lourdes@gmail.com

**Background and aims:** Efficacy and effectiveness of direct-acting antivirals (DAAs) in HIV/HCV coinfected patients such as mono-infected patients; however, few studies analyze post-treatment improvement in this population. This study aimed to evaluate the changes in renal and hepatic function and fibrosis in coinfected patients treated with direct-acting antivirals.

**Method:** In this observational and prospective study, from April 2017 to April 2022, HIV/HCV coinfected this patient from a specialized care clinic in Mexico; the duration of treatment with DAAs was 12 weeks. Quantitative variables were described using the mean and standard deviation or median and interquartile range. Using the Wilcoxon rank test, the continuous quantitative variables were compared with the 24-week results (sustained viral response).

**Results:** 86 patients were included, mean age of 40.36 (SD 9.08); 79 (91.9%) men and 7 (8.1%) women, all on ART with virological suppression. The following results were obtained when comparing the baseline data vs. sustained viral response: glomerular filtration rate ($105.0$ IU/l (79.0-$86.25$) vs. 21.1 IU/l (15.2-$22.0$) with $p = 1.0582E-12$), ALP ($34.1$ with $p = 3.52E-05$, Total cholesterol ($149.75$ mg/dl (134.5-$183.25$) vs. $147.95$ mg/dl (143.25-$187.87$) with $p = 0.035503$, LDL Cholesterol
85.0 mg/dl (63.22–104.05) vs. 102.2 mg/dl (85.65–120.85) with p = 0.002335.

**Conclusion:** HIV/HCV coinfected patients in virological suppression showed medium-term improvement in most biochemical and metabolic parameters. Simultaneously, a decrease in fibrosis scores was observed after presenting a sustained viral response.

**THU-212**

**Sustained virologic response outcomes in patient with hemodialysis-hepatitis C receiving treatment with direct-acting antivirals agents**

Fardhah Akil1,2, Rini Bachtiar1,2, Muhammad Luthfi Parewangi1,2, Nu’man AS Daud1,2, Susanto Kusuma1,2, Amelia Rifai1,2, Hasyim Kasim3, Haerani Rasyid4, 1Centre of Gastroenterology-Hepatology HAM Akil/DR. Wahidin Sudirohusodo General Hospital, Indonesia; 2Hasanuddin University, Division of Gastroenterology-Hepatology, Department of Internal Medicine, Indonesia; 3Hasanuddin University, Division of Nephrology, Department of Internal Medicine, Indonesia

**Email:** dndakil@gmail.com

**Background and aims:** Direct-acting antiviral agents (DAAs) have become first-line treatment for hepatitis C virus (HCV) infection and was associated with a survival benefit among persons on hemodialysis. Study of efficacy treatment of DAAs by sustained virologic response (SVR) in dialysis patients are still limited especially in Indonesian population.

**Method:** This retrospective cohort study was conducted in tertiary care hospital in Makassar, Indonesia between 2017 and 2020. From 90 patients naïve HCV on hemodialysis, 75 of them had received DAAs with regimen Sofosbuvir/Simeprevir, Sofosbuvir/Daclastavir, Sofosbuvir/Ribavirin, and Elbasta/vi/Grazoprevir. The outcome were sustained virological responses by 12 weeks (SVR12), improvement or deterioration of kidney function by estimated Glomerular Filtration Rate (eGFR)/creatinine, hepatic fibrosis assessed by aspartate aminotransferase-to-platelet ratio index (APRI)/Fibrosis-4 index (FIB-4) scores and the associated factors.

**Results:**

- Overall the SVR12 rate was 93.3% and by regimen SOF/SIM, SOF/DAC, SOF/RIB, and ELB/GRV were 95.7%, 90%, 100%, and 80%, while Child-Pugh (CP) class A/B/C had 95.6%/90%/100% respectively. In patients with cirrhosis/no cirrhosis, the SVR rate were similar 93.5%/93.2%.
- The mean eGFR for SOF/SIM associated with SVR12 were deteriote from 36.1 to 17.15, while SOF/DAC were improve from 14.54 to 18.79; but no statistically significant for overall eGFR.
- Both overall mean score APRI and FIB-4 improvement was associated with SVR12 0.16 (95% CI 0.03–0.30) and 0.42 (95% CI 0.13–0.71) respectively; similar to APRI/FIB-4 pre and post treatment regardless of the DAAs regimens (p < 0.05).

**Conclusion:** DAA-mediated SVR12 in HCV dialysis patients resulted in high rate SVR12 >90% and similar rate in all CP class, cirrhosis status with improvement of hepatic fibrosis and kidney function especially on sofosbufir/daclastavir regimen.

**Figure:** (abstract: THU-211): Represents the box-and-whisker plots of the Score for hepatic fibrosis.
RAS testing performed, where mutation was present in 51%, 25% received ribavirin with SOF/VEL/VOX. 42% had pre-treatment indeterminate (0.9%). 17.2% receive SOF/VEL prior to SOV/VEL/VOX; were diverse (GT1: 74.4%, GT2: 9.9%, GT3: 26.1%, GT4: 8.5%, GT6: 1.4%).

Overall pooled SVR12 was 95.0% (95%CI: 94.0–95.8%), with lower SVR12 in Europe compared to region (Europe 84.3% vs Asia Pacific: 96.2%; America 93.0% or Africa 98.9%, p < 0.0001 for all). Predictors for treatment failure for retreatment by SOF/VEL/VOX were genotype 3 (OR 0.39, 95%CI: 0.23–0.64, I²7%), active HCC (OR 0.22, 95%CI: 0.08–0.57, P<0.0001), baseline cirrhosis (OR 0.25, 95%CI: 0.11–0.60, I²41%), decompensated cirrhosis (OR 0.09, 95%CI: 0.03–0.23, I²38%) and prior SOF/VEL (OR 0.35, 95%CI: 0.13–0.94, I²54%). Baseline RAS mutation and addition of ribavirin to SOF/VEL/VOX was not associated with higher SVR12. Treatment discontinuation due to drug-related was uncommon (10 studies, 0.2%).

Conclusion: SOF/VEL/VOX is efficacious and safe for retreatment in HCV patients with prior DAA failure. even with RAS mutation. Our findings support SOF/VEL/VOX as 1st-line rescue treatment for DAA-experienced HCV patients.

Background and aims: About 5% of chronic hepatitis virus (HCV) patients treated with direct-acting antiviral did not achieve sustained virological response (SVR12). Data on treatment outcome and predictor of treatment failure on DAA-experienced HCV patients receiving sofosbuvir/velpatasvir/voxilaprevir (SOF/VEL/VOX) is limited. We performed a systematic review and meta-analysis to evaluate the efficacy and safety of SOF/VEL/VOX as salvage treatment in DAA-experienced HCV patients.

Method: A comprehensive search of 5 electronic databases were performed from inception to 1st January 2023. All English literature, irrespective of study design, publication dates were extracted. Pooled estimates were reported in odds ratio (OR) with 95% confidence interval (CI) using random-effect model. Our study outcome was the SVR12, based on modified intention-to-treat; secondary outcome was treatment discontinuation due to treatment-related adverse effect. Subgroup analysis performed based on genotype, status of cirrhosis, HCC, prior SOF/VEL exposure and region.

Results: Over 517 citations identified from 5 databases (PubMed, EMBASE, MEDLINE, Clinical-trial.gov and Web of Science). Data from 24 studies (Asia pacific = 5, Africa = 3, America = 7, Europe = 9) involving 2,822 DAA-experienced HCV patients were included. All studies had low to moderate risk of bias. The mean age was 53 years old, 81% were male. 42% had liver cirrhosis. Genotype distributions were diverse (GT1: 74.4%, GT2: 9.9%, GT3: 26.1%, GT4: 8.5%, GT6: 1.4%, indeterminate: 0.9%). 17.2% receive SOF/VEL prior to SOV/VEL/VOX; 25% received ribavirin with SOF/VEL/VOX. 42% had pre-treatment RAS testing performed, where mutation was present in 51%.

Viral hepatitis C Therapy and resistance

THU-214
Progress towards achieving hepatitis C elimination in the country of Georgia, April 2015-December 2022
Tengiz Tsirtsvadze1,2, Amiran Gamkrelidze3, Nikoloz Chkhartishvili1, Akaki Abutidze1,2, Lali Sharvadze2,4, Maia Butashvili5, Jaba Zarkua6, Lia Gvinjilia1,2, Shaun Shadaker6, Ekaterine Adamia3, Stefan Zeuzem10, Sanjeev Arora11, Francisco Averhoff12, Senad Handanagic13, Tamar Gabunia3, Infectious Diseases, AIDS and Clinical Immunology Research Center, Georgia; 2Ivane Javakhishvili Tbilisi State University, Georgia; 3National Center for Disease Control and Prevention, Georgia; 4Centers for Disease Control and Prevention, Georgia; 5Goethe University Hospital, Germany; 6University of New Mexico, United States; 7Department of Family and Preventive Medicine, Emory University School of Medicine, United States

Background and aims: The country of Georgia launched the world’s first national hepatitis C elimination program in April 2015. Key strategies include nationwide screening, active case finding, linkage to care, decentralized care, and provision of treatment for all persons with hepatitis C virus (HCV) infection, along with effective prevention interventions. The elimination program aims to achieve the following targets: a) diagnose 90% of HCV-infected persons, b) treat

Figure: (abstract: THU-212).
95% of those diagnosed, and c) cure 95% of those treated. We report progress toward elimination targets of the elimination program.

Method: The estimated number of persons with HCV infection was based on a 2015 population-based national seroprevalence survey, which showed that 5.4% of the general adult population had current HCV infection (approximately 150,000 persons). We analyzed data in the national HCV screening and treatment databases during April 2015–December 2022.

Results: As of December 31, 2022, 154,428 adults screened positive for HCV antibodies. Of those, 128,093 (82.9%) received HCV RNA or core antigen testing. A total of 100,576 (78.5%) persons tested had detectable HCV infection, and 80,828 (80.4%) initiated treatment. Of 57,031 adults who were evaluated for sustained virologic response (SVR), 56,447 (99.0%) had no detectable HCV RNA. Based on the 90–95% program goals, Georgia has diagnosed 67.1% of the estimated 150,000 adults with current HCV infection, treated 63.0% of the target 128,250 (95% of 150,000), and cured 46.3% of the target 121,837 (95% of 128,250). Treatment effectiveness was comparable among persons with advanced fibrosis (FIB-4 score F3 or F4) with 98.3% achieving SVR, and among patients with mild or no liver fibrosis (FIB-4 score≤F2), SVR = 99.2%, p < .0001.

Conclusion: Georgia has made substantial progress toward eliminating hepatitis C. Over 65% of persons with current HCV infection have been diagnosed, and most have initiated treatment and experienced high cure rates regardless of fibrosis status. Challenges remain in identifying and linking to care persons with current HCV infection in Georgia. The Nationwide integrated, decentralized model of HCV treatment, which is already implemented in many locations, will be critical to improve linkage to care and close gaps in the HCV cascade of care.

THU-215

The most difficult to cure with pangenotypic regimens HCV infected population

Robert Flisiak1, Hanna Berak2, Anna Parfieniuk-Kowerda1, Dorota Dybowska3, Krzysztof Tomasiewicz4, Marek Sitko5, Dorota Zareńska-Michaluk6, Włodzimierz Mazur7, Ewa Jancewskas8, Jakub Klapaczynski9, Jerzy Jaroszewicz10, Robert Flisiak1, Hanna Berak2, Anna Parfieniuk-Kowerda1, Dorota Dybowska3, Krzysztof Tomasiewicz4, Marek Sitko5, Dorota Zareńska-Michaluk6, Włodzimierz Mazur7, Ewa Jancewskas8, Jakub Klapaczynski9, Jerzy Jaroszewicz10.

Background and aims: Pangenotypic therapies for HCV infections, although universal and highly effective, leave the risk of treatment failure. The aim of the analysis was to find out the most difficult to cure with pangenotypic regimens population of HCV infected patients.

Method: The analysis included patients selected from the EpiTer-2 database, a large retrospective, multicentre, national real-world study evaluating DAA treatment during period of 2015–2022 in 17, 166 consecutive subjects with hepatitis C virus (HCV) infection. The effectiveness of treatment was assessed in populations known as a worse response to treatment, and then in a population with a combination of all these characteristics.

Results: A total of 5,549 patients were treated with pangenotypic regimens, of which 5,217 achieved SVR, that after excluding 194 lost to follow-up resulted in a response rate of 97.4%. In the group of 1,338 patients infected with genotype 3, the SVR rate was 94.5%, among 1,142 patients with cirrhosis-94.2%, in the population of 2,852 men-96.5%, and among 941 people with BMI>30 it reached 96.8%. The analysis carried out in a group of 82 men with cirrhosis and obesity, infected with genotype 3 showed the effectiveness of pangenotypic therapy at the level of only 85.4%, with 89.3% in treatment naive patients and 76.9% in patients with previous therapy failure.

Conclusion: Studying a large population of pangenotypically treated HCV-infected patients, we showed relatively low effectiveness in men with cirrhosis and obesity, infected with genotype 3. Triple therapy should be considered initiating the treatment of HCV infections in this group, which, however, needs to be confirmed in further studies. Previous studies (Polaris-3) were conducted in a less demanding population of patients with cirrhosis infected with genotype 3, so they did not take into account gender and BMI, which significantly worsen the effectiveness.

THU-216

Real-life effectiveness of voxilaprevir/sofosbuvir/velpatasvir in hepatitis C patients previously treated with sofosbuvir/velpatasvir or glecaprevir/pibrentasvir

Juan Carlos Ruiz-Cobo1, Jordi Llaneras1, Maria Buti1,2, Xavier Forns2,3,4, Isabel Conde2,6, Ana Arencibia Almeida7, Moises Diago8,9, Francisco Javier Garcia-Samaniego Rey10,11, José Castellote Alonso12,13, Susana Llerena14,15, Elisa Rodríguez16,17, Beatriz Mateos Muñoz18,19,20, Manuel Rodríguez21,22, Inmaculada Fernández Vázquez23, Jose Miguel Rosales Zabál24, José Luis Calleja Panero25,26,27,28,29, Rosa M Morillas27,28,29, Silvia Montoliu30,31, Adolfo Gallego Moya2, Raul J. Andrade32,33,34,35, Manuel Hernández Guerra36, Esther Badia-Aranda37,38, Carlota Jimeno Mate39, Jesús González Santiago39,40, Beatriz Cuencia41, Vanesa Bernal Monterde42,43, Manuel Delgado44, Juan Turmes45,46, Sabela Lenz47,48,49, Valt Hebron University Hospital, Hepatology, Barcelona, Spain; 2CIBERehd, 3Hospital Clinic de Barcelona, Liver Unit Hospital Clinic, Barcelona, Spain; 4Institut d’Investigacions Biomèdiques August Pi i Sunyer (IDIBAPS), Barcelona, Spain; 5Universitat de Barcelona, Barcelona, Spain; 6La Fe University and Polytechnic Hospital, Hepatology and Liver Transplantation Unit, Valencia, Spain; 7Our Lady of Candelaria University Hospital, Gastroenterology and Hepatology, Santa Cruz de Tenerife, Spain; 8 Consortium General University Hospital of Valencia, Valencia, Spain; 9University of Valencia, Valencia, Spain; 10IdiPaz, Madrid, Spain; 11La Paz University Hospital, Madrid, Spain; 12 Bellvitge University Hospital, L’Hospitalet de Llobregat, Spain; 13IDIBELL Institut d’Investigació Biomèdica de Bellvitge, L’Hospitalet de Llobregat, Spain; 14Marqués de Valdecilla University Hospital, Gastroenterology and Hepatology, Santander, Spain; 15IDIVAL, Santander, Spain; 16Virgen del Rocio University Hospital, Digestive Diseases Research Unit, Sevilla, Spain; 17Facultad de Biología, Cell Biology, Sevilla, Spain; 18Ramón y Cajal Hospital, Gastroenterology, Madrid, Spain; 19Instituto Ramón y Cajal de Investigación Sanitaria-ICVS, Madrid, Spain; 20Alcalde University, A lcalde de Henares, Spain; 21 Central University Hospital of Asturias, Gastroenterology and Hepatology, Oviedo, Spain; 22University of Oviedo, Oviedo, Spain; 23University Hospital Oviedo, Gastroenterology and Hepatology, Madrid, Spain; 24Hospital Costa del Sol, Gastroenterology and Hepatology, Marbella, Spain; 25Puerta de Hierro Majadahonda University Hospital, Majadahonda, Spain; 26Instituto de Investigación Sanitaria Puerta del Hierro, Spain; 27 Germans Trias i Pujol Hospital, Hepatology, Badalona, Spain; 28IGIT Institute Germans Trias i Pujol, Badalona, Spain; 29Universitat Autònoma de Barcelona, Bellaterra, Spain; 30Hospital University Hospital of Tarragona Joan XXIII, Tarragona, Spain; 31Institut d’Investigación Sanitària Pere Virgili, Spain; 32 Hospital de la Santa Creu i Sant Pau, Spain; 33 Hospital Universitari Virgen de la Victoria, Málaga, Spain; 34BIONAND, Málaga, Spain; 35University of Malaga, Málaga, Spain; 36Hospital Universitario de Canarias, La Laguna, Spain; 37Burgos University Hospital, Gastroenterology and Hepatology, Burgos, Spain; 38Hospital De Valme, Gastroenterology and Hepatology, Seville, Spain; 39Salamanca University Hospital, Gastroenterology and Hepatology, Salamanca, Spain; 40Biomedicine Research Institute (IBSAL) Salamanca, Spain; 41Getafe University Hospital, Gastroenterology and Hepatology, Getafe, Spain; 42 Miguel Servet University Hospital, Gastroenterology and Hepatology, Zaragoza, Spain; 43Instituto de...
Background and aims: Voxilaprevir/sofosbuvir/velpatasvir (VOX/SOF/VEL) is the recommended therapy for patients with chronic hepatitis C who failed to direct-acting antivirals (DAAs). This is based on studies that mainly included failures to DAAs that are not currently recommended. There is still limited data on retreatment after failure to current first line therapies, sofosbuvir/velpatasvir (SOF/VEL) and glecaprevir/pibrentasvir (GLE/PIB). The aim of the study was to analyze the effectiveness and safety of VOX/SOF/VEL in a real-world setting among only failures to SOF/VEL or GLE/PIB.

Method: Patients with HCV retreated with VOX/SOF/VEL after SOF/VEL or GLE/PIB failure were enrolled in 26 centers in Spain between December of 2017 and December of 2022. All patients received VOX/SOF/VEL + ribavirin (RBV) for 12 weeks. Sustained virological response (SVR) was defined as undetectable HCV-RNA 12 (SVR12) weeks after the end-of-treatment. Patients with HCV reinfection were excluded.

Results: A total of 135 patients were included, 98 (72.6%) had failed to SOF/VEL and 37 (27.4%) to GLE/PIB. Baseline characteristics were median age 54.1 (IQR 9) years, 84.4% male, 96% Caucasian, 11.9% were cirrhotic. GT3 was the predominant in 50.4% of patients followed by GT1 in 36.8%. Median HCV-RNA was 2.9 × 10⁶ (2.4 × 10⁶–3.2 × 10⁶) IU/ml. Up to now, 97 (86.6%) of 111 patients who reached follow-up 12 weeks after treatment have achieved SVR. There was a trend to higher rate of SVR in patients previously treated with GLE/PIB than SOF/VEL (88.9% vs. 85.5%) (p = 0.43). There were no significant differences in SVR between patients with or without cirrhosis (84% vs. 90%) (p = 0.24), or based on HCV genotype, being 83% for GT3 vs. 89% in other genotypes (p = 0.29). Among the 14 patients without SVR to VOX/SOF/VEL despite completing treatment, 9 were GT3, 7 had cirrhosis and 4 (29%) were both GT3, cirrhotic and previously treated with SOF/VEL. RBV was added to VOX/SOF/VEL in 8 (6%) patients and all of them achieved SVR including 5 (63%) GT3 with cirrhosis and prior failure to SOF/VEL. There were no adverse relevant events related to the medication.

Conclusion: VOX/SOF/VEL in the real world is an effective rescue therapy for failures to SOF/VEL or GLE/PIB. There is a trend toward higher SVR in patients previously treated with GLE/PIB. The addition of RBV to VOX/SOF/VEL could rise the rate of SVR and might be considered in patients with GT3, cirrhosis and prior failure to SOF/VEL.

THU-217
An algorithm for simplified hepatitis C virus treatment with non-specialist care based on real-world data from a nationwide registry in Taiwan

Ming-Lung Yu¹,²,³,⁴, Chi-Ming Tai⁵,⁶, Lien-Jieou Mou⁷, Hsing-Tao Kuo⁸, Chung-Feng Huang⁹,¹⁰,¹¹, Kuo-Chih Tseng¹²,¹³, Chingchu Lo¹⁴, Ming-Jong Bai⁵,¹⁵, Sih-Ren Wang¹⁶, Jee-Fu Hu²,³

Method: Patients with HCV retreated with VOX/SOF/VEL after SOF/VEL or GLE/PIB failure were enrolled in 26 centers in Spain between December of 2017 and December of 2022. All patients received VOX/SOF/VEL + ribavirin (RBV) for 12 weeks. Sustained virological response (SVR) was defined as undetectable HCV-RNA 12 (SVR12) weeks after the end-of-treatment. Patients with HCV reinfection were excluded.

Results: A total of 135 patients were included, 98 (72.6%) had failed to SOF/VEL and 37 (27.4%) to GLE/PIB. Baseline characteristics were median age 54.1 (IQR 9) years, 84.4% male, 96% Caucasian, 11.9% were cirrhotic. GT3 was the predominant in 50.4% of patients followed by GT1 in 36.8%. Median HCV-RNA was 2.9 × 10⁶ (2.4 × 10⁶–3.2 × 10⁶) IU/ml. Up to now, 97 (86.6%) of 111 patients who reached follow-up 12 weeks after treatment have achieved SVR. There was a trend to higher rate of SVR in patients previously treated with GLE/PIB than SOF/VEL (88.9% vs. 85.5%) (p = 0.43). There were no significant differences in SVR between patients with or without cirrhosis (84% vs. 90%) (p = 0.24), or based on HCV genotype, being 83% for GT3 vs. 89% in other genotypes (p = 0.29). Among the 14 patients without SVR to VOX/SOF/VEL despite completing treatment, 9 were GT3, 7 had cirrhosis and 4 (29%) were both GT3, cirrhotic and previously treated with SOF/VEL. RBV was added to VOX/SOF/VEL in 8 (6%) patients and all of them achieved SVR including 5 (63%) GT3 with cirrhosis and prior failure to SOF/VEL. There were no adverse relevant events related to the medication.

Conclusion: VOX/SOF/VEL in the real world is an effective rescue therapy for failures to SOF/VEL or GLE/PIB. There is a trend toward higher SVR in patients previously treated with GLE/PIB. The addition of RBV to VOX/SOF/VEL could rise the rate of SVR and might be considered in patients with GT3, cirrhosis and prior failure to SOF/VEL.
Background and aims: Although pan-genotypic direct-acting antivirals (DAA) sofosbuvir/velpatasvir (SOF/VEL) and glecaprevir/pibrentasvir (GLE/PIB) have simplified hepatitis C virus (HCV) treatment, treatment access remains limited due to constraints of specialist resource (e.g., gastroenterologist). Task-sharing by directing non-complicated cases to non-specialists is therefore crucial for upscaling treatment delivery. This study aimed to develop an algorithm to identify patients who can be safely managed by non-specialists.

Method: In this observational study, 10,641 HCV-infected patients registered in the Taiwan HCV Registry (TACR, a nationwide database of HCV-infected patients treated with DAA) between August 2019 and August 2021 were screened, and were included if they received ≥1 dose of SOF/VEL or GLE/PIB and fulfilled the eligibility criteria for simplified treatment by either the European Association for the Study of the Liver (EASL) or the American Association for the Study of Liver Diseases (AASLD) guidelines. Multivariate analysis was conducted to identify patient risk factors associated with Grades 2–4 laboratory abnormalities in liver function parameters (including alanine aminotransferase, aspartate aminotransferase, and total bilirubin) during treatment and the three-month post-treatment follow-up period. An algorithm for simplified treatment with non-specialists (the TACR algorithm) was then developed based on 1) the EASL and AASLD criteria, 2) the risk factors identified, and 3) previous studies regarding additional management needs for special populations.

Results: A total of 7,677 patients were included in this analysis. Multivariate analyses identified the following patient characteristics associated with higher risks of Grades 2–4 abnormalities: age >70 years old, presence of hepatocellular carcinoma, total bilirubin >1.2 mg/dL, estimated glomerular filtration rate (by the Modification of Diet in Renal Disease equation) <60 ml/min/1.73 m2, and Fibrosis-4 >3.25. Incorporating these factors into the algorithm can help better differentiate patient populations with less and more safety management needs. The TACR algorithm for simplified HCV treatment with non-specialists (Figure) was then formulated. Briefly, patients with any ineligibility factors (such as history of hepatic compensation) should seek specialist care due to more complex management needs. Patients with any conditional ineligibility factors (such as age >70 years old) can be managed by specialist care, or by non-specialist care after consultation with a specialist. Patients without any ineligibility factor can be safely managed by non-specialists.

Conclusion: The TACR algorithm can provide important guidance in the effort to promote task sharing to non-specialists, which would be an important step towards HCV elimination.

Figure: (abstract: THU-217).
THU-218
Evaluating utilization and management of comedications with potential for drug-drug interactions among patients with chronic hepatitis C initiating treatment with sofosbuvir/velpatasvir or glecaprevir/pibrentasvir
Stuart C Gordon1, Andrea Steffens2, Laura Weber2, Kimberly McNiff2, Alon Yehoshua3. 1Henry Ford Hospital, United States; 2Optum, United States; 3Gilead Sciences, Inc., United States
Email: andrea.steffens@optum.com

Background and aims: Direct-acting antiviral (DAA) agents for treatment of chronic hepatitis C (HCV) include glecaprevir/pibrentasvir (GLE/PIB), a protease inhibitor with known drug-drug interaction (DDI) effects, and sofosbuvir/velpatasvir (SOF/VEL), a protease inhibitor-free regimen with a more favorable DDI profile. This analysis compared rates and management of comediations with DDI risk (DDI comedications) among patients initiating DAA treatment with SOF/VEL or GLE/PIB.

Method: Adults initiating SOF/VEL or GLE/PIB from July 2016–April 2020 were identified from US administrative claims data in the Optum Research Database. The index date was the first claim for SOF/VEL or GLE/PIB. Continuous enrollment 12 months before (baseline) and 6 months after the index date was required. Patients with baseline liver disease, HCV treatment, or HIV were excluded. Demographics and DDI comedication use were measured. All DDI comedications associated with GLE/PIB and SOF/VEL and DDI comedication severity, defined from more to less severe as red, amber, or yellow, were from the Liverpool HEP Drug Interactions Database. DDI comedication discontinuation, dose decrease, and change to medication with no DDI risk during DAA treatment were measured in the subset of patients with prevalent DDI comedications 90 days prior to index.

Results: Among 4,528 patients meeting study criteria, 66.6% of GLE/PIB initiators and 43.7% of SOF/VEL initiators had any baseline DDI comedication use (p < 0.01). Compared with SOF/VEL initiators, GLE/PIB initiators had higher baseline rates of red (21.4% vs 2.3%), amber (51.9% vs 41.6%), and yellow (31.4% vs 2.8%, all p < 0.01) DDI comedications. DDI comedication use decreased during DAA treatment but remained higher in GLE/PIB initiators vs SOF/VEL initiators (41.5% vs 28.9%, p < 0.01). Overall, 979 GLE/PIB and 658 SOF/VEL initiators used prevalent DDI comedications in the 90 days pre-index. Of these, GLE/PIB vs SOF/VEL initiators had similar mean age (61.6 vs 61.8 years), proportions of female (42.2% vs 38.8%) and commercially insured (32.0% vs 29.5%) patients; baseline compensated cirrhosis was lower among GLE/PIB vs SOF/VEL initiators (5.8% vs 9.6%, p < 0.01). A higher proportion of GLE/PIB vs SOF/VEL initiators discontinued at least 1 DDI comedication before initiating DAA treatment (52.2% vs 38.0%, p < 0.01). During DAA treatment, GLE/PIB vs SOF/VEL initiators had higher rates of dose decrease (10.8% vs 6.8%, p = 0.026) and change to medication with no DDI risk (3.5% vs 1.1%, p = 0.014).

Conclusion: Use of DDI comedications was identified among a substantial proportion of patients, with higher rates of DDI comedication use and actions taken to manage DDI comedication use in GLE/PIB vs SOF/VEL initiators. Additional research is needed to assess real-world consequences of potential DDIs.

Figure: (abstract: THU-218).
**THU-219**
Concomitant use of proton pump inhibitors and Sofosbuvir/Velpatasvir: evidence from randomized clinical trials and real-world data

Rafael Esteban¹, Steve Flamm², Maria Buti¹, Juan Turnes³, Liyun Ni⁴, Candido Hernández⁵, Alessandra Mangia⁶. ¹Hospital Vall Hebron, Barcelona, Spain; ²Northwestern University Feinberg School of Medicine, Chicago, United States; ³Complejo Hospitalario Universitario de Pontevedra, Gastroenterology and Hepatology Department, Pontevedra, Spain; ⁴Gilead Sciences, Biostatistics Virology, Foster City, United States; ⁵Gilead Sciences, Global Medical Affairs, Madrid, Spain; ⁶IRCCS Casa Sollievo della Sofferenza, UOSD Epatologia, San Giovanni Rotondo, Italy

Email: candido.hernandez@gilead.com

**Background and aims:** Literature and product labels suggest velpatasvir bioavailability may be reduced when administered concomitantly with a proton pump inhibitor (PPI), based mainly on pharmacokinetic studies. We aimed to determine the clinical relationship between PPI use and sustained virologic response rates (SVR) in patients treated with sofosbuvir/velpatasvir (SOF/VEL) for chronic hepatitis C virus (HCV) infection in available data coming from Phase 2/3 clinical trials (RCT) and Real-World Data (RWD).

**Method:** Retrospective and descriptive analysis of data from patients treated with SOF/VEL for 12 weeks with and without concomitant use of PPIs and participating in Phase 2/3 RCTs and RWD studies. In RCT, PPI use was captured as part of standard concomitant medication reporting, with specific details regarding PPI dosing not collected. Main variables collected for this analysis consisted of SVR12 and relapse rate.

**Results:** Overall, 546 patients with PPI use were identified, 87 coming from RCT and 459 from RWD. The overall control group of patients without PPI use was 5,201; 2,517 in RCTs and 2,684 in RWD. In RCT, patients receiving PPI and SOF/VEL were mainly male (79%), with a mean age of 57 years (26–78), GT3 in 56% and cirrhotic in 35%. Most patients participating in RCT (66%, 57/87) continuously used PPI during the 12-week course of treatment with SOF/VEL, omeprazole being the most used PPI (68%). Overall SVR12 in PPI users was 97% (84/87), comparable to the reported by non-PPI users (97%); SVR12 in GT3 patients was 96% (47/49), in F4 was 94% (30/32). In GT3 plus F4 patients, SVR12 was 96% (23/24). Of the 3 patients who did not achieve SVR12 in PPI-users, 2 patients relapsed (relapse rate 2%) and one patient with a history of diabetes discontinued SOF/VEL after 7 days of dosing due to hyperglycemia. In RWD, patients receiving PPI and SOF/VEL were male (54%), with a mean age of 61 years, GT3 in 25% and cirrhotic in 29%. Overall SVR12 in PPI users was 99% (454/459), comparable to the reported by non-PPI users (99%).

**Conclusion:** In RCTs and RWD, the single-tablet regimen of SOF/VEL for 12 weeks was effective in patients with concomitant PPI use. These data support the use of SOF/VEL according to labeled recommendations with respect to co-administration of PPIs and other acid reducing agents.

**THU-220**
Sofosbuvir/Velpatasvir plus Ribavirin for chronic hepatitis C Virus genotype 3 infected cirrhotic patients with or without HIV or HBV coinfection: real-world experience from southwest China

Ti Wu¹, Ti Wu¹, Kang Huang¹, Xiaofei Li¹, Nihong Lu¹, Zhirong Zhao¹, Lei Wu¹, Jingsong Bai¹, Junyi Li¹, Haiwen Li¹, Yingrong Du¹. ¹The 3rd People’s Hospital of Kunming, Yunnan Province, China

Email: 2894502062@qq.com

**Background and aims:** Evidence of direct-acting antiviral (DAA) treatment for refractory chronic hepatitis C (CHC) patients was limited. We aimed to evaluate the effectiveness and safety of Sofosbuvir/Velpatasvir (SOF/VEL) plus Ribavirin (RBV) in cirrhotic patients with hepatitis C virus genotype 3 (GT3) with or without HIV or HBV coinfection.

**Method:** From June 2018 to December 2021, CHC GT3 patients who received SOF/VEL plus RBV (dosage of RBV depended on weight) for 12 weeks were enrolled. Liver cirrhosis was diagnosed by clinical presentation and radiology examination. The primary end point was...
POSTER PRESENTATIONS

sustained virologic response at 12 weeks off-therapy (SVR12). Adverse events (AEs) were assessed during treatment.

Results: In total, 285 treatment-naive patients were recruited at the Third People's Hospital of Kunming. Mean age was 48.18 ± 8.27 years-old and 74.04% (211/285) were male. All patients had GT3 HCV infection including 44 patients with GT3a and 241 patients with GT3b. All patients had liver cirrhosis, 47% (133/285) had compensated cirrhosis (CC), 53% (152/285) had decompensated cirrhosis (DC). 98.95% (282/285) patients achieved SVR12 with SOF/VEL plus RBV treatment for 12 weeks, including 97.72% (43/44) in GT3a and 99.17% (239/241) in GT3b. According to coinfection condition, SVR12 rate in CC group were: 99.25% (132/133) in mono-HCV infected patients, and 100% (22/22) in HCV/HIV. In DC group, 98.68% (150/152) in mono-HCV infected patients, 94.12% (16/17) in HCV/HIV and 100% (7/7) in HBV/HCV coinfected and 100% (1/1) in HBV/HCV/HIV coinfected patients achieved SVR12. At the end of treatment, the APRI score and FIB-4 score in CC group and DCC group were improved, and the improvement in the compensated cirrhosis group was better than that in decompensated cirrhosis group (PAPRI = 0.001, PFIb-4 = 0.001). Mean ALT (from 74.27 ± 23.04U/L to 39.31 ± 12.22U/L, p < 0.05) and AST (from 73.98 ± 25.54U/L to 44.17 ± 15.56U/L, p < 0.05) also significantly declined after treatment.1 patient had serious AE of hemolysis but recovered after 2–3 days of interruption of RBV. Most AEs were consistent with clinical sequelae of advanced liver disease or known toxicities of RBV.

Conclusion: SOF/VEL combined with RBV for cirrhotic GT3 hepatitis C patients all obtained high SVR12 (>95%) and improved liver function during treatment, and SOF/VEL combined with RBV regimen is recommended for cirrhotic GT3 hepatitis C patients.

THU-221

Efficacy of direct-acting antivirals in patients with hepatitis C virus-associated cryoglobulinemia and monoclonal gammapathy

Sofiyia Gavrisheva1, Dzhahal Abdurakhamanov2, Nikolay Bulanov2, Tatiana Krasnova1, Elena Tanashchuk2, Teona Rozina1,2, Elena Nikulkina1, Svetlana Milovanova2, Anna Filatova1,2, Sergey Moiseev1,2, Lomonosov Moscow State University, Moscow, Russian Federation; 2Second Moscow State Medical University, Moscow, Russian Federation

Email: gavrisheva sofia@gmail.com

Background and aims: Monoclonal gammapathy (MG) is caused by a clonal expansion of plasma cells producing a unique immunoglobulin. MG is common in patients with B-cell lymphoproliferative disorders such as hepatitis C virus (HCV)-associated mixed cryoglobulinemia, and the long-term outcomes of direct-acting antiviral (DAA) therapy in these patients are not fully understood.

Method: We conducted a case series investigation of 10 HCV-positive patients with cryoglobulinemia and MG (diagnosed by serum and urine protein electrophoresis with immunofixation), who received DAA therapy (Table 1). Nine patients met the criteria for HCV-associated cryoglobulinemic vasculitis (HCV-CV) and one patient had asymptomatic cryoglobulinemia (AC). Patients were evaluated at baseline (before starting DAs) and every 6 months after the end of HCV treatment (EoT). The activity of HCV-CV was assessed by using Birmingham Vasculitis Activity Score Version 3 (BVAS.v3).

Results: All patients achieved sustained virological response. Skin purpura was improved in 9/9 (100%) patients, joint involvement — in all 5/5 (100%), sicca syndrome — in 2/2 (100%), and peripheral polyneuropathy — in 2/6 (33.3%) patients. Signs of kidney involvement persisted in 3/5 (60%) patients, including declined glomerular filtration rate in two cases and persistent proteinuria in one patient. In the latter patient a kidney biopsy showed membranoproliferative glomerulonephritis with large subendothelial deposits, there were no typical signs of kidney involvement associated with multiple myeloma. Patient with AC developed Waldenstrom macroglobulinemia 2 years after the EoT and received rituximab-containing chemotherapy. The monoclonal proteins disappeared in 8/10 (80%) patients with a median time of 13.5 months after EoT, in 2 of them — only after rituximab therapy (including the patient with Waldenstrom macroglobulinemia). 3 other patients received glucocorticosteroids during follow-up (for 3, 6 and 30 months). Immunologic response (defined as absence of circulating cryoglobulins, rheumatoid factor and normal C4 level) was achieved only in 4 (40%) patients, whereas elimination of cryoglobulins occurred in 9 (90%) patients. Complete (defined by a BVAS.v3 score of 0) and partial (defined as BVAS.v3 score <50% of the baseline score) clinical response were achieved by 4 (44.4%) and 5 (55.6%) patients with HCV-CV, respectively. No patient died during follow-up.

Note: Continuous data are expressed as median (interquartile range)

Conclusion: DAA therapy in patients with HCV-associated cryoglobulinemia and MG was associated with high rates of monoclonal immunoglobulin elimination and clinical improvement, however in some cases additional immunosuppressive therapy is required.

THU-222

Resistance-associated substitutions described after failure of anti-NSSA direct-acting antiviral treatment in 58 hepatitis C Virus (HCV) infected patients in Cameroon

Serge Tchangou1,2,3, Maurelle Magatsing1, Tatiana Nganso1, Marthe Ntep Eboko1, Mathurin Kowo4, Christian Tzeuton5

1Polyclinique Bordeaux Douala, Infectious Disease, Douala, Cameroon; 2National Network for the fight against viral Hepatitis, deputy chairman, Douala, Cameroon; 3Centre Hospitalier de Libourne, Infectious disease, Libourne, France; 4Yaounde University hospital, Yaounde, Cameroon; 5university of douala, douala, Cameroon

Email: stchangou@gmail.com

Background and aims: The World Health Organization (WHO) set the goal to eliminate Hepatitis C as a major public health threat by 2030. This goal is challenging in sub-Saharan African countries, where HCV seroprevalence remains too high (i.e. around 3% in Cameroon), due to insufficient funding, lack of screening policies, poor-linkage-to-care strategies, expensive HCV treatments, and more recently, failure of HCV DAA combinations pan-genotypic drugs. Recent European data report suboptimal rates of sustained virological response (SVR) in patients of African origin who were infected with HCV genotype subtypes unusually found in Western Europe (i.e. Genotype 51e, G1g, G11 as well as G4c, G4e, G4f, G4r). We aim to describe clinical and virological characteristics of patients escaping from first line HCV treatment including DAA combination in a

Table 1:

Baseline characteristics n = 10

| Age, years | 57.5 (49.0-65.8) |
| Female sex, n (%) | 8 (80) |
| Cirrhosis, n (%) | 6 (60) |
| Clinical manifestations in 9 patients with HCV-CV, n (%) | |
| Skin purpura | 9 (100) |
| Arthralgia/arthritis | 5 (55.6) |
| Peripheral polyneuropathy | 6 (66.7) |
| Kidney involvement | 5 (55.6) |
| Sicca syndrome | 2 (22.2) |
| Monoclonal immunoglobulin type, n (%) | |
| IgM kappa | 5 (50) |
| IgA kappa | 1 (10) |
| IgG kappa | 1 (10) |
| IgG lambda and IgM kappa | 1 (10) |
| Not determined | 2 (20) |
| Follow-up period after EoT, months | 62.0 (46.5-76.6) |

Note: Continuous data are expressed as median (interquartile range)

Conclusion: Resistance-associated substitutions described after failure of anti-NSSA direct-acting antiviral treatment in 58 hepatitis C Virus (HCV) infected patients in Cameroon is a major public health threat by 2030. This goal is challenging in sub-Saharan African countries, where HCV seroprevalence remains too high (i.e. around 3% in Cameroon), due to insufficient funding, lack of screening policies, poor-linkage-to-care strategies, expensive HCV treatments, and more recently, failure of HCV DAA combinations pan-genotypic drugs. Recent European data report suboptimal rates of sustained virological response (SVR) in patients of African origin who were infected with HCV genotype subtypes unusually found in Western Europe (i.e. Genotype 51e, G1g, G11 as well as G4c, G4e, G4f, G4r). We aim to describe clinical and virological characteristics of patients escaping from first line HCV treatment including DAA combination in a

Table 1:

Baseline characteristics n = 10

| Age, years | 57.5 (49.0-65.8) |
| Female sex, n (%) | 8 (80) |
| Cirrhosis, n (%) | 6 (60) |
| Clinical manifestations in 9 patients with HCV-CV, n (%) | |
| Skin purpura | 9 (100) |
| Arthralgia/arthritis | 5 (55.6) |
| Peripheral polyneuropathy | 6 (66.7) |
| Kidney involvement | 5 (55.6) |
| Sicca syndrome | 2 (22.2) |
| Monoclonal immunoglobulin type, n (%) | |
| IgM kappa | 5 (50) |
| IgA kappa | 1 (10) |
| IgG kappa | 1 (10) |
| IgG lambda and IgM kappa | 1 (10) |
| Not determined | 2 (20) |
| Follow-up period after EoT, months | 62.0 (46.5-76.6) |

Note: Continuous data are expressed as median (interquartile range)

Conclusion: DAA therapy in patients with HCV-associated cryoglobulinemia and MG was associated with high rates of monoclonal immunoglobulin elimination and clinical improvement, however in some cases additional immunosuppressive therapy is required.
national survey data collected in the two biggest Cameroonian city: Douala and Yaounde.

Method: Retrospective descriptive study. Data collected from Jan 1st 2020 to Dec 31th 2021. Inclusion criteria: patients escaping from HCV first line treatment including a DAA combination; coming to polyclinic Bordeaux douala's hospital, having a blood test for NS5a genotype virologic test which was sent to Grenoble University hospital (France); giving their consent agreement. This study was agreed by the regional ethical committee.

Results: 58 patients were included; aged 31 to 91 (median 69.5). Women (n = 35; 60%). Weight (BMI>25): (n = 49, 67.2%). HCV was diagnosed since a median of 7.4 years before. All patients received their first line regimen. Fibrosis stage 4 (META VIR F4) or cirrhosis: (n = 18; 31%). Proven relapsed treatment (n = 32; 55%). HIV co-infected patients (n = 2; 3.4%). Died by dec 31th 2021 (n = 10; 17.2%). Failure associated factors: Antiacid or Proto-pump inhibitor IPP (n = 1; 8%). Traditional medicine (n = 5; 8.6%). Poor compliance (n = 3; 5.1%). Treatment regimen on failure: SOFOSBUVIR/LEDIPASVIR (n = 25; 43%); SOFO/LEDI/RIBAVIRIN (n = 9; 15.5%); SOFOSBUVIR/DACLATASVIR (n = 9; 15.5%); SOFO/DACLA/RIBA (n = 2; 3.4%); SOFOSBUVIR/VELPASVIR (n = 11; 18.9%); SOFO/VELPA/RIBA (n = 2; 3.4%). Genotypes distribution: G1 (n = 36; 62%); G4 (n = 15; 25.8%); G2 (n = 4; 6.9%); Non ampli (n = 3; 5%). Subtypes Distribution: G1 (n = 19; 32%); G4f (n = 13; 22.4%); G1e (n = 7; 12%); G1a not a b (n = 3; 5%); G1b (n = 2; 3.4%); one patient for: G1c; G1g; G1h; G2e; G2k or q; G4t; G4 not a b. Resistance-associated distribution: L31/M/V (n = 18; 31%); Q30H/KQ/S/R/W (n = 16; 27%); Y93/C/H/M (n = 13; 22%); L31M+Q30R (n = 4; 6%); L28M+Q30R (n = 2; 3%); M28V/M/T (n = 2; 3%); R30/Q (n = 2; 3%); Others (n = 22; 37%).

Conclusion: We described a high proportion of unusual subtypes (G1l, G4f, G1e) in HCV patients escaping from their first line treatment including DAA combination, underlining the high interest on accessing to affordable genotypic resistance tests in this context

THU-223 - Retreatment of patients experiencing failure with Hepatitis C direct-acting antivirals

Nessa Quinn1, Colm Bergin2, Ciaran Bannan2, Susan McKiernan3, Suzanne Norris4, Gillian Farrell2, Clara Houlihan2, Catherine Murray2, Lewel Alvarado3, Noelle Cullen2, Linda Finnerty3, Suzanne Hunt4, Bernard Carr1, Gail Melanophy1, Miriam Coghlan1, 1St. James's Hospital, Pharmacy, Ireland; 2St. James's Hospital, Genito Urinary Medicine and Infectious Diseases (GUIDE), Ireland; 3St. James's Hospital, Hepatology, Ireland

Email: nequinn@stjames.ie

Background and aims: The sustained virological response (SVR) rate for first line direct-acting antiviral (DAA) therapy for hepatitis C virus (HCV) infection in Ireland surpasses 95%. Factors associated with the limited number of treatment failures include incomplete adherence, advanced cirrhosis (Child Pugh class B and C) and the presence of resistance associated substitutions (RASs). The aim of this study was to determine the frequency of treatment failure in patients treated in St James Hospital (SJH), Dublin and to review retreatment regimens and outcomes.

Method: Data was extracted from hospital HCV treatment records and the National Hepatitis C Treatment Registry to identify patients

Figure: (abstract: THU-223).
who received all-oral DAA treatment for HCV from 2014 to 2021 in SJH.

**Results:** A total of 2,015 patients received at least one course of all-oral DAA treatment for HCV. A total of 1,589 patients achieved SVR (97.9%) (per protocol analysis). Twenty-five patients failed to achieve SVR, twenty of whom had RASs detected. The most common RASs conferring reduced susceptibility to treatment included NS5A RASs at positions Q30 and Y93 and NS3 RASs at position Q80. Eight patients had >1 NS5A mutation and/or dual class resistance. Of 23 patients who were retreated, 18 achieved SVR (14 of whom received triple therapy with sofosbuvir/velpatasvir/pibrentasvir (SOF/VEL/VOX) or sofosbuvir/glecaprevir/pibrentasvir (SOF/G/P) and 9 of whom received concurrent ribavirin). Five patients failed to achieve SVR with retreatment, two of whom were successfully treated with a third course of DAAs. The remaining three patients are awaiting third line treatment.

**Conclusion:** Three class DAA regimens are a highly effective retreatment for HCV even in the presence of multiple NS5A and NS3 mutations.

**THU-224**

**Efficacy and safety of Sofosbuvir Plus Daclatasvir bilayer tablet with or without Ribavirin in patients with chronic hepatitis C genotype 4 Infection**

Mohamed Hassany1, Sameh Ramadan2, Ehab Moustafa3, Basem Eysa1, Ahmed Zidan1, Amany Hassan1, Heba Abdulaziz1, Shimaa Afify1, Mohamed Saeed1, Hanaa Shalabi1, Asmaa Gomaa4, Naglaa Allam4, Eman Abdelsameea2, Aliia Sabry4, Alzhraa Alkhathib4, Heba Sameh4, Mostafa Elhelbawy4, Ahmed Radwan3, Sahar Hassany3, Enas Attia2, Mai Abdel Razek2, Fatema Elamrawy2, Waseem Medhat2, Omar Hamed2, Dalia Safari4, Doris Ezzat4, Khaled Prince3, Imam Waked4, 1National Hepatology and Tropical Medicine Research Institute, Egypt; 2Fayoum General Hospital, Egypt; 3Assuit University, Egypt; 4National Liver Institute, Menofia University, Egypt; 5ClinMax, Egypt; 6Minapharm Pharmaceuticals, Egypt

**Background and aims:** The evolution of the hepatitis C virus (HCV) therapies, and its very high efficacy, led to a remarkable improvement of the treatment outcome. The combination of sofosbuvir 400 mg and daclatasvir 200 mg is considered one of the best pan-genotypic regimens which was endorsed by many regional and global guidelines, especially after the robust availability of the generic versions of both drugs, which promoted the access to care. Several countries have adopted the concept of developing the bilayer tablets as an innovative drug formula for enhancing the drug delivery and treatment adherence especially in the long-term therapies and multi-mediated diseases. The aim of this study is to evaluate the safety and efficacy of a single bilayer tablet that contains 400 mg of SOF and 60 mg of DAC administered once daily with or without RBV in patients with genotype 4 HCV.

**Method:** The study is a Phase IV, prospective, open-label, multicenter study. The patients were classified into 2 groups (easy or difficult to treat), patients with no liver cirrhosis, Fib-4 ≤3.25, albumin >3.5 g/dl, total bilirubin ≤1.2 mg/dl, INR ≤1.2, platelet count >150,000 mm3 and treatment-naïve are considered as the easy to treat group, and the patients with any opposite parameter were considered as the difficult to treat group. All patients received a single Bilayer tablet that contains 400 mg of SOF and 60 mg of DAC once daily. The difficult-to-treat patients also received RBV divided into two daily doses to reach a total dose of 1200 mg/day if the patient’s weight was ≥75 kg or 1000 mg/day when the weight was <75 kg. The treatment duration was 12 weeks, and the patients were followed up for an additional 12 weeks after the end of treatment. The safety data and the relation of each of the adverse events to study medications were reported.

**Results:** A total of 198 patients were screened throughout the study, out of which 142 were enrolled in the study (easy to treat = 120; difficult to treat = 22). The study drug has proven to be effective and safe to be used for patients with HCV disease. The viral load reached the level of low detection and was sustained after 12 weeks of stopping the drug in 88.7% (126/142) of the patients according to the ITT analysis and 100% (99/99) in the per protocol analysis. Only 2 patients (1.4%) showed related AE that were mild or moderate and were resolved by week 24 of the study, additional non-related one death and other adverse events were reported.

**Conclusion:** the combination of SOF and DAC in a single bilayer tablet ± ribavirin is an effective and tolerable treatment regimen for HCV genotype 4 patients.
Author Index

Aabakken, Lars, S408 (WED-317)
Aamann, Luise, S982 (THU-304)
Abaal-Rahman, Faisal, S859 (SAT-119), S1006 (THU-383)
Abadia, Marta, S982 (THU-304), S1006 (THU-383)
Abadpour, Shadab, S59 (OS-076)
Abad, Javier, S291 (SAT-340)
Abate, Maria Lorena, S605 (THU-415), S1056 (TOP-106)
Abbasi, Amanullah, S319 (SAT-557)
Abbas, Minaam, S1054 (TOP-100)
Abbas, Nadir, S56 (OS-073), S398 (WED-299), S466 (THU-497)
Abbas, Zaigham, S1054 (TOP-100)
Abbati, Gianluca, S1105 (WED-176)
Abbott, Jane, S1127 (WED-209)
Abdallah, Ali, S133 (THU-403)
Abdalla, Rima, S127 (TOP-093)
Abdelhameed, Ahmed, S463 (THU-491)
Aberg, Fredrik, S595 (THU-275)
Aberle, Stephan, S996 (THU-327), S1135 (SAT-150), S1170 (SAT-200)
Abeysekera, Kushala, S177 (FRI-455), S621 (THU-441), S858 (SAT-118), S867 (SAT-130), S1198 (THU-203)
Abiven, Joëlle, S722 (SAT-505), S769 (WED-453), S777 (WED-469)
Abdelhamid, Ahmed, S463 (THU-491)
Abe-Chayama, Hiromi, S72 (OS-098), S1017 (FRI-216)
Abedin, Nada, S276 (WED-385)
Abe, Hiroshi, S818 (FRI-508)
Abe, Naokazu, S394 (WED-293)
Abe, Masahiro, S545 (SAT-246)
Abed, Saima, S186 (FRI-339)
Abdelkhalek, Amin, S1054 (TOP-100)
Abdelraouf, Ramil, S574 (THU-115)
Adair, Gill, S1006 (THU-382)
Adalja, Masoud, S197 (FRI-553)
Adams, Enrico, S900 (FRI-341)
Adam, Gerhard, S285 (SAT-331)
Adamia, Ekaterine, S931 (FRI-205), S1204 (THU-214)
Adam, René, S46 (OS-053-YI), S458 (THU-483)
Adamson, Colby, S773 (WED-460)
Adam, Valeria, S251 (WED-344)
Adamir, Haydar, S195 (FRI-546)
Adnan, Muna, S1006 (THU-383), S1057 (SAT-232)
Addario, Luigi, S105 (LBP-09)
Addy, Carol, S995 (THU-324)
Adebayo, Daniele, S195 (FRI-546)
Adegoke, Oluwatobi, S71 (OS-097)
Adem, Nia, S25 (OS-020-YI)
Adel, Michael, S375 (SAT-361), S563 (SAT-281), S947 (THU-258)
Adlung, Lorenz, S527 (SAT-213)
Adori, Csaba, S326 (WED-222), S433 (SAT-353)
Adorini, Luciano, S804 (WED-550)
Addovi, Valentina, S233 (THU-371), S513 (FRI-311)
Adoukou, Jean-Pierre, S897 (FRI-146)
Adrien, Lannes, S86 (OS-121-YI), S198 (FRI-550), S318 (SAT-556), S667 (SAT-419)
Adu, Prince, S883 (FRI-125), S886 (FRI-130), S1198 (THU-187), S1200 (THU-207)
Aehling, Niklas, S244 (WED-335)
Aehling, Niklas F, S197 (FRI-549), S201 (FRI-555)
Aerosens, Jeroen, S444 (SAT-374), S1034 (FRI-248)
Aeschbacher, Thomas, S1055 (TOP-103)
Affronti, Marco, S668 (SAT-288)
Afiy, Shimaa, S1212 (THU-224)
Afonso, Marta B., S734 (WED-397)
Afonjushkin, Taras, S224 (THU-358)
Afroz, Saba, S268 (WED-371), S641 (THU-476)
Agapito, Giuseppe, S568 (SAT-288)
Agarwal, Ankit, S401 (WED-304), S587 (THU-135)
Agarwal, Banwari, S195 (FRI-543), S220 (THU-355)
Agarwal, Kosh, S31 (OS-030), S53 (OS-067), S91 (OS-128), S112 (LBP-18), S642 (THU-551), S905 (FRI-161), S1060 (WED-117), S1081 (WED-143), S1081 (WED-144), S1134 (SAT-148), S1137 (SAT-153), S1138 (SAT-154),...
Author Index

Aguirre, Joan, S865 (SAT-129)
Aguirre, Jose Roberto, S900 (FRI-151)
Aguilera, Victoria, S2 (GS-003)
Agynbay, Aibar, S320 (SAT-559)
Aguilar, Raul, S123 (LBP-35)
Aguirrezabal, Ion, S737 (THU-114)
Agollah, Germaine D., S13 (LBO-05)
Agorastou, Polyxyeni, S1128 (WED-211)
Agozin, Marina, S245 (WED-336)
Agrawal, Prashant, S182 (TOP-040)
Agrawal, Sudeep, S607 (THU-419)
Agu, Rubén Rodríguez, S140 (FRI-399), S529 (SAT-216)
Agulier-Bravo, Beatriz, S78 (OS-109-YI)
Agulier-Company, Juan, S375 (WED-263)
Agulier, Ferran, S143 (FRI-404), S206 (TOP-046)
Agular, Juan Cristobal, S1126 (WED-208)
Agular, Laia, S737 (WED-403)
Agular, Raúl, S123 (LBP-35)
Aguilera, Antonio, S921 (FRI-188)
Aguilera Sancho, Victoria, S87 (OS-123-YI), S476 (THU-517), S485 (THU-535)
Aguilera, Victoria, S2 (GS-003)
Aguirre, Jose Roberto, S900 (FRI-151)
Aguyire, Joan, S865 (SAT-129)
Aghayev, Ali, S605 (THU-414), S608 (SAT-403)
Akalu, Eni, S605 (THU-414), S608 (SAT-403)
Akalu, Tiriwork Fekadu, S685 (SAT-129)
Akalu, Us, S31 (OS-030), S181 (FRI-463)
Akarca, Ulus S, S1137 (SAT-152)
Akarus, Mesut, S181 (FRI-463)
Akkari, Kuthbdinin, S333 (WED-236), S334 (WED-237), S334 (WED-238), S501 (FRI-290), S999 (THU-333)
Akbult, Seval, S408 (WED-317)
Akgoglu, Banu, S948 (THU-259)
Akerbl, Petri, S57 (OS-074-YI), S940 (THU-249)
Akik, Fardhah, S1203 (THU-212)
Akkili-Oeztuerk, Oezlem, S26 (OS-022)
Akinobu, Taketomi, S444 (SAT-373)
Akriyama, Matthew, S100 (LBO-01)
Akpinar, Hsian Nuri, S645 (THU-556)
Akm, Fatima, S1196 (THU-200)
Akmushevich, Lucy, S89 (OS-125)
Akuta, Norio, S1183 (THU-177)
Akylidiz, Murat, S181 (FRI-463), S1109 (WED-183)
Akyuz, Filiz, S709 (SAT-485)
Aalas, Basma, S779 (WED-472), S795 (SAT-532)
Aal, Aftab, S967 (THU-286)
Aaladag, Murat, S181 (FRI-463)
Aalina, Giuliano, S40 (OS-045), S55 (OS-070)
Aalani, Muhsein, S11 (LBO-03)
Aalahon, Paloma, S248 (WED-341)
Alaparthi, Lakshmi, S782 (WED-506)
Alarcón, Cristina, S587 (THU-136)
Alarcon, Francisa Cuenca, S392 (WED-290), S964 (THU-282), S980 (THU-301), S996 (THU-326), S998 (THU-331)
Alarcón-Sánchez, Brisa Rodope, S151 (FRI-414), S160 (FRI-426)
Alarqan, Reem, S724 (SAT-509)
Alatralch, Nadia, S50 (OS-075)
Alavi, Maryam, S910 (FRI-169)
Alazawi, William, S39 (OS-043), S612 (THU-426), S621 (THU-441), S624 (THU-447), S708 (SAT-483), S726 (SAT-512), S740 (WED-406), S825 (FRI-520)
Albano, Emanuele, S526 (SAT-211), S751 (WED-425), S804 (WED-551)
Albela, Manuel, S69 (OS-094)
Albenmousa, Ali, S958 (THU-273), S1011 (THU-388)
Alberch, Pol Olivas, S984 (THU-308)
Alberio, Lorenzo, S105 (LBO-08)
Albert, Tran, S498 (FRI-286)
Alhbiavi, Somaya, S195 (FRI-546), S809 (FRI-466)
Albillos, Agustin, S3 (GOS-003), S8 (OS-009), S19 (OS-111-YI), S73 (OS-102), S87 (OS-123-YI), S105 (LBO-09), S220 (THU-355), S279 (TOP-043), S475 (THU-514)
Albir, Marina García, S451 (SAT-387)
Albrecht, Thomas, S547 (SAT-248)
Albuquerque, Miguel, S64 (OS-084-YI), S776 (WED-467)
Alcama, Luis Armando Mendez, S840 (FRI-492)
Alcol, Maria Belen Piqueras, S587 (THU-136)
Aldana, Andres Gomez, S869 (SAT-133)
Aldrian, Denise, S987 (THU-313)
Aldve, Martina, S857 (SAT-115)
Aleger, Marta, S356 (THU-246), S788 (WED-518), S802 (WED-546)
Alelyani, Jabr, S724 (SAT-509)
Alemani, Luigina Vanessa, S88 (OS-124-YI), S974 (THU-293)
Alem, Soo, S9 (OS-012), S31 (OS-030), S53 (OS-068), S113 (LBO-20), S1091 (WED-158), S1101 (WED-171), S1150 (SAT-170)
Alemany, Merce Roget, S376 (WED-264)
Alessandria, Carlo, S10 (LBO-01), S253 (WED-348)
Alexander, Emma, S984 (THU-307), S987 (THU-312), S999 (THU-332)
Alessandria, Giacomo, S111 (WED-185), S1189 (THU-186)
Alexopoulos, Theodoros, S262 (WED-362), S978 (THU-298)
Alexopoulos, Alexandra, S262 (WED-362), S400 (WED-302), S978 (THU-298)
Alejad, Wesam, S89 (OS-125)
Al-Faddagh, Hind, S724 (SAT-509)
Alfaide, Dulce, S876 (FRI-117), S1161 (SAT-185)
Alfano, Vincenzo, S1018 (FRI-218)
Alfonso-Cervello, Clara, S682 (SAT-442)
Berenguer Haym, Marina, S476 (THU-517)
Berenguer, Marina, S2 (GS-003),
S75 (OS-105), S133 (THU-404),
S181 (FRI-462), S366 (TOP-061),
S380 (WED-270), S469 (THU-501),
S470 (THU-503), S474 (THU-512),
S481 (THU-525), S485 (THU-535),
S921 (FRI-188), S984 (THU-282),
S980 (THU-301), S989 (THU-315),
S996 (THU-326), S998 (THU-331),
S1099 (WED-168), S1124 (WED-205),
S1172 (THU-162)
Beretta, Laura, S516 (FRI-317)
Beretta, Marisa, S972 (THU-291)
Berg, Christoph, S108 (LBP-12),
S403 (WED-307), S1139 (SAT-156),
S1147 (TOP-110)
Berg, Christoph P., S90 (OS-126),
Berg, Annemarie, S113 (LBP-20)
Berg, Hilmar, S737 (WED-403)
Berg, Karin, S956 (THU-150)
Berge, Rolf, S370 (WED-254)
Berger, Scott, S173 (FRI-448)
Bergeres, Jorge Saz, S932 (FRI-208)
Berggren, Per-Olof, S363 (FRI-388)
Bergheim, Ina, S154 (FRI-419),
S413 (FRI-334), S625 (THU-449),
S798 (WED-539)
Bergh, Tom Vanden, S764 (WED-446)
Bergin, Colm, S16 (OS-004),
S1211 (THU-223)
Bergman, David, S82 (OS-116-YI),
Bergman, Carsten, S979 (THU-299)
Bergquist, Anna, S383 (WED-277),
S408 (WED-317), S857 (SAT-115)
Bergstrom, Jaclyn, S65 (OS-086),
S839 (FRI-490)
Berghthaler, Andreas, S739 (WED-405),
S746 (WED-418)
Berg, Thomas, S90 (OS-126),
S108 (LBP-12), S197 (FRI-549),
S201 (FRI-555), S244 (WED-335),
S362 (FRI-386), S483 (THU-529),
S507 (FRI-299), S507 (FRI-300),
S576 (THU-118), S1043 (FRI-260),
S1050 (FRI-270), S1071 (WED-132),
S1090 (WED-156), S1134 (SAT-148),
S1139 (SAT-156), S1147 (TOP-110),
S1176 (THU-168)
Berhe, Nega, S927 (FRI-197),
S1150 (SAT-170)
Berlakovich, Gabriela, S465 (THU-494),
S465 (THU-495), S470 (THU-505),
S489 (THU-545)
Berliner, Dominik, S240 (WED-326)
Berner, Mark, S822 (FRI-515)
Bermúdez, María, S12 (LBO-04),
S533 (SAT-224)
Bernabeu-Andreu, Francisco A.,
S683 (SAT-443)
Bernabeu, Jesús Quintero, S971 (THU-291)
Bernal, Carmen, S470 (THU-503)
Bernalles, Irantzu, S738 (WED-404)
Bernal, Sara Borrego, S365 (FRI-391)
Bernal, William, S479 (THU-521)
Bernardes, Christina, S846 (WED-478)
Bernardo-Seisededos, Ganeko, S736 (WED-400)
Bernasconi, Davide, S381 (WED-272)
Bernatik, Sophia, S431 (FRI-369)
Berndt, Nikolaus, S362 (FRI-366)
Bernieh, Anas, S417 (FRI-350)
Bernsmeier, Christine, S77 (OS-108-YI),
S214 (THU-345), S754 (WED-431)
Bernts, Lucas H.P., S973 (THU-292)
Berraondo, Pedro, S537 (SAT-232)
Beres, Marie-Luise, S571 (SAT-292)
Bertelli, Cristina, S632 (THU-461),
S645 (THU-557), S722 (SAT-506)
Berthoud, Tamara, S1119 (WED-197)
Bertino, Gaetano, S40 (OS-045),
S55 (OS-070), S568 (SAT-288)
Bertoletti, Antonio, S543 (SAT-241),
S1024 (FRI-229)
Bertoli, Ada, S1122 (WED-203)
Bertolini, Emanuela, S978 (THU-297)
Bertoni, Costanza, S120 (LBP-29),
S837 (FRI-487)
Bertran, Esther, S331 (WED-231),
S529 (SAT-216)
Berzigotti, Annalisa, S20 (OS-012-YI),
S61 (OS-080-YI), S86 (OS-121-YI),
S87 (OS-123-YI), S279 (TOP-043),
S280 (TOP-048), S283 (SAT-327),
S481 (THU-526), S485 (THU-533),
S609 (THU-421), S664 (SAT-414)
Besch, Camille, S62 (OS-083-YI)
Besisik, Fatih, S709 (SAT-485)
Bes, Marta, S506 (FRI-298)
Besquesquet-Rougerie, Clement,
S806 (WED-555)
Bessa, Isabel, S842 (FRI-495)
Bessa, Xavier, S267 (WED-370),
S273 (WED-381)
Bessieux, Marc, S836 (FRI-485)
Bessette, Paul, S5 (GS-005)
Besson, Adrien, S769 (WED-453),
S777 (WED-469)
Bessone, Fernando, S132 (THU-401),
S245 (WED-336)
Bessonova, Leona, S379 (WED-268),
S844 (FRI-500)
Bester, Romina, S945 (THU-256)
Bester, Jan, S61 (OS-080-YI), S628 (THU-454)
Bethell, Richard, S1038 (FRI-252)
Bettencourt, Ricki, S648 (TOP-075),
S649 (TOP-083), S652 (SAT-412)
Bettinger, Dominik, S304 (SAT-531),
S305 (SAT-534), S318 (SAT-555),
S575 (THU-116), S586 (THU-134)
Beudeker, Boris, S496 (FRI-282),
S501 (FRI-291), S1016 (TOP-108),
S1019 (FRI-219)
Beuers, Ulrich, S10 (LBO-01), S14 (LBO-06),
S55 (OS-071-YI), S403 (WED-307),
S427 (FRI-364)
Beugger, Anja, S485 (THU-533)
Bevilacqua, Michele, S203 (FRI-558)
Author Index
Author Index

Caballero-Díaz, Daniel, S331 (WED-231)
Caballero, Federico, S932 (FRI-208)
Caballero, Francisco J., S57 (OS-074-YI), S527 (SAT-212), S541 (SAT-238)
Caballol, Berta, S493 (FRI-276)
Cabello, MR, S18 (OS-007)
Cabello, Riccardo, S274 (WED-382)
Cabezas, Joaquín, S911 (FRI-171), S921 (FRI-188), S934 (FRI-211)
Cabezas, Joaquín, S171 (FRI-445)
S1098 (WED-166), S1178 (THU-171)
Cahibbo, Giuseppe, S558 (THU-144), S593 (THU-195)
Cable, Edward, S338 (WED-246)
Cable, Rebecca, S673 (SAT-428)
Cable, Edward, S338 (WED-246)
Cacchi, Riccardo, S86 (OS-121-YI)
Cadamuro, Luca, S374 (WED-260)
Cadamuro, Massimiliano, S72 (OS-099), S767 (THU-427)
Cacciola, Irene, S457 (THU-481), S460 (THU-485)
Cacidori, Pierluigi, S36 (OS-070)
Cacciola, Irene, S457 (THU-481), S460 (THU-485)
Caglieris, Matteo, S547 (THU-480)
Calmes, Mélanie, S435 (SAT-358)
Calmy, Alexandra, S101 (LBP-04)
Calvaruso, Vincenzo, S36 (OS-036), S40 (OS-045), S55 (OS-070), S56 (OS-073), S237 (WED-320), S374 (WED-260), S609 (THU-421), S1111 (WED-186), S1118 (WED-196)
Calvez, Vincent, S1044 (FRI-261)
Calvisi, Diego, S529 (SAT-215), S534 (SAT-226), S544 (SAT-244)
Calvo, Ana Avellon, S902 (FRI-153)
Calvo, Jorge, S911 (FRI-171)
Calvo, Mariona, S579 (THU-124)
Calvo, Pier Luigi, S969 (THU-289)
Camagni, Stefania, S471 (THU-507)
Camahoria-Silva, Amélia, S730 (WED-539)
Cameron, Madeline, S404 (WED-310)
Cameron, Rainie, S538 (SAT-234), S542 (SAT-238)
Cameron, Grace, S177 (FRI-455)
Cameron, Grace, S177 (FRI-455)
Campbell, Cori, S868 (SAT-131), S874 (THU-137), S918 (WED-181)
Campbell, Fiona, S1154 (SAT-176), S1162 (SAT-187)
Campello, Elena, S564 (SAT-283)
Canadas, Jordi, S670 (SAT-305)
Canadas, Jordi, S670 (SAT-305)
Canillas, Lidia, S267 (WED-370), S273 (WED-381)
Canivet, Clémence M, S667 (SAT-419), S672 (SAT-427)
Canales, Jordi, S670 (SAT-305)
Canales, Jordi, S670 (SAT-305)
Canizar, Aysun, S1109 (WED-183)
Cane, Dan, S32 (OS-031)
Canger, Mariona, S579 (THU-124)
Cangemi, Roberto, S217 (THU-350)
Cannavo, Mario Rita, S40 (OS-045), S55 (OS-070)
Cannito, Stefania, S526 (SAT-211), S766 (WED-449)
Cannon, Mary D, S91 (OS-128), S1179 (THU-172)
Cano, María Elise, S911 (FRI-171)
Cano, Antonio David Palau, S1124 (WED-205)
Canova, Lorenzo, S978 (THU-297)
Cant, Carles, S762 (WED-442)
Canva, Valérie, S552 (OS-066)
Cao, Zhujun, S195 (FRI-546)
Cao, Lu, S330 (WED-229)
Cao, Jiacheng, S272 (WED-378)
Cao, Xi, S329 (WED-229)
Cao, Sheng, S145 (TOP-073)
Cao, Xi, S329 (WED-229)
Cao, Xi, S1163 (SAT-189)
Cao, Zhujun, S195 (FRI-546)
Cao, Xi, S329 (WED-229)
Cao, Zhujun, S195 (FRI-546)
Cao, Zhujun, S195 (FRI-546)
Cao, Zhujun, S195 (FRI-546)
Cao, Zhujun, S195 (FRI-546)
Cao, Zhujun, S195 (FRI-546)
Cao, Zhujun, S195 (FRI-546)
Cao, Zhujun, S195 (FRI-546)
Author Index
Author Index
Castro, Vanda, S902 (FRI-154)
Castven, Darko, S277 (WED-387),
S527 (SAT-213), S536 (SAT-230),
S547 (SAT-248), S557 (SAT-268)
Castven, Jovana, S536 (SAT-230),
S557 (SAT-268)
Catalano, Carolyn, S273 (WED-380),
S312 (SAT-545), S623 (THU-445),
S1011 (THU-390)
Cataluña, Jose Guillain, S599 (THU-157)
Caterini, Luciano, S1122 (WED-203)
Caterino, Tina Di, S657 (SAT-404)
Cathcart, Andrea, S11 (LBO-02)
Cattan, Stéphane, S61 (OS-081)
Cattazzo, Filippo, S203 (FRI-558),
S668 (SAT-420), S1190 (THU-188)
Cattin, Anne-Laure, S75 (OS-105)
Cauduro, Carolina Gomes Da Silveira,
S621 (THU-442)
Caulder, Alex, S1198 (THU-203)
Causse, Xavier, S52 (OS-066), S107 (LBP-11)
Caussy, Cyrielle, S603 (THU-410),
S687 (SAT-450), S701 (SAT-469)
Cavalieri, Maria Lorena, S971 (THU-291)
Cavalletto, Luisa, S990 (THU-316)
Cavallone, Daniela, S1091 (WED-157)
Cavallo, Rossana, S917 (FRI-180)
Cavassini, Matthias, S101 (LBP-04)
Cavazza, Anna, S127 (TOP-093)
Cavicchioli, Alessia, S729 (SAT-517)
Caviglia, Gian Paolo, S521 (FRI-325),
S605 (THU-415), S673 (SAT-430),
S704 (SAT-474), S713 (SAT-494),
S1056 (TOP-106), S1072 (WED-133)
Cavoli, Tancredi Li, S513 (FRI-311)
Çavuş, Bilger, S709 (SAT-485)
Cayon, Lorena, S709 (SAT-484)
Cazzagon, Nora, S40 (OS-045),
S55 (OS-070), S56 (OS-073),
S72 (OS-099), S374 (WED-260),
S383 (WED-277), S407 (WED-315)
Ceausu, Emanoil, S1054 (TOP-100)
Ceccarelli, Daniele, S837 (FRI-487)
Ceccherini Silberstein, Francesca,
S1072 (WED-133), S1122 (WED-203)
Cederborg, Anna, S276 (WED-384)
Cedrés, Susana, S375 (WED-263)
Ceesay, Amie, S1106 (WED-178),
S1106 (WED-179)
Celada-Sendino, Miriam, S171 (FRI-445),
S1098 (WED-166)
Celaj, Stela, S385 (WED-279)
Celen, Mustafa, S1137 (SAT-152)
Celik, Ferya, S852 (WED-490)
Cellner, Linda, S553 (SAT-261)
Celsa, Ciro, S374 (WED-260),
S592 (THU-144), S1118 (WED-196)
Cendron, Laura, S766 (WED-449)
Ceni, Elisabetta, S545 (SAT-245),
S550 (SAT-254)
Centelles, Eva, S489 (THU-546)
Centola, Cielo, S735 (WED-398)
Cereda, Danilo, S920 (FRI-185)
Cerezo-Wallis, Daniela, S78 (OS-109-YI)

S1226

Cerini, Federica, S374 (WED-260)
Ceriotti, Ferruccio, S669 (SAT-422),
S1154 (SAT-175), S1159 (SAT-181),
S1164 (SAT-190), S1170 (SAT-199)
Cerminara, Dana, S975 (THU-294)
Cerocchi, Orlando, S503 (FRI-293)
Cervantes, Vanessa, S648 (TOP-075)
Cervello, Melchiorre, S568 (SAT-288)
Cervenka, Igor, S945 (THU-255)
Cervera, Marta, S15 (OS-001),
S163 (FRI-431), S250 (WED-343),
S664 (SAT-415), S851 (WED-486)
Cervoni, Jean Paul, S318 (SAT-556),
S975 (THU-295)
Cesaro, Simone, S88 (OS-124-YI)
Cescon, Matteo, S519 (FRI-322)
Cespiati, Annalisa, S500 (FRI-288),
S632 (THU-461), S645 (THU-557),
S668 (SAT-420), S722 (SAT-506),
S814 (FRI-474)
Ceuleers, Hannah, S776 (WED-466),
S790 (WED-523)
Chabert, Christian, S762 (WED-442)
Chacon, Carla, S664 (SAT-415)
Cháfer, Isabel Terol, S476 (THU-517)
Chaganti, Joga, S263 (WED-364)
Chaidez, Alexander, S971 (THU-291)
Chaigneau, Julien, S672 (SAT-427)
Chai, Jin, S760 (WED-439)
Chainuvati, Siwaporn, S19 (OS-009),
S237 (WED-321), S502 (FRI-292)
Chaiprasert, Amnart, S262 (WED-360)
Chaiwiriyawong, Supakorn, S514 (FRI-314)
Chalasani, Naga, S171 (FRI-444),
S612 (THU-427), S649 (TOP-080)
Chalkidou, Anna, S1128 (WED-211)
Challis, Benjamin, S344 (THU-228)
Chaltin, Patrick, S1025 (FRI-231)
Chalut, Kevin, S122 (LBP-34)
Cham, Hawa, S67 (OS-090-YI)
Chamroonkul, Naichaya, S514 (FRI-314),
S721 (SAT-503)
Chamseddine, Shadi, S582 (THU-128)
Chan, Connie, S431 (FRI-368)
Chanda, Sushmita, S112 (LBP-18),
S1029 (FRI-238), S1030 (FRI-241),
S1162 (SAT-188), S1164 (SAT-192)
Chandes, Florine, S673 (SAT-429),
S694 (SAT-461)
Chandnani, Sanjay, S405 (WED-312),
S643 (THU-553)
Chan, Doreen, S808 (TOP-091),
S820 (FRI-512)
Chandramouli, Abhishek Shankar,
S620 (THU-440)
Chandra, Nidhi, S790 (WED-522)
Chandran, Vineesh Indira, S629 (THU-455),
S657 (SAT-404)
Chan, Eric, S1087 (WED-151),
S1115 (WED-191)
Chang, Chun-Chao, S1180 (THU-174)
Chang, De-Hua, S594 (THU-147)
Chang, Devon Y., S659 (SAT-408)
Chang, Eu, S300 (SAT-522)

Journal of Hepatology 2023 vol. 78(S1) | S1213–S1305

Chang, Felicia, S644 (THU-555),
S710 (SAT-487)
Chang, Jason Pik Eu, S283 (SAT-327),
S334 (WED-238)
Chang, Nakho, S817 (FRI-506)
Chang, Sandra, S1030 (FRI-241)
Chang, Silvia, S1055 (TOP-103)
Chang, Te-Sheng, S1180 (THU-174),
S1206 (THU-217)
Chang, Ting, S85 (OS-120)
Chang, Xiu-Juan, S1085 (WED-149)
Chang, Ying, S1152 (SAT-173)
Chang, Young, S916 (FRI-179)
Chang, Yujiao, S1143 (SAT-161)
Chan, Henry LY, S29 (OS-025),
S506 (FRI-298), S507 (FRI-300),
S1064 (WED-123), S1131 (SAT-144),
S1132 (SAT-145), S1137 (SAT-153),
S1146 (SAT-166), S1148 (SAT-167)
Chan, Kai En, S629 (THU-456)
Chan, Kwan Shuen, S537 (SAT-231)
Chan, Russell, S680 (SAT-439)
Chan, Stephen, S1 (GS-002-YI),
S12 (LBO-04)
Chanteranne, Brigitte, S172 (FRI-446)
Chan, Wah-Kheong, S29 (OS-025),
S644 (THU-555), S710 (SAT-487),
S721 (SAT-503), S863 (SAT-125)
Chan, Wah Loong, S644 (THU-555),
S710 (SAT-487)
Chao, Hann-Hsiang, S832 (FRI-478)
Chapin, Catherine, S961 (THU-278)
Chapman, Brooke, S311 (SAT-543)
Chapman, Kath, S182 (FRI-464)
Chappell, Catherine, S913 (FRI-174)
Chappidi, Sridhar Reddy, S209 (THU-339)
Charatcharoenwitthaya, Phunchai,
S19 (OS-009), S237 (WED-321),
S721 (SAT-503)
Charatcharoenwitthaya, Punchai,
S502 (FRI-292)
Charlotte, Frederic, S607 (THU-418),
S651 (SAT-394)
Charlton, Michael, S29 (OS-026),
S30 (OS-027), S604 (THU-413),
S619 (THU-438), S619 (THU-439),
S643 (THU-552), S655 (SAT-401)
Charre, Caroline, S1170 (SAT-199)
Charrière, Sybil, S603 (THU-410)
Charton, Julie, S954 (THU-267)
Chartouni, Maria, S1093 (WED-159)
Charu, Vivek, S25 (OS-020-YI),
S81 (OS-115-YI)
Cha, Sang-Hoon, S414 (FRI-336),
S752 (WED-427)
Chascsa, David, S590 (THU-141)
Chattergoon, Michael, S32 (OS-031),
S1079 (WED-141)
Chatterjee, Saurabh, S800 (WED-544)
Chattopadhyay, Sutirtha, S442 (TOP-053)
Chauchan, Neha, S187 (FRI-533)
Chaudhri, Eirum, S49 (OS-060)
Chaudhry, Afzal, S1075 (WED-137)
Chaudhry, Asad, S912 (FRI-172)


Author Index
Chien, Shih-Chieh, S1140 (SAT-157)
Childs, Kate, S1179 (THU-172)
Chi, Li-Chi, S361 (FRI-385)
Chim, Angel Mei-Ling, S1148 (SAT-167)
Chin, Allison, S304 (SAT-532)
China, Louise, S74 (OS-103-YI),
S975 (THU-295)
Chinaroonchai, Tanongsak,
S237 (WED-321)
Chinellato, Monica, S766 (WED-449)
Ching, Carmen, S246 (WED-339)
Chin, Mike, S5 (GS-005)
Chiou, Fang Kuan, S123 (LBP-35),
S387 (WED-282)
Chiou, Jen-Jie, S252 (WED-346)
Chirapongsathorn, Sakkarin,
S262 (WED-360)
Chirouze, Catherine, S994 (THU-322)
Chi, Susan, S414 (FRI-336),
S752 (WED-427)
Chittajallu, Vibhu, S385 (WED-279)
Chiu, Chang-Fang, S588 (THU-138)
Chiu, Keith Wan Hang, S490 (TOP-068)
Chiu, SM, S1134 (SAT-148)
Chiu, Yencheng, S1140 (SAT-157)
Chi, Xiumei, S117 (LBP-24)
Chkhartishvili, Nikoloz, S881 (FRI-123),
S921 (FRI-187), S1204 (THU-214)
Chng, Elaine, S65 (OS-087),
S112 (LBP-17), S333 (WED-236),
S334 (WED-237), S334 (WED-238),
S501 (FRI-290), S757 (WED-436),
S762 (WED-443), S806 (TOP-076),
S824 (FRI-518), S999 (THU-333)
Cho, Dana, S548 (SAT-251)
Chodik, Gabriel, S1195 (THU-199)
Cho, Eun Ju, S510 (FRI-306),
S610 (THU-423)
Cho, Eun Young, S438 (SAT-362),
S712 (SAT-491), S1136 (SAT-151)
Chohan, Aishwarya, S901 (FRI-152)
Cho, Heejin, S494 (FRI-278), S513 (FRI-312),
S1062 (WED-120)
Cho, Hyo Jung, S572 (TOP-071)
Choi, Dongho, S437 (SAT-361),
S456 (THU-479), S563 (SAT-281),
S947 (THU-258)
Choi, Eunho, S798 (WED-540)
Choi, Gwang Hyeon, S583 (THU-130),
S916 (FRI-179)
Choi, Gyu-Seong, S471 (THU-506),
S474 (THU-513)
Choi, Hannah S.J., S1132 (SAT-145)
Choi, Hwa Young, S407 (WED-316),
S916 (FRI-179)
Choi, In Young, S758 (WED-437),
S779 (WED-473)
Choi, Jonggi, S393 (WED-292),
S573 (THU-113), S589 (THU-140),
S998 (THU-330), S1062 (WED-121),
S1130 (TOP-105), S1139 (SAT-155)
Choi, Jong Young,
S148 (FRI-409)
Choi, Joon-Il, S508 (FRI-301)

S1228

Choi, Mi Ran, S156 (FRI-420),
S343 (THU-227)
Choi, Moon Seok, S267 (WED-369),
S305 (SAT-533), S631 (THU-459),
S821 (FRI-514)
Choi, Myeung Gi, S141 (FRI-401)
Choi, Sung Chul, S631 (THU-459)
Choi, Sung Eun, S25 (OS-021-YI)
Choi, Tae-Young, S438 (SAT-362)
Choi, Won-Mook, S573 (THU-113),
S589 (THU-140), S998 (THU-330),
S1062 (WED-121), S1130 (TOP-105),
S1139 (SAT-155)
Choi, Yun-Jung, S338 (WED-246),
S367 (TOP-063), S371 (WED-256)
Cho, Jai Young, S583 (THU-130)
Cho, Jang Hwan, S773 (WED-460)
Cho, Ju-Yeon, S637 (THU-469),
S697 (SAT-464)
Chokkalingam, Anand, S1059 (WED-116)
Chokshi, Shilpa, S324 (WED-218),
S324 (WED-219), S432 (FRI-371)
Cho, Kyung Joo, S362 (FRI-387),
S552 (SAT-259)
Cholankeril, George, S173 (FRI-448),
S472 (THU-508)
Chollet, Celine, S206 (TOP-046)
Cholongitas, Evangelos, S400 (WED-302),
S1128 (WED-211)
Chong, Kediende, S69 (OS-094)
Chong, Lee-Won, S1180 (THU-174),
S1206 (THU-217)
Chong, Shi-En, S644 (THU-555),
S710 (SAT-487)
Chon, Hong Jae, S575 (THU-116),
S582 (THU-128), S586 (THU-134),
S592 (THU-143)
Chon, Young Eun, S757 (WED-435),
S829 (FRI-527), S916 (FRI-179),
S1078 (WED-139)
Choong, Ingrid, S9 (GS-012)
Chotiyaputta, Watcharasak, S19 (OS-009),
S237 (WED-321), S502 (FRI-292)
Chotkoe, Shivani, S776 (WED-466),
S790 (WED-523)
Choudhry, Asad, S1196 (THU-200)
Choudhry, Naheed, S912 (FRI-172)
Choudhry, Sabina, S179 (FRI-459)
Choudhury, Ashok, S191 (FRI-539),
S195 (FRI-546), S274 (WED-382)
Choudhury, Tahmid, S803 (WED-548)
Chouik, Yasmina, S118 (LBP-27),
S687 (SAT-450), S701 (SAT-469)
Chou, Kwok-Hsiung, S1206 (THU-217)
Chounta, Athina, S400 (WED-302)
Chou, Wen-Min, S1026 (FRI-233)
Chowdhury, Swapan, S115 (LBP-22)
Chowdhury, Tasadduk, S516 (FRI-317)
Chow, Pierce, S9 (GS-011), S582 (THU-129),
S591 (THU-142)
Chow, Victor Yung Sin, S1195 (THU-198)
Cho, Yong Kyun, S637 (THU-469),
S697 (SAT-464), S1073 (WED-135)
Cho, Young Seo, S834 (FRI-482)

Journal of Hepatology 2023 vol. 78(S1) | S1213–S1305

Cho, Young Youn, S690 (SAT-455),
S698 (SAT-466), S705 (SAT-477),
S712 (SAT-491)
Cho, Yuri, S117 (LBP-25), S510 (FRI-306),
S642 (THU-550)
Christensen-Dalsgaard, Mikkel,
S321 (TOP-036)
Christensen, Lee, S848 (WED-480)
Christensen, Peer Brehm, S880 (FRI-121)
Christensen, Stefan, S1174 (THU-166)
Christinet, Montserrat Fraga, S105 (LBP-08),
S481 (THU-526)
Christodoulou, Dimitrios, S400 (WED-302),
S922 (FRI-189), S1128 (WED-211)
Chua, Damien, S79 (OS-111)
Chuah, Kee Huat, S644 (THU-555),
S710 (SAT-487)
Chuang, Wan-Long, S53 (OS-067),
S125 (LBP-38), S1023 (FRI-226),
S1137 (SAT-153), S1159 (SAT-182),
S1169 (SAT-198), S1180 (THU-174),
S1206 (THU-217)
Chua, Sin Hui Melissa, S698 (SAT-467),
S714 (SAT-495)
Chua, Siou Sze, S591 (THU-142)
Chuaypen, Natthaya, S354 (THU-243),
S356 (THU-245)
Chu, Chi-Jen, S1172 (THU-163)
Chu, Kai-Min, S825 (FRI-521)
Chulanov, Vladimir, S53 (OS-068),
S1091 (WED-158)
Chung, Alexander, S591 (THU-142)
Chung, Brian K., S364 (FRI-390),
S420 (FRI-353), S421 (FRI-355),
S428 (FRI-365)
Chung, Chuhan, S31 (OS-029),
S737 (WED-401)
Chung, Clive Yik Sham, S537 (SAT-231)
Chung, Diana, S659 (SAT-407)
Chung, Goh Eun, S510 (FRI-306),
S642 (THU-550)
Chung, Nakia, S81 (OS-115-YI)
Chung, Raymond, S58 (OS-075)
Chung, Sungwon, S610 (THU-423),
S630 (THU-457), S635 (THU-466),
S1048 (FRI-268), S1062 (WED-120),
S1144 (SAT-163)
Chung, Woo Jin, S588 (THU-137)
Chung, Yooyun, S432 (FRI-371),
S962 (THU-280)
Chun, Ho Soo, S585 (THU-132),
S1065 (WED-124)
Chu, Niansheng, S450 (SAT-386)
Chupina, Vilena, S767 (WED-451)
Chu, Po-sung, S156 (FRI-421),
S409 (TOP-060)
Chu, Xin-Jie, S784 (WED-510)
Chu, Yin-Lun, S48 (OS-058)
Ciaccio, Antonio, S992 (THU-319)
Ciancio, Alessia, S107 (LBP-11),
S917 (FRI-180), S1072 (WED-133),
S1082 (WED-146), S1177 (THU-169),
S1200 (THU-206)
Ciaranello, Andrea, S878 (FRI-119)


Author Index

Cooper, Curtis, S115 (WED-191), S117 (WED-194)
Cooreman, Michael, S651 (SAT-393), S823 (FRI-517)
Coppola, Carmine, S1082 (WED-146)
Corbato, Nicolò, S107 (LBP-11), S1082 (WED-146)
Corel, Agustin, S435 (SAT-357)
Cordier, Ahmed, S840 (FRI-491)
Cordero, Paul, S205 (TOP-042)
Cordier, Kathleen, S612 (THU-427), S52 (OS-065-YI)
Corelli, Marco, S823 (FRI-517)
Costanzo, Giuseppe Di, S593 (THU-145)
Costa, Roger Flores, S222 (THU-356)
Costa-Sá, Ana, S842 (FRI-495)
Costa-Becker, Ana, S1158 (SAT-182)
Costa-Becker, Ana, S1158 (SAT-182)
Costa, Guido, S446 (SAT-377)
Costa, Mariana, S1111 (WED-185), S1189 (THU-186)
Costa-Moreira, Pedro, S366 (TOP-061)
Costantino, Andrea, S1154 (SAT-175)
Costanzo, Giuseppe Di, S593 (THU-145)
Costo, Nathaniel, S1347 (SAT-196)
Costa-Badía, Bruno, S734 (WED-397)
Costa, Angélica, S822 (FRI-515), S828 (FRI-525)
Costentin, Charlotte, S61 (OS-081), S103 (LBP-07), S500 (FRI-289), S656 (SAT-403), S667 (SAT-419), S672 (SAT-427)
Costa, Guido, S446 (SAT-377)
Costa, Mariana, S1111 (WED-185), S1189 (THU-186)
Costa-Moreira, Pedro, S366 (TOP-061)
Costantino, Andrea, S1154 (SAT-175)
Costanzo, Giuseppe Di, S593 (THU-145)
Costo, Nathaniel, S1347 (SAT-196)
Costa-Badía, Bruno, S734 (WED-397)
Costa, Angélica, S822 (FRI-515), S828 (FRI-525)
Costentin, Charlotte, S61 (OS-081), S103 (LBP-07), S500 (FRI-289), S656 (SAT-403), S667 (SAT-419), S672 (SAT-427)
Costa, Guido, S446 (SAT-377)
Costa, Mariana, S1111 (WED-185), S1189 (THU-186)
Costa-Moreira, Pedro, S366 (TOP-061)
Costantino, Andrea, S1154 (SAT-175)
Costanzo, Giuseppe Di, S593 (THU-145)
Costo, Nathaniel, S1347 (SAT-196)
Costa-Badía, Bruno, S734 (WED-397)
Costa, Angélica, S822 (FRI-515), S828 (FRI-525)
Costentin, Charlotte, S61 (OS-081), S103 (LBP-07), S500 (FRI-289), S656 (SAT-403), S667 (SAT-419), S672 (SAT-427)
Costa, Guido, S446 (SAT-377)
Costa, Mariana, S1111 (WED-185), S1189 (THU-186)
Costa-Moreira, Pedro, S366 (TOP-061)
Costantino, Andrea, S1154 (SAT-175)
Costanzo, Giuseppe Di, S593 (THU-145)
Costo, Nathaniel, S1347 (SAT-196)
Costa-Badía, Bruno, S734 (WED-397)
Costa, Angélica, S822 (FRI-515), S828 (FRI-525)
Costentin, Charlotte, S61 (OS-081), S103 (LBP-07), S500 (FRI-289), S656 (SAT-403), S667 (SAT-419), S672 (SAT-427)
Costa, Guido, S446 (SAT-377)
Costa, Mariana, S1111 (WED-185), S1189 (THU-186)
Costa-Moreira, Pedro, S366 (TOP-061)
Costantino, Andrea, S1154 (SAT-175)
Costanzo, Giuseppe Di, S593 (THU-145)
Costo, Nathaniel, S1347 (SAT-196)
Costa-Badía, Bruno, S734 (WED-397)
Costa, Angélica, S822 (FRI-515), S828 (FRI-525)
Costentin, Charlotte, S61 (OS-081), S103 (LBP-07), S500 (FRI-289), S656 (SAT-403), S667 (SAT-419), S672 (SAT-427)
Author Index

De Conte, Annachiara, S903 (FRI-155)
Deep, Amar, S1050 (FRI-269)
Deepika, S210 (THU-340)
De-Freitas, Cecilia, S1150 (SAT-169)
Del Carmen Roma, Maria, S55 (OS-070), S91 (OS-129-YI), S107 (LPB-11), S108 (LPB-12), S1135 (SAT-149), S1142 (SAT-159), S1154 (SAT-175), S1159 (SAT-181), S1164 (SAT-190), S1170 (SAT-199)
de Guana, Mikel Ruiz, S137 (FRI-395)
de Gottiardi, Andrea, S87 (OS-123-YI)
de Graaff, Barbara, S523 (FRI-329)
Degraeuwe, Lars, S1051 (FRI-272)
Delaunay, Dominique, S603 (THU-410)
Delamarre, Adele, S56 (OS-073), S123 (OS-070), S61 (OS-080-YI), S609 (THU-421), S667 (SAT-419), S672 (SAT-427), S674 (SAT-431), S722 (SAT-508), S769 (WED-453), S777 (WED-469), S833 (FRI-480), S1160 (SAT-184), S1161 (SAT-185)
Delegge, Mark, S977 (THU-296), S1007 (THU-385)
Delerive, Philippe, S762 (WED-442), S776 (WED-467)
Deleuran Hansen, Emil, S175 (FRI-452)
Deleus, Ellen, S753 (WED-430)
Delgado, Alberto, S1028 (FRI-236), S1032 (FRI-245)
Delgado, Igotz, S137 (FRI-395), S529 (SAT-215), S738 (WED-404), S741 (WED-408)
Delgado, Manuel, S964 (THU-282), S980 (THU-301), S996 (THU-326), S998 (THU-331), S1205 (THU-216)
Delgado, Teresa Cardoso, S140 (FRI-399), S529 (SAT-216)
del Hoyo, Javier, S180 (FRI-462)
Deliere, Bénédicte, S134 (THU-447)
Del Pozo, Igotz, S137 (FRI-395), S975 (THU-295)
Delpech, Fabian, S431 (FRI-369)
Delvalle, Gauthier, S897 (FRI-416)
Delwaide, Jean, S1016 (FRI-219)
De los Santos, Ignacio, S1037 (FRI-251)
Delphin, Marion, S1060 (WED-117), S1108 (WED-181)
Del Plano, Filomena, S800 (WED-542)
Delpierre, Julien, S364 (FRI-390)
Del Rio, Alvaro, S546 (SAT-247)
Del Rio-Cubillo, Cristina, S892 (FRI-139)
Dermalde, Miguel, S431 (FRI-369)
De Maria, Nicola, S54 (OS-069)
Dermayer, Tanguy, S971 (THU-289)
De Matteo, Elena, S1037 (FRI-251)
Demenick, Barbara, S306 (SAT-535)
de Meijer, Vincent, S740 (WED-407), S798 (WED-538)
De Meester, Robert, S306 (SAT-535)
Demadrid, Nathalie Fabre, S292 (FRI-201)
Demarest, Sylvie, S1164 (SAT-190), S1167 (SAT-195)
de Meur, Christophe, S460 (THU-486), S482 (THU-528)
Denecke, Timm, S483 (THU-529), S507 (FRI-299)
Deng, Guohong, S196 (FRI-547), S948 (THU-260)
Deng, Huan, S274 (WED-382)
Deng, Hui, S549 (SAT-253)
Deng, Rui, S22 (OS-016)
Deng, Yangyang, S832 (FRI-478)
Deng, Yung, S243 (WED-332)
den Hoed, Caroline, S46 (OS-053-YI), S454 (TOP-052)
den Hoed, Marcel, S769 (WED-454)
de Nicola, Francesca, S1018 (FRI-218)
Denis, Séverine, S329 (WED-228), S403 (WED-307), S417 (FRI-349), S1139 (SAT-156)
de Oca Luna, Roberto Montes, S337 (WED-244)
de Oliveira, Silvia Bastos, S1201 (THU-208)
De Pauli, Alessandro, S486 (THU-537)
de Pedro, Maria Sanz, S690 (SAT-454)
Deprez, Benoît, S954 (THU-267)
Derben, Finn C., S425 (FRI-362)
der Borch, Koen Van, S443 (SAT-371)
derdey, Jolien, S622 (THU-444)
der Eijk, Annemieke Van, S892 (FRI-138)
derenje, Thomas, S444 (SAT-374)
derer, Stefanie, S536 (SAT-230)
derin, Esra, S1179 (THU-172)
derler, Martina, S142 (FRI-402)
der Meer, Adriaan Van, S46 (OS-053-YI), S306 (SAT-536), S454 (TOP-052), S982 (THU-304)
de Roa, Marianne, S300 (SAT-322)
D'Errico, Maria Antonietta, S519 (FRI-322)
de Rudder, Maxime, S438 (SAT-363)
de Ruiter, Christa, S786 (WED-515)
Desai, Dev, S971 (THU-291)
Desai, Monica, S909 (FRI-165)
Desalegn, Hailemichael, S195 (FRI-546), S274 (WED-382), S865 (SAT-129), S916 (FRI-178), S1117 (WED-195), S1150 (SAT-170)
Desandré, Guillaume, S534 (SAT-225)
Descamps, Benedicte, S226 (THU-361)
Descat, Amandine, S355 (THU-244)
de Schaetzen, Arthur, S76 (OS-106-YI)
deschenes, Marc, S645 (THU-557)
Desclaux, Alain, S649 (SAT-495)
De Deseo, Francielle Tramontini Gomes, S1016 (FRI-236)
Demenick, Barbara, S306 (SAT-535)
de Meijer, Vincent, S740 (WED-407), S798 (WED-538)
Demeulemaere, Laura, S172 (FRI-447)
Derick, Muneer, S197 (FRI-549), S351 (THU-238), S1139 (SAT-156)
Demma, Shirin, S247 (WED-340)
Del Carmen Asenjo Lobos, Claudia, S840 (FRI-492)
Del Carmen Dominguez, Maria, S1126 (WED-208)
Del Carmen Rico, Maria, S728 (SAT-515)
Delcea, Catalina, S192 (FRI-541)
Del Conte, Anthony, S260 (WED-358), S809 (FRI-466)
de Ledinghen, Victor, S522 (OS-066), S56 (OS-073), S61 (OS-080-YI), S107 (LPB-11), S498 (FRI-286), S609 (THU-421), S667 (SAT-419), S672 (SAT-427), S674 (SAT-431), S722 (SAT-508), S769 (WED-453), S777 (WED-469), S833 (FRI-480), S1160 (SAT-184), S1161 (SAT-185)
Del Carmen Asenjo Lobos, Claudia, S840 (FRI-492)
De Deseo, Francielle Tramontini Gomes, S1016 (FRI-236)
De Sousa Damião, Filipe, S87 (OS-123-YI)
de Sousa, Francielle Tramontini Gomes, S1167 (SAT-195)
de Sousa, Marcela, S1037 (FRI-251)
Desterke, Christophe, S460 (THU-486), S482 (THU-528)
Author Index

Diaz, Alba, S12 (LBO-04), S87 (OS-123-Y1), S493 (FRI-276), S497 (FRI-284)
Diaz, Asuncion, S880 (FRI-121), S902 (FRI-153)
Diaz del Campo, Nuria Pérez, S605 (THU-415)
Diaz, Fernando, S481 (THU-525), S1098 (WED-166)
Diaz-Ferrer, Javier, S496 (FRI-282), S865 (SAT-129), S900 (FRI-151)
Diaz-Flores, Felicitas, S893 (FRI-140)
Diaz-González, Álvaro, S380 (WED-270), S392 (WED-290), S399 (WED-300)
Diaz, Irene Gonzalez, S690 (SAT-454), S697 (SAT-465), S705 (SAT-478), S706 (SAT-479)
Diaz, Luis Antonio, S865 (SAT-129)
Diaz-Mejía, Nely, S375 (WED-263)
Diaz-Mitoma, Francisco, S1119 (WED-197)
Diaz-Muñoz, Mauricio, S547 (SAT-249)
Diaz, Paula Haridian Quintana, S893 (FRI-140)
Diaz, Raquel, S87 (OS-123-Y1)
Diaz, Rodríguez, S1124 (WED-205)
Di Benedetto, Clara, S54 (OS-069)
Di Benedetto, Davide, S389 (WED-284), S590 (THU-156)
Di Cesare, Ernesto, S685 (SAT-446)
Di, Chun, S514 (FRI-313)
Di Cola, Simone, S217 (THU-350), S218 (THU-352)
Di Diego, Rosa Ortiz De, S936 (FRI-214)
Diemery, Maria Luisa Gonzalez, S133 (THU-404), S481 (THU-525), S964 (THU-282)
Diehl, Anne Mae, S800 (WED-544)
Diemer, Hans-Peter, S996 (THU-327)
Dieterich, Douglas T, S116 (LBO-23)
Dieterich, Douglas T, S894 (FRI-141)
Dieterich, Julie, S955 (THU-324)
Dieterich, Peter, S377 (WED-265)
Dietz-Fricke, Christopher, S107 (LBP-11), S108 (LBP-12), S1139 (SAT-156)
Dietz, Julia, S90 (OS-126), S91 (OS-129-Y1), S1039 (FRI-254), S1042 (FRI-259)
Díez, Jose Manuel Olivarres, S892 (FRI-139), S898 (FRI-148)
Díez, Ruben, S852 (WED-489)
Díez, Sandra, S852 (WED-489)
Di Giacomo, Maria, S791 (WED-525)
Di Gioia, Cira, S360 (FRI-383)
Di Giorgio, Angelo, S966 (THU-285)
Digikia, Antonio, S12 (LBO-04)
Digkria, Willemijn, S306 (SAT-536)
Diken, Mustafa, S26 (OS-022)
Dikopoulos, Nektarios, S1139 (SAT-156)
Dikou, Eleonora, S626 (THU-452), S637 (THU-470)
Dilli, Alexandra, S438 (SAT-363)
Dilli, Daer, S261 (WED-359)
Dill, Michael, S403 (WED-307), S541 (SAT-238), S594 (THU-147)
Dillon, John, S867 (SAT-130)
Di Lorenzo, Andrea, S1072 (WED-133)
Dima, Francesco, S203 (FRI-558)
Dicer, Dine, S274 (WED-382)
Ding, Dora, S64 (OS-085)
Dingfelder, Jule, S465 (THU-494), S465 (THU-495), S470 (THU-505), S489 (THU-545)
Ding, Huiguo, S358 (FRI-381)
Ding, John Nik, S380 (WED-271)
Ding, Weimao, S638 (THU-471), S696 (SAT-463), S724 (SAT-510), S1068 (WED-127), S1078 (WED-140), S1080 (WED-142), S1094 (WED-162), S1128 (WED-212)
Ding, Yanhua, S109 (LBP-13), S110 (LBP-14), S112 (LBP-18), S1164 (SAT-192)
Ding, Yibo, S1016 (TOP-111)
Dinkelborg, Katja, S1031 (FRI-243)
Diotalevii, Sara, S120 (LBP-29)
Dis Cesare, Ernesto, S685 (SAT-446)
Discher, Thomas, S90 (OS-045)
Disco, Alan, S948 (THU-259)
Disse, Emmanuel, S603 (THU-410), S687 (SAT-450), S701 (SAT-469)
Ditello, Marco, S36 (OS-036), S40 (OS-045), S55 (OS-070)
di Tocco, Francesca Casuscelli, S1018 (FRI-218)
Di Tommaso, Luca, S12 (LBO-04)
Diser, Thomas, S495 (FRI-280)
Divino, Victoria, S977 (THU-296), S1007 (THU-385)
Dixit, Bharat, S1169 (SAT-197)
Dixon, Emmanuel Dauda, S739 (FRI-405)
Dixon, Susan, S1141 (SAT-158)
Dixon, Thomas, S193 (FRI-543)
Di Zocco, Daniel E., S54 (OS-049-Y1), S142 (FRI-403), S144 (FRI-406)
Djebbar, Meriem, S498 (FRI-286)
Djennies, Lær, S257 (WED-354)
Djokic, Mila, S553 (SAT-261)
Djoufet, Ivana, S5 (OS-005)
Dobbermann, Henrik, S277 (WED-387), S687 (SAT-449)
Dobes, Jan, S945 (THU-255)
Dobraski, Beata, S505 (FRI-296)
Dobrobaia, Andreea, S1123 (WED-204)
Dobrynska, Marta, S32 (OS-031)
Dodd, Maja, S605 (THU-414), S650 (TOP-085), S653 (SAT-397)
Dodge, Jennifer, S161 (FRI-428), S169 (FRI-441)
D’Odorico, Anna, S407 (WED-315)
Dodd, Mihai, S277 (WED-386)
D’Offizi, Giampiero, S107 (LBP-11)
Dohan, Anthony, S859 (SAT-120)
Author Index

Eftoul, Jean Rene Ngele, S170 (FRI-442)
Eichelberger, Beate, S246 (WED-338)
Eiblmaier, Anja, S507 (FRI-299)
Eguchi, Yuichiro, S627 (THU-453)
Ebert, Matthias, S358 (FRI-381)
Eboko, Marthe Ntep, S1210 (THU-222)
Ebrahimim, Fahim, S82 (OS-116-YI)
S600 (TOP-079)
Ebwill, Ebanja Joseph, S1051 (FRI-272)
Echavarria, Victor, S171 (FRI-445)
S251 (WED-344), S911 (FRI-171)
Echavarria, Juan Emilio, S902 (FRI-153)
Ecker, Dominik, S90 (OS-127-YI)
S299 (SAT-521)
Edelman, Elazer, S325 (WED-220)
S333 (WED-235)
Edlund, Karolina, S413 (FRI-334)
S778 (WED-470), S940 (THU-249)
Edwards, Katherine, S822 (FRI-515)
Edwards, Lindsey A, S7 (GS-007)
S326 (WED-441)
Ee, Neo Jean, S1204 (THU-213)
Efe, Cumali, S392 (WED-290)
Effert, Thomas, S551 (SAT-256)
Efole, Jean Rene Ngele, S170 (FRI-442)
Egerman, Robert, S914 (FRI-176)
S1182 (THU-175)
S101 (LBP-15)
Egger, Robert, S31 (OS-029),
S790 (WED-522)
Eg-red-Rah, Elmar, S507 (FRI-302)
Eguchi, Hidetoshi, S439 (SAT-366)
S509 (FRI-302)
S86 (OS-121-YI)
S87 (OS-123-YI)
S253 (WED-348), S283 (SAT-327),
S318 (SAT-556), S975 (THU-295),
S981 (THU-303)
S535 (SAT-221)
S533 (FRI-137)
S535 (SAT-226), S524 (SAT-246)
S541 (SAT-238), S544 (SAT-244)
S785 (FRI-115)
S156 (SAT-518), S197 (FRI-555),
S1021 (THU-175)
S477 (WED-354)
S1182 (WED-212)
S125 (LBP-38), S387 (WED-282)
S650 (TOP-085), S653 (SAT-397),
S707 (SAT-481)
Eltanz, Yasir, S724 (SAT-509)
Elamrawy, Fatima, S1212 (THU-224)
Elaraki, Fatima, S1162 (SAT-187)
Elbashaw, Hany, S89 (OS-125)
Elbashawi, Ahmed, S203 (FRI-557)
Elsharkawy, Ahmed, S231 (THU-368),
S232 (THU-370)
Ellisi, Zizi, S673 (FRI-113)
Elston, Robert, S110 (LBP-15),
S1039 (FRI-255), S1154 (SAT-176),
S1162 (SAT-187)
Eltepu, Laxman, S548 (SAT-251)
Elwick, Hannah, S901 (FRI-152)
Elim, Ayman, S140 (FRI-399)
Eliass, Minah, S840 (FRI-491)
Elgretti, Wessel, S645 (THU-557)
Engel, Samuel, S49 (OS-060),
S610 (THU-423), S650 (TOP-085),
S653 (SAT-397)
Engels, Zoe, S1021 (FRI-224)
Englebert, Gert, S621 (THU-442)
Engelhardt, blouse, W1075 (THU-137)
Enkhbat, Anir, S1104 (WED-175)
Enkhjargal, Samuul, S176 (SAT-497),
S718 (SAT-499), S1104 (WED-175)
Ennequin, Gai, S806 (WED-555)
Enomoto, Masaru, S56 (SAT-286)
Enomoto, Nobuyuki, S1183 (THU-177)
Enrique, Lisandro Moises, S932 (FRI-208)
Enrique-Rodriguez, Cesar Jesus,
S267 (WED-370), S273 (WED-381)
Ennsai, Cokce Kobazi, S951 (THU-264)
Entrialgo, Rodrigo, S560 (SAT-275)
Epstein, Eliana, S58 (OS-075)
Epstein, Rachel, S838 (FRI-489),
S878 (FRI-119), S1180 (THU-173)
Erard, Domitille, S62 (OS-083-YI)
Ercan, Caner, S214 (THU-345)
Erdemir, Gizen, S477 (THU-518)
Erdem, Merve, S542 (SAT-240)
Erdin, Ayse, S65 (OS-086)
Erdman, Joris, S836 (FRI-485)
Erdozain, Jose Carlos, S1105 (WED-177)
Ergenc, Ilkay, S389 (WED-286)
Erhardt, Andreas, S1137 (SAT-152)
Eric, Oihane, S534 (SAT-226)
Erickson, Mary, S378 (WED-267),
S426 (FRI-363)
Eriksen, Peter Lykke, S159 (FRI-424),
S257 (WED-354)
Eriksson, Per, S756 (WED-434)
Ertel, Nicole, S1134 (S480)
Ertel, Judith, S723 (SAT-507)
Ertel, Hildegund, S1015 (TOP-107)
Eruzun, Rafael, S822 (FRI-515)
Escandón, Rafael, S822 (FRI-515)
Escarrabill, Joan, S497 (FRI-284),
S849 (WED-483)
Escorsell, Angeles, S73 (OS-100-YI),
S164 (FRI-433)
Escudero-Garcia, Desamparados,
S35 (OS-035-YI), S682 (SAT-442),
S693 (SAT-460)
Espínol-López, Blanca, S732 (TOP-090)
Escudero, Raquel, S902 (FRI-153)
Esun, John, S971 (THU-291)
Eskridge, Wayne, S627 (THU-453)
Eslick, Guy, S132 (THU-412)
Est, Medina-Morales, S56 (OS-073)
Esmat, Gamal, S840 (FRI-491)
Espérance, Claire, S170 (FRI-443)
Espina, Silvia, S1187 (THU-183)
Espindula, Rafael, S1188 (THU-184)
Espinoza, Jorge Simón, S140 (FRI-399)
Espiritu, Christine L, S1171 (SAT-202)
Espuelgues, Juan V, S335 (WED-239),
S781 (WED-505)
Esquer, Joshua Covarrubias, S123 (LBP-35),
S387 (WED-282)
Essbauer, Sandra, S945 (THU-256)
Author Index

Evans, Tom, S1169 (SAT-198)
Evans, Ronald, S662 (SAT-412)
Evans, Helen, S971 (THU-291)
Evans, Hannah, S337 (WED-243)
Everson, Greg, S684 (SAT-444),
Evole, Helena Hernandéz, S131 (THU-399),
Evert, Katja, S521 (FRI-324)
Evangelista, Lorenzo, S942 (THU-251)
Estulin, Dmitrii, S612 (THU-426)
Etzion, Ohad, S9 (GS-012)
Eun, So-Young, S948 (THU-259)
Ettich, Julia, S441 (SAT-368)
Ezair, Manon, S494 (FRI-279),
Eun Yeon, Jong, S798 (WED-540)
Evain, Manon, S494 (FRI-279), S15 (OS-001), S163 (FRI-431), S843 (FRI-499)
Fabregat, Isabel, S331 (WED-231),
Fabregas, Emilio, S481 (THU-546)
Fabiani, Françoise Lunel, S897 (FRI-115), S916 (FRI-178),
Fabrellas, Núria, S897 (FRI-115), S916 (FRI-178),
Fabiani, Françoise Lunel, S897 (FRI-115), S916 (FRI-178),
Ezzat, Doris, S1212 (THU-224)
Ezhili, Mullai, S473 (THU-510)
Ezzati, Dari, S1212 (THU-224)
Fabiani, Françoise Lunel, S897 (FRI-115), S916 (FRI-178),
Ezzat, Doris, S1212 (THU-224)
Fabiani, Françoise Lunel, S897 (FRI-115), S916 (FRI-178),
Ezzat, Doris, S1212 (THU-224)
Fabiani, Françoise Lunel, S897 (FRI-115), S916 (FRI-178),
Ezzat, Doris, S1212 (THU-224)
Author Index
Author Index
Ghannouchi, Haroun, S585 (THU-133)
Gheorghe, Cristian, S899 (FRI-150)
Gheorghe, Liana, S9 (GS-012),
S899 (FRI-150)
Gherardi, Gaia, S322 (TOP-037)
Gherlan, George Sebastian, S9 (GS-012),
S1054 (TOP-100)
Ghesquière, Bart, S452 (SAT-390)
Ghimire, Sabitri, S433 (SAT-354)
Ghioca, Mihaela, S899 (FRI-150)
Ghittoni, Giorgia, S586 (THU-134)
Ghosh, Indrajit, S721 (SAT-504),
S1122 (WED-202)
Giaccetto, Marco, S40 (OS-045),
S55 (OS-070)
Giacchetto, Marco, S592 (THU-144)
Giannelli, Gianluigi, S493 (FRI-277),
S495 (FRI-280)
Giannelli, Valerio, S54 (OS-069),
S247 (WED-340), S482 (THU-527),
S994 (THU-323)
Giannini, Edoardo, S511 (FRI-308)
Giannini, Edoardo Giovanni,
S40 (OS-045), S54 (OS-069),
S55 (OS-070), S374 (WED-260),
S586 (THU-134)
Giannitrapani, Lydia, S568 (SAT-288)
Giannone, Fabio, S541 (SAT-237)
Giannou, Anastasios, S525 (TOP-069)
Giannoulis, George, S1128 (WED-211)
Gianoncelli, Alessandra, S360 (FRI-383)
Gibaja, Veronica, S526 (TOP-072)
Gibbs, Craig, S5 (GS-005)
Gibson, Andy, S909 (FRI-165)
Gibson, Robert, S195 (FRI-546)
Gieger, Christian, S968 (THU-288)
Gielen, Vera, S1141 (SAT-158),
S1145 (SAT-164)
Giera, Martin, S786 (WED-515)
Gies, Inge, S65 (OS-088)
Gigante, Elia, S577 (THU-119)
Gigi, Eleni, S730 (SAT-518)
Gigliotti, Luca C., S751 (WED-425)
Gignoux, Etienne, S69 (OS-094)
Giladi, Hilla, S549 (SAT-252)
Gilbert, Benoit, S24 (OS-018-YI)
Gilbert, Jack, S662 (SAT-412)
Gil, Erik Ramon, S538 (SAT-234)
Giles, Benjamin, S1005 (THU-381)
Gilgenkrantz, Hélène, S435 (SAT-358)
Gil-Gomez, Antonio, S760 (WED-440),
S770 (WED-457)
Gilg, Stefan, S44 (OS-050-YI)
Gillard, Justine, S772 (WED-458)
Gillberg, Per-Göran, S57 (OS-074-YI)
Gillevet, Patrick, S342 (TOP-038),
S347 (THU-233)
Gill, Madeleine, S230 (THU-367)
Gill, Upkar, S118 (LBP-27), S558 (SAT-271),
S1024 (FRI-229), S1033 (FRI-246),
S1105 (WED-176)
Gil, Mar, S780 (WED-474)
Gilmour, Susan, S123 (LBP-35),
S387 (WED-282)

Gil-Pitarch, Claudia, S140 (FRI-399),
S529 (SAT-216), S544 (SAT-244),
S546 (SAT-247)
Gilson, Richard, S721 (SAT-504),
S1122 (WED-202)
Gimenez-Garzo, Carla, S423 (FRI-359)
Gimignani, Giancarlo, S40 (OS-045),
S55 (OS-070)
Giné, Alvaro Eguilero, S544 (SAT-244)
Ginès, Pere, S10 (LBO-01), S15 (OS-001),
S158 (FRI-423), S163 (FRI-431),
S166 (FRI-437), S250 (WED-343),
S664 (SAT-415), S737 (WED-403),
S845 (TOP-054), S851 (WED-486)
Ginés, Raquel Fernández, S777 (WED-468)
Ginion, Audrey, S439 (SAT-364)
Gioia, Stefania, S87 (OS-123-YI),
S237 (WED-320), S251 (WED-345),
S950 (THU-261), S994 (THU-323)
Giordanengo, Valérie, S1158 (SAT-180)
Giorgio, Angelo Di, S938 (TOP-057)
Giorgio, Massimo De, S471 (THU-507)
Giovannini, Catia, S571 (TOP-067)
Girala, Marcos, S865 (SAT-129),
S900 (FRI-151)
Giráldez-Gallego, Alvaro,
S1098 (WED-166), S1126 (WED-208)
Giralt, Albert, S762 (WED-442)
Girardi, Enrico, S907 (FRI-164)
Girardi, Noemi, S564 (SAT-283)
Giraud, Guillaume, S1014 (TOP-104)
Giraudi, Pablo J, S768 (WED-452),
S793 (WED-529)
Giraudo, Chiara, S990 (THU-316)
Girbes, Alexandre Perez, S682 (SAT-442)
Giri, Dewan, S729 (SAT-516)
Girija, Sanal Madhusudana,
S207 (THU-337)
Gish, Robert G., S882 (FRI-124),
S900 (FRI-151), S901 (FRI-152),
S1072 (WED-134), S1087 (WED-151),
S1089 (WED-153), S1093 (WED-160),
S1121 (WED-200)
Gitahi, Jane, S858 (SAT-118),
S1198 (THU-203)
Gitahi, Priscillah, S69 (OS-094)
Giudicelli, Héloise, S494 (FRI-279),
S515 (FRI-316)
Giudicelli-Lett, Heloïse, S87 (OS-123-YI),
S589 (THU-139)
Giuffrè, Mauro, S711 (SAT-489)
Giuffrida, Paolo, S592 (THU-144)
Giuli, Lucia, S252 (WED-347),
S981 (THU-302)
Giuly, Nathalie, S1093 (WED-159)
Giunta, Diego, S245 (WED-336),
S253 (WED-348)
Giustini, Leonardo, S5 (GS-005)
Gjini, Kamela, S521 (FRI-325),
S617 (THU-435), S637 (THU-470),
S704 (SAT-474), S713 (SAT-494)
Gkantsinikoudi, Christina, S39 (OS-043)
Glampson, Ben, S1075 (WED-137)
Glaus, Jesus, S737 (WED-402)

Journal of Hepatology 2023 vol. 78(S1) | S1213–S1305

Gleeson, Dermot, S382 (WED-273),
S391 (WED-289)
Glenister, Kristen, S861 (SAT-123)
Glenn, Jeffrey, S9 (GS-012)
Glickman, Jonathan, S31 (OS-029),
S790 (WED-522)
Gliddon, Louise, S215 (THU-346)
Glitscher, Mirco, S1039 (FRI-254),
S1042 (FRI-259)
Gliwicz, Dorota, S971 (THU-291)
Gloor, Severin, S44 (OS-050-YI)
Gluud, Lise Lotte, S65 (OS-088),
S165 (FRI-434), S321 (TOP-036),
S614 (THU-429), S702 (SAT-471),
S742 (WED-411)
Gnemmi, Viviane, S12 (LBO-04),
S146 (FRI-408)
Gobbo, Giulia, S105 (LBP-09)
Godec, Sergej, S142 (FRI-403)
Godey, Sameer, S209 (THU-339)
Godinho-Santos, Ana, S279 (WED-390)
Goedhals, Dominique, S1108 (WED-181)
Goediker, Juliana, S979 (THU-299),
S1139 (SAT-156)
Goel, Amit, S1050 (FRI-269)
Goel, Ashish, S87 (OS-123-YI),
S274 (WED-382)
Goeman, Els, S764 (WED-446)
Goeppert, Benjamin, S547 (SAT-248)
Goffaux, Alexis, S464 (THU-493),
S639 (THU-473)
Goff, Cameron, S173 (FRI-448),
S472 (THU-508)
Goffic, Charles Le, S74 (OS-104)
Gogia, Marine, S921 (FRI-187)
Gogia, Sudhanshu, S808 (TOP-091)
Gogna, Apoorva, S582 (THU-129),
S591 (THU-142)
Goh, Boon Bee George, S967 (THU-286),
S1096 (WED-165)
Goh, Brian, S591 (THU-142)
Gohil, Vikrant, S1051 (FRI-272)
Goh, Jade Shu Qi, S591 (THU-142)
Göhlmann, Hinrich, S1034 (FRI-248)
Goh, Myungji, S267 (WED-369),
S305 (SAT-533), S513 (FRI-312),
S631 (THU-459), S821 (FRI-514)
Goicoechea, Ibai, S534 (SAT-226)
Goikoetxea, Naroa, S140 (FRI-399),
S529 (SAT-216), S532 (SAT-221),
S544 (SAT-244), S546 (SAT-247)
Gokcan, Hale, S181 (FRI-463),
S477 (THU-518)
Gökden, Yasemin, S279 (WED-391)
Golabi, Pegah, S600 (TOP-081),
S627 (THU-453), S861 (SAT-122)
Golamari, Srinivasa Reddy, S293 (SAT-344)
Goldberg, David, S398 (WED-298),
S459 (THU-484), S470 (THU-504)
Goldberg, Lital, S128 (THU-394)
Goldenberg, Simon, S7 (GS-007)
Goldin, Robert D., S624 (THU-446),
S719 (SAT-501)
Goldklang, Monica, S85 (OS-120)

S1241


Author Index

Gómez-Domínguez, Elena, S366 (TOP-061)
Gómez, Eduardo Vilar, S171 (FRI-444),
Gómez, Diana Carolina, S869 (SAT-133)
Gómez-Gonzalez, Emilio, S335 (WED-240)
Gómez, Manuel Romero, S8 (GS-009),
Gómez- Camarero, Judith, S700 (SAT-468),
Gomez-Cabrero, David, S143 (FRI-404),
Gómez, Araceli Casado, S921 (FRI-188)
Gomez, Angela Carvalho, S476 (THU-517)
González, Andrea, S251 (WED-344),
S911 (FRI-171)
González-Aseguinolaza, Gloria, S1024 (FRI-228)
González, Daniela, S940 (THU-249)
Gonzalez de frutos, Concepción, S964 (THU-282), S980 (THU-301), S996 (THU-326)
González, Delia Almeida, S301 (WED-296)
Gonzalez-Dieguz, Maria Luisa, S980 (THU-301), S996 (THU-326), S998 (THU-331)
González, Elena Tenorio, S314 (SAT-549)
Gonzalez, Esther Arnaiz, S803 (WED-548)
Gonzalez, Faíbola Perez, S893 (FRI-140)
González-Ágáel, Javier, S554 (SAT-263)
Gonzalez-Grande, Rocio, S314 (SAT-549),
S1126 (WED-208)
González, Hector Taboada, S932 (FRI-208)
González-Huezco, Maria Sarai, S195 (FRI-546)
Gonzalez, Isabel, S852 (WED-489)
González, Jesús Manuel, S587 (THU-136)
González-Jiménez, A, S126 (FRI-107)
González, Lorena Mosteiro, S738 (WED-404)
González-Recio, Irene, S140 (FRI-399),
S529 (SAT-215), S532 (SAT-221), S544 (SAT-244)
Gonzalez-Romero, Francisco, S137 (FRI-395), S738 (WED-404)
González-Romero, Francisco, S529 (SAT-215), S741 (WED-408)
Gonzalez-Sanchez, Ester, S331 (WED-231), S560 (SAT-275)
Gonzalez, Stefam, S241 (WED-328)
Gonzalez-Tuñon, S554 (SAT-263)
Gonzalez, Veronica Ethn Prado, S865 (SAT-129)
Gonzalez, Francois, S1030 (FRI-241)
Goodall, Barbara, S909 (FRI-166)
Good, Jean-Marc, S105 (LBP-08)
Goodman, Zachary, S11 (LBO-03), S782 (WED-506)
Goodwin, Bryan, S422 (FRI-356)
Goodwin, Tyler, S35 (OS-034)
Gours, Nicolas, S481 (THU-526),
S757 (WED-426)
Gopal, Purva, S12 (LBO-04)
Gophna, Uri, S824 (FRI-519)
Gopi, Srikanth, S6 (GS-006), S233 (TOP-041)
Gordon, Emmanuel, S1150 (SAT-169), S1160 (SAT-183), S1161 (SAT-185)
Gordillo, Noelia, S198 (FRI-550), S807 (TOP-077)
Gordon, Fiona, S177 (FRI-455), S858 (SAT-118), S909 (FRI-165), S1198 (THU-203)
Gordon, Melita, S522 (FRI-327)
Gordon, Stuart, S125 (LBP-38), S863 (SAT-125), S1208 (THU-218)
Gordon, Stuart, C, S388 (WED-283), S627 (THU-453)
Gordon, Victoria, S382 (WED-273)
Gore, John, S555 (SAT-265)
Gores, Gregory, S28 (OS-024-VI)
Gorfu, Zebeaman Tibebe, S1120 (WED-199)
Görögülü, Esra, S1039 (FRI-254),
S1042 (FRI-257)
Goria, Odile, S86 (OS-121-VI), S975 (THU-295)
Gormley, Sarah, S877 (FRI-118)
Gormsen, Lars, S159 (FRI-424)
Gorsuch, Cassandra, S35 (OS-034)
Gorter, Alan, S740 (WED-407)
Gosset, Andréa, S923 (FRI-191)
Goswami, Rohan, S472 (THU-509)
Gothland, Adélie, S1044 (FRI-261)
Gottfriedsson, Magnús, S880 (FRI-121)
Gottfriedová, Halima, S61 (OS-080-VI)
Gottwald, Millie, S13 (LBP-05)
Götze, Oliver, S628 (THU-454)
Gouveia, Angelique, S27 (OS-023-VI)
Goulas, Anastis, S1194 (THU-196),
S1194 (THU-197)
Goulis, Ioannis, S1128 (WED-211)
Goundan, Pranava, S67 (OS-091)
Goutas, Ilias, S880 (FRI-121)
Goutas, Konstantinos, S880 (FRI-121)
Gournopulos, Kostas, S122 (LBP-33-VI)
Gouton, Martial, S833 (FRI-340)
Goulette, Nathalie, S482 (THU-528),
S500 (FRI-289)
Gouttenoire, Jéréme, S1031 (FRI-243)
Govaere, Olivier, S78 (OS-110), S781 (WED-475)
Govaerts, Liesbeth, S1114 (WED-190)
Gow, Paul, S311 (SAT-543),
S380 (WED-271)
Goyal, Atul, S660 (SAT-410), S812 (FRI-471)
Goyal, Tani, S658 (SAT-406),
S703 (SAT-473)
Gozdowska, Jolanta, S563 (SAT-280)
Gozlan, Yael, S128 (THU-394)
Graceffa, Pietro, S1111 (WED-186),
S1118 (WED-196)
Graff, Hannah, S103 (LBP-06)
Grainger, Richard, S1011 (THU-389)
Grajowska, Wieslawa, S837 (FRI-486),
S950 (THU-262)
Gralton, Kate, S731 (TOP-089)
Gramantieri, Laura, S571 (TOP-067)
Author Index

Hildt, Eberhard, S1039 (FRI-254), S1042 (FRI-259)
Hilleret, Marie-Noëlle, S52 (OS-066), S107 (LBP-11), S473 (THU-511), S894 (FRI-142), S1106 (WED-179), S1160 (SAT-184)
Hill, Megan, S662 (SAT-412)
Hilpert, Martin, S664 (SAT-414)
Hilsenbeck, Susan, S517 (FRI-319)
Hilpert, Martin, S664 (SAT-412)
Hill, Megan, S662 (SAT-412)
Hoffmann, Malike, S33 (OS-032), S318 (SAT-555), S447 (SAT-379)
Hoffmann, Ute, S940 (THU-249)
Hoffmann, Wolf Peter, S1139 (SAT-156)
Hofmeister, Megan, S1052 (SAT-141)
Hofstetter, Thomas, S737 (THU-402)
Ho, Gideon, S65 (OS-087), S763 (WED-445)
Hohenester, Simon, S329 (WED-228), S417 (FRI-349), S948 (THU-259), S990 (THU-317)
Hohlstein, Philipp, S188 (FRI-534)
Ho, Hsin-Tien, S825 (FRI-521)
Ho, Jinlin, S94 (THU-335), S1153 (SAT-182)
Hollande, Clemence, S196 (FRI-259), S473 (THU-511), S1153 (SAT-174), S1164 (SAT-192), S1171 (SAT-201)
Hou, Jiajie, S543 (SAT-242)
Hou, Jinyoung, S304 (WED-308), S404 (WED-310)
Houssels, Debra, Pauline, S86 (OS-121-YI), S473 (THU-511), S981 (THU-303)
Houts, Carrie, S1087 (WED-151)
Hou, Xinyi, S93 (FRI-544)
Hou, Yichuan, S11 (LBO-03), S1147 (TOP-110)
Hou, Yoo-Chun, S1023 (SAT-155)
Houlahan, Ciara, S1211 (THU-223)
Hou, Ying-Chih, S522 (SAT-505), S769 (WED-453), S777 (WED-469)
Hou, Qing, S496 (FRI-283), S1172 (THU-163)
Hou, Qiaohao, S347 (THU-232)
Houri, Inbal, S403 (WED-308), S404 (WED-310)
Houssel-Debray, Pauline, S86 (OS-121-YI), S473 (THU-511), S981 (THU-303)
Houts, Carrie, S1087 (WED-151)
Hou, Xinyi, S93 (FRI-544)
Hou, Yichuan, S11 (LBO-03), S1147 (TOP-110)
Hou, Yoo-Chun, S1023 (SAT-155)
Houlahan, Ciara, S1211 (THU-223)
Hou, Ying-Chih, S522 (SAT-505), S769 (WED-453), S777 (WED-469)
Hou, Qing, S496 (FRI-283), S1172 (THU-163)
Hou, Qiaohao, S347 (THU-232)
Houri, Inbal, S403 (WED-308), S404 (WED-310)
Houssel-Debray, Pauline, S86 (OS-121-YI), S473 (THU-511), S981 (THU-303)
Houts, Carrie, S1087 (WED-151)
Hou, Xinyi, S93 (FRI-544)
Hou, Yichuan, S11 (LBO-03), S1147 (TOP-110)
Hou, Yoo-Chun, S1023 (SAT-155)
Houlahan, Ciara, S1211 (THU-223)
Hou, Ying-Chih, S522 (SAT-505), S769 (WED-453), S777 (WED-469)
Hou, Qing, S496 (FRI-283), S1172 (THU-163)
Hou, Qiaohao, S347 (THU-232)
Houri, Inbal, S403 (WED-308), S404 (WED-310)
Houssel-Debray, Pauline, S86 (OS-121-YI), S473 (THU-511), S981 (THU-303)
Houts, Carrie, S1087 (WED-151)
Hou, Xinyi, S93 (FRI-544)
Hou, Yichuan, S11 (LBO-03), S1147 (TOP-110)
Hou, Yoo-Chun, S1023 (SAT-155)
Houlahan, Ciara, S1211 (THU-223)
Hou, Ying-Chih, S522 (SAT-505), S769 (WED-453), S777 (WED-469)
Hou, Qing, S496 (FRI-283), S1172 (THU-163)
Hou, Qiaohao, S347 (THU-232)
Houri, Inbal, S403 (WED-308), S404 (WED-310)
Houssel-Debray, Pauline, S86 (OS-121-YI), S473 (THU-511), S981 (THU-303)
Houts, Carrie, S1087 (WED-151)
Hou, Xinyi, S93 (FRI-544)
Hou, Yichuan, S11 (LBO-03), S1147 (TOP-110)
Hou, Yoo-Chun, S1023 (SAT-155)
Houlahan, Ciara, S1211 (THU-223)
Hou, Ying-Chih, S522 (SAT-505), S769 (WED-453), S777 (WED-469)
Hou, Qing, S496 (FRI-283), S1172 (THU-163)
Hou, Qiaohao, S347 (THU-232)
Houri, Inbal, S403 (WED-308), S404 (WED-310)
Inayat, Faisal, S268 (WED-371)
Indolfi, Giuseppe, S965 (WED-483)
Indolfi, Giuseppe, S965 (WED-483)
Indrani, José A., S805 (WED-553)
Ingram, Suzanne, S848 (WED-480)
Ingram, Wendy, S153 (FRI-418)
Ingrid, Marcoz, S161 (FRI-429)
Inia, José A., S805 (WED-553)
Innes, Hamish, S548 (SAT-250)
Innocenti, Francesco, S645 (THU-556)
Innocent, Victoria, S1058 (WED-113)
Inoue, Takako, S1095 (WED-163)
Invernizzi, Pietro, S11 (LBO-03), S40 (OS-045), S55 (OS-070), S56 (OS-073), S374 (WED-260), S381 (WED-272), S447 (SAT-380), S982 (THU-304), S992 (THU-319)
Iorio, Anna Paola, S88 (OS-124-YI)
Iori, Raffaele, S966 (THU-285)
Iotti, Stefano, S360 (FRI-383)
Ippili, Ravi, S67 (OS-091)
Ippolito, Davide, S381 (WED-272)
Iqbal, Afshan, S435 (SAT-357)
Iqbal, Shahed, S64 (OS-085)
Iqbal, Tariq, S123 (LBP-36), S368 (WED-251)
Irani, Farah, S591 (THU-142)
Irano, Patricia, S375 (WED-263)
Irish, Dianne, S879 (FRI-120)
Irizarry, Paola, S8 (GS-009), S529 (SAT-215), S738 (WED-404)
Irizarry, Paola, S8 (GS-009), S529 (SAT-215), S738 (WED-404)
Irizarry, Paola, S8 (GS-009), S529 (SAT-215), S738 (WED-404)
Ito, Seigo, S453 (SAT-392)
Ito, Tatsuya, S646 (THU-559)
Iuliano, Antonella, S942 (THU-251)
Ivanez, Arpad, S553 (SAT-261)
Ivashkin, Vladimir, S260 (WED-357)
Iversen, Aske Thorn, S65 (OS-088)
Iwagami, Yoshifumi, S439 (SAT-366), S509 (FRI-302)
Iwaki, Michihiro, S50 (OS-028), S616 (THU-433), S686 (SAT-448)
Iwakiri, Katsukiko, S240 (WED-327), S317 (SAT-554), S818 (FRI-508), S820 (FRI-511)
Iwamoto, Hideki, S584 (THU-131)
Iyer, Janani, S31 (OS-029), S790 (WED-522)
Izagirre, Maider Huici, S28 (OS-024-YI)
Izick, Jakob R., S285 (FRI-339)
Izumi, Namiki, S53 (OS-067), S65 (OS-086), S598 (THU-155), S644 (THU-554), S1113 (WED-189), S1137 (SAT-153)
Izzi, Antonino, S36 (OS-036), S40 (OS-045), S55 (OS-070)
Izzy, Manhal, S241 (WED-328), S555 (SAT-265), S900 (FRI-151)
Jaan, Ali, S183 (FRI-339)
Jaber, Arash, S314 (SAT-548)
Jaber, Samir, S74 (OS-104)
Jablonski, Maciej, S53 (OS-067), S1137 (SAT-153)
Jabri, Yamen, S483 (THU-530)
Jacobs, Mathias, S37 (OS-039-YI), S90 (OS-127-YI), S107 (LBP-11), S108 (LBP-12), S193 (FRI-545), S199 (FRI-551), S201 (FRI-554), S244 (WED-334), S282 (SAT-326), S284 (SAT-330), S286 (SAT-332), S288 (SAT-335), S292 (SAT-342), S299 (SAT-521), S313 (SAT-547), S831 (FRI-477), S939 (TOP-058), S1135 (SAT-150)
Jack, Kathyrn, S847 (WED-479)
Jackson, Kathy, S875 (FRI-115)
Jacob, Hole, Mikal, S428 (FRI-365)
Jacobs, Daniel, S932 (FRI-208)
Jacobsen, Birgitte, S629 (THU-455), S657 (SAT-204), S851 (WED-487)
Jacobovitz, Ira M., S1072 (WED-134), S1089 (WED-153), S1093 (WED-160), S1121 (WED-200)
Jacomet, Christine, S876 (FRI-117)
Jacquemin, Emmanuel, S954 (THU-267), S969 (THU-289), S971 (THU-291)
Jadawdji, Zainab, S1129 (WED-213)
Jaekel, Elmar, S425 (FRI-362), S466 (TGH-496), S579 (WED-537)
Jaeckers, Joris, S524 (TOP-066), S573 (WED-430)
Jäger, Julius, S413 (FRI-334)
Author Index

Kasi, Nagraj, S123 (LBP-35), S387 (WED-282)
Kassab, Mohamed, S521 (FRI-326)
Kassas, Mohamed El, S627 (THU-453), S863 (SAT-125)
Kasten, Jennifer, S417 (FRI-350)
Kastrup, Nanna, S156 (FRI-432)
Kasuga, Ryosuke, S156 (FRI-421), S409 (TOP-060)
Kataria, Nitin, S590 (THU-141)
Katw, Awi, S415 (FRI-345)
Katchman, Helena, S195 (FRI-546), S315 (SAT-550)
Kateh, Angels, S579 (THU-124)
Katemann, Christoph, S229 (THU-366)
Katharina Frank, Anna, S418 (FRI-351)
Kathawate, Ranganathan, S398 (WED-298)
Kathemann, Simone, S987 (THU-313)
Kather, Jakob Nikolai, S12 (LBO-04)
Katja, Füssel, S379 (WED-269)
Kato, Azusa, S453 (SAT-392)
Kato, Hideaki, S323 (WED-216)
Kato, Keizo, S188 (FRI-508)
Kato, Naoya, S1183 (THU-177)
Katsahian, Sandrine, S859 (SAT-120)
Katzarov, Krum, S198 (FRI-550), S317 (SAT-554), S818 (FRI-508), S627 (THU-453), S686 (SAT-448)
Kawabata, Takumi, S882 (FRI-326), S1059 (WED-161), S1070 (WED-130), S1072 (WED-134), S1089 (WED-153), S1093 (WED-160), S1121 (WED-200)
Kautiainen, Hannu, S370 (WED-253)
Kautz, Achim, S627 (THU-453)
Kawada, Norifumi, S325 (WED-221), S395 (WED-293), S566 (SAT-286), S1183 (THU-177)
Kawaguchi, Takumi, S584 (THU-131), S627 (THU-453), S686 (SAT-448)
Kawai, Hidehiko, S633 (THU-463)
Kawanaka, Miwa, S616 (THU-433), S686 (SAT-448)
Kawano, Tamachiki, S240 (WED-327), S317 (SAT-554), S818 (FRI-508), S820 (FRI-511)
Kawata, Kazuhito, S394 (WED-293), S584 (THU-131), S686 (SAT-448)
Kawli, Kashmira, S290 (SAT-338), S310 (SAT-542)
Kaja, Ebru, S254 (WED-349), S255 (WED-351), S270 (WED-375)
Kai, Kayani, S447 (SAT-380)
Kai, Philip, S717 (SAT-498)
Kajiyama, Menal, S181 (FRI-463)
Kamakoglu, Sabahattin, S709 (SAT-485)
Kanakowski, Konstantin, S176 (FRI-454)
Kamelier, Geert, S568 (SAT-289), S836 (FRI-485)
Kanev, Bradley, S453 (SAT-392)
Kanjee, Andrew, S101 (LBP-03), S195 (FRI-546)
Ke, Bibo, S453 (SAT-391), S730 (TOP-068)
Kechaugas, Stergios, S605 (THU-414), S607 (THU-418), S650 (TOP-085), S651 (SAT-394), S653 (SAT-397), S707 (SAT-481)
Kedaresetty, Chandan, S209 (THU-339)
Keer, James, S850 (WED-484)
Kennedy, Patrick, S118 (LBP-27)
Kemp, Susan, S174 (FRI-450)
Kennell, Timothy, S65 (OS-087), S601 (TOP-062)
Kendrick, Michael, S44 (OS-050-VI), S465 (THU-495)
Kendrick, Stuart, S110 (LBP-15)
Kennedy, James, S274 (WED-382)
Kennedy, Patrick, S118 (LBP-27), S1024 (FRI-229), S1033 (FRI-246), S1034 (FRI-248), S1087 (WED-151), S1105 (WED-176), S1127 (WED-209)
Kenny, Fiona, S324 (WED-218), S324 (WED-219)
Keppler, Oliver, S945 (THU-256)
Kepstin, Ejlad, S669 (SAT-423)
Kerber, Annareen, S35 (OS-035-VI), S206 (TOP-046)
Kerins, Caoimhe, S324 (WED-218)
Kerkar, Nanda, S44 (OS-040-VI), S971 (THU-291)
Kerlik, Jana, S880 (FRI-121)
Kern, Anna, S44 (OS-050-VI), S455 (OS-051-VI), S465 (THU-495)
Kersten, Remco, S55 (OS-071-VI)
Keskin-Erdogan, Zalike, S337 (WED-243)
Keskin, Onur, S1039 (TOP-100), S1109 (WED-183), S1137 (SAT-152)
Kessler, Harald, S996 (THU-327)
Kesten, Jo, S858 (SAT-118), S909 (FRI-165)
Keetchoglu, Ioannis, S400 (WED-302)
Kew, Guan Sen, S300 (SAT-522)
Khabra, Efrat, S409 (TOP-060)
Khac, Eric Nguyen, S61 (OS-081), S161 (FRI-429), S318 (SAT-556)
Khaderi, Saira, S173 (FRI-448)
Khader, Majid, S403 (WED-308)
Khakayla, Abeer, S484 (THU-532)
Khakoo, Salim, S1075 (WED-137)
Khalaf, Maya, S1006 (THU-382)
Khalili, Marion, S74 (OS-104)
Khaled, Ala, S475 (THU-515)
Khaled, Najib Ben, S47 (OS-057), S596 (THU-150)
Khalenkov, Maxim, S307 (SAT-338)
Khalili, Korosh, S503 (FRI-293)
Khan, Asad, S995 (THU-324)
Khan, Imran, S272 (WED-379)
Khan, Muhammad Sohail, S1196 (THU-200)
Khanne, Deepanshu, S294 (SAT-346)
Khan, Pir Zarak, S912 (FRI-172)
Khan, Rayan, S900 (FRI-151)
Khan, Saniya, S277 (WED-388)
Khan, Shahid, S864 (SAT-127)
Khan, Sohaib, S1122 (WED-203)
Khan, Sulhera, S204 (FRI-560)
Khan, Waleed, S740 (WED-406)
Khan, Waqas, S877 (FRI-118)
Khaoprasert, Sanpolpai, S262 (WED-360)
Kharawala, Saliuddin, S1145 (SAT-164)
Khatri, Robin, S60 (OS-079-VI)
Khattab, Mahmoud, S333 (THU-241), S550 (SAT-255), S795 (WED-532)
Khem, Khorshid, S113 (LBP-19)
Kheyar, Ame, S456 (THU-478)
Khokhluk, Olena, S429 (FRI-367)
Khorsand, Shirin, Elizabeth, S445 (SAT-376)
Khoshawi, Archit, S790 (WED-522)
Khoury, Tania, S670 (SAT-242), S681 (SAT-440)
Khudyakov, Yury, S891 (FRI-136)
Khukhlina, Oksana, S712 (SAT-490)
Kiani, Narsis, S290 (SAT-337)
Kido, Masahiro, S545 (SAT-246), S559 (SAT-272)
Kiessling, Fabian, S571 (SAT-292)
Ki, Han Seul, S442 (SAT-369), S728 (SAT-514)

Journal of Hepatology 2023 vol. 78(1) S1213-S1305 S1253
Author Index

Llaceras, Jordi, S91 (OS-129-YI), S904 (FRI-158), S1082 (WED-145), S1178 (THU-171), S1205 (THU-216)
Llanillo, Loreto Hierro, S965 (THU-289)
Llanosa, Marta, S423 (FRI-359)
Llarch, Neus, S407 (FRI-284), S579 (THU-124), S589 (WED-483)
Lledó, José Luis, S573 (THU-114), S579 (THU-124)
Lleo, Ana, S40 (OS-045), S44 (OS-049-YI), S55 (OS-070), S374 (WED-260), S383 (WED-277), S446 (SAT-377), S579 (THU-123)
Llerena, Susana, S911 (FRI-171), S934 (FRI-211), S1098 (WED-166), S1205 (THU-216)
Llewellyn, Jessica, S71 (OS-097)
Lligoñoa, Anna, S166 (FRI-437)
Llop, Elba, S2 (GS-003), S8 (GS-009), S87 (OS-123-YI), S272 (WED-378), S279 (TOP-043), S283 (SAT-327), S291 (SAT-340), S683 (SAT-443), S693 (SAT-460), S970 (THU-290)
Lloves, Marina, S1191 (THU-190)
Llovet, Josep, S48 (OS-059-YI)
Lloyd, Alison, S75 (OS-105)
Lloyd, Jonathan, S422 (FRI-356)
Locarnini, Stephen, S1028 (FRI-237), S1164 (SAT-191)
Locatelli, Franco, S88 (OS-124-YI)
Lo, Chen-Yu, S895 (FRI-143), S1180 (THU-174)
Lo, Ching-Chu, S895 (FRI-143), S1180 (THU-174)
Lo, Ching-Chu, S1206 (THU-217)
Lo, Chun-Han, S856 (TOP-099)
Lockart, Ian, S263 (WED-364)
Loddo, Massimilliano, S711 (SAT-489)
Lodge, Peter, S46 (OS-053-YI)
Lodi, Francesca, S524 (TOP-066)
Loewe, Christian, S576 (THU-118)
Loey Mak, Lung Yi, S1033 (FRI-246)
Lo, Gin-Ho, S1169 (SAT-198)
Loglio, Alessandro, S107 (LBP-11)
Lo, Gora, S57 (OS-090-YI), S1106 (WED-178)
Loh, Joon, S263 (WED-364)
Loi, Pooi Ling, S300 (THU-329)
Lohmeyer, Jürgen, S1147 (TOP-110)
Lohoff, Falk, S792 (WED-527)
Lohoues, Marie Jeanne, S195 (FRI-546)
Lohe, Ansgar, W2, S42 (OS-047-YI), S56 (OS-073), S285 (SAT-331), S373 (WED-258), S379 (WED-269), S527 (SAT-213), S579 (THU-123), S582 (THU-128), S982 (THU-304), S1139 (SAT-156)
Loi, Pooi Ling, S300 (SAT-522)
Lokan, Julie, S265 (THU-450)
Lok, Anna, S24 (OS-019), S251 (WED-345), S308 (SAT-540), S609 (THU-422)
Loke, Kelvin Siu Hoong, S582 (THU-129), S591 (THU-142)
Lok, James, S91 (OS-128), S642 (THU-551), S905 (FRI-161), S1081 (WED-143), S1081 (WED-144)
Lolatto, Riccardo, S120 (LBP-29), S837 (FRI-487)
Lolicato, Marco Gaetano, S552 (SAT-258)
Lomas, Laura Isusi, S866 (FRI-129)
Lomasney, Kristen Vieira, S937 (TOP-056)
Lomax, Joe, S153 (FRI-418)
Lombardelli, Stephen, S993 (THU-320)
Lombardi, Angela, S992 (THU-318)
Lombardi, Ludovica, S217 (THU-350)
Lombardi, Rosa, S632 (THU-461), S645 (THU-557), S668 (SAT-420), S722 (SAT-506), S772 (WED-459), S814 (FRI-474)
Lombardo, Antonino, S237 (WED-320)
Lombardo, Daniele, S457 (THU-481)
Lombardo, Julissa, S900 (FRI-151)
Loménie, Nicolas, S12 (LBO-04)
Lonardi, Sara, S592 (THU-143), S593 (THU-145)
Long, Fuli, S1076 (WED-138), S1157 (SAT-179)
Long, Michelle, S608 (THU-420), S811 (FRI-469)
Longo, Miriam, S744 (WED-413), S772 (WED-459), S783 (WED-507), S802 (WED-547)
Longpre, Lara, S123 (LBP-35)
Lensmann, Ida, S173 (FRI-449), S717 (SAT-498), S723 (SAT-507)
Loo, Jing Hong, S658 (SAT-406), S703 (SAT-473)
Loomba, Rohit, S1 (GS-001), S13 (LBO-05), S31 (OS-029), S49 (OS-061), S65 (OS-086), S85 (OS-120), S115 (LBP-22), S118 (LBP-26), S612 (THU-427), S627 (THU-453), S647 (TOP-074), S648 (TOP-075), S649 (TOP-080), S649 (TOP-083), S659 (SAT-407), S662 (SAT-412), S666 (SAT-417), S675 (SAT-432), S678 (SAT-438), S684 (SAT-444), S790 (WED-522), S839 (FRI-490), S865 (SAT-129)
Loomes, Kathleen M., S961 (THU-278), S971 (THU-291), S1003 (THU-378)
Loosen, Sven H, S136 (THU-409)
Loosen, Sven H., S630 (THU-458)
Lopens, Steffi, S514 (FRI-313)
López-Bermudo, Lucía, S732 (TOP-090)
López de Cózar, Estela Soria, S569 (WED-374)
López-Gómez, Marta, S272 (WED-378), S291 (SAT-340), S683 (SAT-443)
López-Hoyos, Marcos, S251 (WED-344), S390 (WED-288)
López, Hugo, S158 (FRI-423), S166 (FRI-437)
López, Joel, S915 (FRI-177)
López-Larrubia, Pilar, S777 (WED-468)
Lopez, Manuel Castillejos, S1202 (THU-211)
López-Pérez, Ana Rosa, S143 (FRI-404)
Maderu, Lilian Torres, S274 (WED-382)
Madejón, Antonio, S917 (FRI-181),
Magini, Giulia, S597 (THU-153)
Maggiore, Sara, S952 (THU-265)
Magnani, Giuseppe, S965 (THU-284),
S966 (THU-285), S987 (THU-308)
Magge, Mindy, S1141 (SAT-158)
Mageras, Anna, S116 (LBP-23),
Maggiora, Marina, S526 (SAT-211)
Maggiore, Giuseppe, S965 (THU-284),
S966 (THU-285), S987 (THU-308)
Maggi, Gianluca, S597 (THU-153)
Maglione, Dianna, S861 (SAT-123)
Magna, Sergio, S666 (SAT-417),
S668 (SAT-421)
Magni, Carlo Federico, S920 (FRI-185)
Magro-Sanchez, Angelica, S1056 (TOP-106)
Mahadeva, Sanjiv, S644 (THU-555),
S710 (SAT-487)
Ma, Haiyan, S1024 (FRI-229)
Mahajan, Anadi, S1141 (SAT-158),
S1145 (SAT-164)
Mahajan, Bhawna, S235 (TOP-044)
Maharaj, Tobias, S979 (THU-300)
Maharsh, Sudhir, S235 (TOP-044),
S238 (WED-322)
Ma, Heming, S327 (WED-225)
Maheshwari, Deepanshu, S212 (THU-343)
Mamood, Hassan, S904 (FRI-157),
S926 (FRI-195)
Mamood, Khaild, S904 (FRI-157)
Mamood, Abdulmaleek, S865 (SAT-129)
Mamood, Tasnim, S353 (THU-241),
S550 (SAT-255)
Mamood, Nadim, S188 (FRI-535),
S248 (WED-342), S265 (WED-366)
Ma, Hong, S34 (OS-033)
Ma, Jiantao, S608 (THU-420)
Ma, Lily, S64 (OS-085)
Malapelle, Umberto, S942 (THU-251)
Maldonado, Valentina, S961 (FRI-384)
Malecki, Pawel, S1007 (THU-384)
Maleh, Elias, S658 (SAT-405)
Malenstein, Hannah Van, S452 (SAT-390)
Ma, Lichun, S536 (SAT-230)
Malgireddy, Anand, S472 (THU-509)
Malik, Jiael, S684 (SAT-445)
Malik, Sabeen, S336 (WED-241)
Malik, Shamir, S314 (SAT-548)
Malik, Sheza, S183 (FRI-339)
Malik, Tehreem, S336 (WED-241)
Ma, Lily, S64 (OS-085)
Malin, Stephen, S756 (WED-434)
Malinverno, Federica, S374 (WED-260)
Malkov, Vlad, S64 (OS-085), S423 (FRI-360),
S678 (SAT-438)
Mallet, Maxime, S266 (WED-368)
Maltz, Vincent, S86 (OS-121-YI),
S161 (FRI-429), S656 (SAT-402),
S859 (SAT-120)
Mallewa, Jane, S522 (FRI-327)
Malmich, Stephen, S133 (THU-403)
Malucelli, Emil, S360 (FRI-383)
Malvestiti, Francesco, S500 (FRI-288),
S669 (SAT-422), S803 (WED-549)
Mameli, Laura, S54 (OS-069),
S482 (THU-527)
Mameno, Nina, S53 (OS-068),
S1091 (WED-158)
Mancino, Fabrizio, S723 (SAT-508)
Mandal, Semu, S909 (FRI-165)
Mandelboim, Michal, S128 (THU-394)
Mandilana, Dionysia, S595 (THU-149),
S1046 (FRI-264)
Mandorfer, Matthias, S19 (OS-010-YI),
S35 (OS-035-YI), S37 (OS-039-YI),
S87 (OS-123-YI), S90 (OS-127-YI),
S193 (FRI-545), S199 (FRI-551),
S201 (FRI-554), S222 (THU-357),
S224 (THU-358), S244 (WED-334),
S246 (WED-338), S279 (TOP-043),
S282 (SAT-326), S284 (SAT-330),
S286 (SAT-332), S288 (SAT-335),
S289 (SAT-336), S292 (SAT-342),
S294 (SAT-345), S299 (SAT-521),
S313 (SAT-547), S316 (SAT-553),
S489 (FRI-285), S831 (FRI-477),
S936 (TOP-055), S939 (TOP-058),
S1135 (SAT-150)
Mandour, Yasmine M., S570 (SAT-291)
Mandoury, Olha, S712 (SAT-490)
Manes, Emmanuel, S400 (WED-302),
S1128 (WED-211)
Manfredi, Giulia Francesca,
S389 (WED-284), S599 (THU-156)
Manfredi, Marcello, S804 (WED-551)
Manfredi, Sylvia, S61 (OS-081)
Manganaro, Susan, S965 (THU-284)
Mang, Anika, S506 (FRI-298)
Mangels, Ameen, S1200 (THU-207)
Mangia, Alessandra, S107 (LBP-11),
S1209 (THU-219)
Mangini, Chiara, S251 (WED-345)
Author Index

Minnier, Jessica, S601 (TOP-082)
Mino, Masaaki, S444 (SAT-373)
Minoves, Mélanie, S500 (FRI-289)
Minten, Jaak, S220 (THU-355)
Mion, Monica, S183 (TOP-049)
Miquel, Joaquim, S1028 (FRI-236), S1032 (FRI-245)
Miquel, Mireia, S587 (THU-136), S1098 (WED-166)
Miquel, Rosa, S324 (WED-218), S324 (WED-219)
M., Mang, S1115 (WED-191)
Mngqibisa, Rosie, S110 (LBP-15)
Mo, Cheng, S784 (WED-510)
Mochida, Satoshi, S395 (WED-293), S1183 (THU-177)
Möckel, Diana, S571 (SAT-292)
Modie, Dominik, S469 (THU-502)
Moeckli, Beat, S24 (OS-018-YI), S531 (SAT-220)
Moe, Fiona Ni Ni, S582 (THU-129), S591 (THU-142)
Moehlin, Julien, S72 (OS-098)
Moeller, Adriaan, S306 (SAT-536)
Moeschlid, Max, S339 (WED-248)
Moeslein, Magnus, S222 (THU-356)
Mo, Fa-Rong, S951 (THU-264)
Mody, Yasser, S1098 (WED-167)
Moga, Lucile, S86 (OS-121-YI), S279 (TOP-043)
Moggio, Maurizio, S744 (WED-413)
Mogler, Caroline, S431 (FRI-369), S945 (256)
Mogul, Douglas, S56 (OS-073)
Mold, Shigeru, S439 (SAT-366)
Mold, V., S733 (WED-395)
Molidaki, Ioannis, S453 (SAT-392)
Mizui, Toshiyuki, S733 (WED-395)
Mizzon, Giulia, S1020 (FRI-222)
Mizuno, Masaaki, S500 (FRI-289)
Mizui, Toshiyuki, S733 (WED-395)
Mo, Sang Yi, S690 (SAT-455)
Mon, Hongmei, S1055 (TOP-103)
Monce, Anne De, S1158 (SAT-180)
Moncén, Carmina, S35 (OS-035-YI)
Monde, Anne, S387 (WED-282)
Montel, Stefano, S220 (THU-355)
Montiel, Natalia, S1126 (WED-208)
Monti, Carla, S984 (THU-308)
Montinari, Carla, S486 (THU-536)
Montoliu, Carmena, S35 (OS-035-YI)
Montoliu, Silvia, S903 (FRI-156), S915 (FRI-177), S1205 (THU-216)
Montón, Cristina, S682 (SAT-442), S781 (WED-505), S1088 (WED-166)
Montoya, Ivan, S1019 (FRI-219)
Montoya, Basilio, S587 (WED-457)
Montoya, Carlos, S335 (THU-234)
Montoya, José, S582 (THU-129)
Montoya, José, S582 (THU-129)
Montoya, José, S582 (THU-129)
Montoya, José, S582 (THU-129)
Montoya, José, S582 (THU-129)
Montoya, José, S582 (THU-129)
Montoya, José, S582 (THU-129)
Montoya, José, S582 (THU-129)
Montoya, José, S582 (THU-129)
Montoya, José, S582 (THU-129)
Montoya, José, S582 (THU-129)
Montoya, José, S582 (THU-129)
Montoya, José, S582 (THU-129)
Montoya, José, S582 (THU-129)
Montoya, José, S582 (THU-129)
Montoya, José, S582 (THU-129)
<table>
<thead>
<tr>
<th>Author Name</th>
<th>Code</th>
<th>Journal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Örneci, Aslı</td>
<td>S709</td>
<td>Journal of Hepatology</td>
</tr>
<tr>
<td>Olgcoin, Karen</td>
<td>S240</td>
<td>WED-326</td>
</tr>
<tr>
<td>Otto, Hans</td>
<td>S1015</td>
<td>THU-289</td>
</tr>
<tr>
<td>Ölkiz, Josuf</td>
<td>S1075</td>
<td>THU-137</td>
</tr>
<tr>
<td>Omar, Asrafi</td>
<td>S570</td>
<td>SAT-291</td>
</tr>
<tr>
<td>Ozmażi, Barbara</td>
<td>S040</td>
<td>OS-045</td>
</tr>
<tr>
<td>S55 (OS-070)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Omella, Judit Domenech</td>
<td>S544</td>
<td>SAT-371</td>
</tr>
<tr>
<td>Omu, Riți</td>
<td>S633</td>
<td>THU-463</td>
</tr>
<tr>
<td>Önal, Zerrin</td>
<td>S969</td>
<td>THU-289</td>
</tr>
<tr>
<td>Ondrej, Podlaha</td>
<td>S443</td>
<td>SAT-371</td>
</tr>
<tr>
<td>Ong, Agnes Bee Leng</td>
<td>S786</td>
<td>WED-514</td>
</tr>
<tr>
<td>Ong, Charlotte Chung Hui</td>
<td>S629</td>
<td>THU-456</td>
</tr>
<tr>
<td>Ong, Christen En Ya</td>
<td>S629</td>
<td>THU-456</td>
</tr>
<tr>
<td>Ongheena, Louis</td>
<td>S172</td>
<td>FRI-447</td>
</tr>
<tr>
<td>Ong, Elden Yen Hng</td>
<td>S629</td>
<td>THU-456</td>
</tr>
<tr>
<td>Onghena, Louis</td>
<td>S172</td>
<td>FRI-447</td>
</tr>
<tr>
<td>Ons, Corinna</td>
<td>S1170</td>
<td>SAT-199</td>
</tr>
<tr>
<td>Ony, Chieko</td>
<td>S899</td>
<td>FRI-149</td>
</tr>
<tr>
<td>Ooi, London Lucien</td>
<td>S591</td>
<td>THU-142</td>
</tr>
<tr>
<td>Oord, Gertine</td>
<td>S496</td>
<td>FRI-282</td>
</tr>
<tr>
<td>Oso, Jakob</td>
<td>S1016</td>
<td>TOP-108</td>
</tr>
<tr>
<td>Osipov, S.</td>
<td>S619</td>
<td>SAT-275</td>
</tr>
<tr>
<td>Oo, Ye Htun</td>
<td>S416</td>
<td>FRI-347</td>
</tr>
<tr>
<td>Onose, Francesco</td>
<td>S88</td>
<td>OS-124-YI</td>
</tr>
<tr>
<td>Oniscu, Gabriela</td>
<td>S46</td>
<td>OS-053-YI</td>
</tr>
<tr>
<td>Ono, Hiroki</td>
<td>S240</td>
<td>WED-327</td>
</tr>
<tr>
<td>Ona, Masafumi</td>
<td>S686</td>
<td>SAT-448</td>
</tr>
<tr>
<td>Oo, Stéphane</td>
<td>S959</td>
<td>FRI-159</td>
</tr>
<tr>
<td>Onida, Francesco</td>
<td>S88</td>
<td>OS-124-YI</td>
</tr>
<tr>
<td>Orkisz, Doriano</td>
<td>S527</td>
<td>SAT-213</td>
</tr>
<tr>
<td>Orrego, Carlos</td>
<td>S1029</td>
<td>FRI-240</td>
</tr>
<tr>
<td>Ortega, Andrea Carenas</td>
<td>S1202</td>
<td>THU-211</td>
</tr>
<tr>
<td>Ortega, Lluisa</td>
<td>S166</td>
<td>FRI-437</td>
</tr>
<tr>
<td>Ortega, Martín Muñoz</td>
<td>S337</td>
<td>WED-244</td>
</tr>
<tr>
<td>Ortega, Miguel A</td>
<td>S19</td>
<td>S01-01-YI</td>
</tr>
<tr>
<td>Ort, Luis Sabater</td>
<td>S451</td>
<td>SAT-387</td>
</tr>
<tr>
<td>Ortega, Fernando Lopitz</td>
<td>S373</td>
<td>SAT-229</td>
</tr>
<tr>
<td>Orrego, Gregor</td>
<td>S564</td>
<td>SAT-282</td>
</tr>
<tr>
<td>Ortonne, Valérie</td>
<td>S1109</td>
<td>WED-192</td>
</tr>
<tr>
<td>Orts, Lara</td>
<td>S87 (OS-123-V)</td>
<td>FRI-499 (S970)</td>
</tr>
<tr>
<td>Or, Yat-Sun</td>
<td>S422</td>
<td>FRI-356</td>
</tr>
<tr>
<td>Oslo, Carlos</td>
<td>S929</td>
<td>SAT-221</td>
</tr>
<tr>
<td>Ossipov, Arsen</td>
<td>S489</td>
<td>TOP-065</td>
</tr>
<tr>
<td>Osmari, Zgjim</td>
<td>S1016</td>
<td>TOP-108</td>
</tr>
<tr>
<td>Osmari, Zgjim</td>
<td>S1016</td>
<td>TOP-108</td>
</tr>
<tr>
<td>Osman, Karim</td>
<td>S56</td>
<td>OS-073</td>
</tr>
<tr>
<td>Osman, Mahlet</td>
<td>S927</td>
<td>FRI-197</td>
</tr>
<tr>
<td>Osman, Mohamed</td>
<td>S426</td>
<td>FRI-363</td>
</tr>
<tr>
<td>Osnato, Anna</td>
<td>S433</td>
<td>SAT-354</td>
</tr>
<tr>
<td>Ostadreza, Mahnoosh</td>
<td>S733</td>
<td>WED-393</td>
</tr>
<tr>
<td>Osta, Eliš</td>
<td>S856</td>
<td>SAT-114</td>
</tr>
<tr>
<td>Oßberg, Nadja</td>
<td>S851</td>
<td>WED-487</td>
</tr>
<tr>
<td>Osten, Tullio</td>
<td>S640</td>
<td>THU-475</td>
</tr>
<tr>
<td>Oster, Ana</td>
<td>S1053</td>
<td>SAT-143</td>
</tr>
<tr>
<td>O'Sullivan, John</td>
<td>S230</td>
<td>THU-367</td>
</tr>
<tr>
<td>Otsuka-Tokuda</td>
<td>S326</td>
<td>FRI-368</td>
</tr>
<tr>
<td>Otsuka, Amandine Ait</td>
<td>S515</td>
<td>FRI-316</td>
</tr>
<tr>
<td>Otto, Tobias</td>
<td>S022</td>
<td>OS-015</td>
</tr>
<tr>
<td>Otao, Juan Isidro Uroz</td>
<td>S366</td>
<td>TOP-061</td>
</tr>
<tr>
<td>Oter, Alejandro</td>
<td>S133</td>
<td>THU-204</td>
</tr>
<tr>
<td>Oter, Wolgang</td>
<td>S806</td>
<td>WED-555</td>
</tr>
<tr>
<td>Otsuka, Amandine Ait</td>
<td>S515</td>
<td>FRI-316</td>
</tr>
<tr>
<td>Oufella, Amandaine Ait</td>
<td>S515</td>
<td>FRI-316</td>
</tr>
<tr>
<td>Oufelln, Alexandra</td>
<td>S640</td>
<td>SAT-275</td>
</tr>
<tr>
<td>Ou, Mengdong</td>
<td>S1185</td>
<td>THU-180</td>
</tr>
<tr>
<td>Oudot, Marine</td>
<td>S72 (OS-098)</td>
<td></td>
</tr>
<tr>
<td>Oulassi, Mustafa</td>
<td>S628</td>
<td>THU-454</td>
</tr>
<tr>
<td>Ouzun, Denis</td>
<td>S684</td>
<td>SAT-384</td>
</tr>
<tr>
<td>Ouzir, Nora</td>
<td>S641</td>
<td>OS-084-YI</td>
</tr>
<tr>
<td>Ovedal, Carola</td>
<td>S36</td>
<td>OS-037</td>
</tr>
<tr>
<td>Ochohnsky, Nadja</td>
<td>S123</td>
<td>LBP-35</td>
</tr>
<tr>
<td>Oveden, William</td>
<td>S284</td>
<td>SAT-329</td>
</tr>
<tr>
<td>Oviedo, Inés</td>
<td>S734</td>
<td>SAT-305</td>
</tr>
<tr>
<td>Oviedo, Gómez</td>
<td>S685</td>
<td>THU-284</td>
</tr>
<tr>
<td>Oviedo, William</td>
<td>S284</td>
<td>SAT-329</td>
</tr>
<tr>
<td>Oveiri, Diletta</td>
<td>S594</td>
<td>THU-323</td>
</tr>
<tr>
<td>Ovez, Sima</td>
<td>S155</td>
<td>FRI-305</td>
</tr>
<tr>
<td>Ovün, Christina</td>
<td>S877</td>
<td>FRI-118</td>
</tr>
<tr>
<td>Ovün, Rhiannon</td>
<td>S721</td>
<td>SAT-504</td>
</tr>
<tr>
<td>Oyubay, Nadia</td>
<td>S467</td>
<td>THU-498</td>
</tr>
<tr>
<td>Oxynebringer, Inger</td>
<td>S59 (OS-076)</td>
<td></td>
</tr>
<tr>
<td>Oszczúreme, Mustafa</td>
<td>S628 (THU-454)</td>
<td></td>
</tr>
<tr>
<td>Öz, Dildem</td>
<td>S65</td>
<td>OS-086</td>
</tr>
<tr>
<td>Özdemir, Burcin</td>
<td>S351</td>
<td>THU-238</td>
</tr>
<tr>
<td>Özger, Ann-Kathrin</td>
<td>S285 (SAT-313)</td>
<td></td>
</tr>
<tr>
<td>Özsezen, Serdar</td>
<td>S763</td>
<td>WED-444</td>
</tr>
<tr>
<td>Ozturk, Bengi</td>
<td>S1109</td>
<td>WED-183</td>
</tr>
<tr>
<td>Paar, Margret</td>
<td>S220</td>
<td>THU-355</td>
</tr>
<tr>
<td>Pab, Pietro</td>
<td>S1122</td>
<td>WED-203</td>
</tr>
<tr>
<td>Pache, Benito</td>
<td>S1116</td>
<td>SAT-185</td>
</tr>
<tr>
<td>Pach, Alain</td>
<td>S857</td>
<td>SAT-116</td>
</tr>
<tr>
<td>Pagadala, Mangesh</td>
<td>S242</td>
<td>WED-330</td>
</tr>
<tr>
<td>Paganeli, Massimiliano</td>
<td>S937</td>
<td>TOP-056</td>
</tr>
<tr>
<td>Pagan, Garcia</td>
<td>S984</td>
<td>THU-308</td>
</tr>
<tr>
<td>Pagan, Alessia</td>
<td>S749</td>
<td>WED-423</td>
</tr>
<tr>
<td>Pagano, Diálo</td>
<td>S457</td>
<td>THU-480</td>
</tr>
<tr>
<td>Pagano, Giuli</td>
<td>S461</td>
<td>THU-487</td>
</tr>
<tr>
<td>Pageaux, Georges-Philippe</td>
<td>S56 (OS-073)</td>
<td></td>
</tr>
<tr>
<td>Pagano, Giuli</td>
<td>S457</td>
<td>THU-480</td>
</tr>
<tr>
<td>Pajek, James</td>
<td>S600</td>
<td>TOP-081</td>
</tr>
<tr>
<td>Pak, Seung Woon</td>
<td>S305</td>
<td>SAT-533</td>
</tr>
<tr>
<td>Pak, Yong-Han</td>
<td>S267</td>
<td>WED-369</td>
</tr>
<tr>
<td>Patan, Anita</td>
<td>S598</td>
<td>THU-154</td>
</tr>
<tr>
<td>Paul, Almuth</td>
<td>S106</td>
<td>LBP-30</td>
</tr>
<tr>
<td>Pau, Nuno</td>
<td>S534</td>
<td>SAT-226</td>
</tr>
<tr>
<td>Pau, Félix García</td>
<td>S480</td>
<td>THU-524</td>
</tr>
<tr>
<td>Pau, Ekaterina</td>
<td>S145</td>
<td>TOP-073</td>
</tr>
<tr>
<td>Pau, Melissa</td>
<td>S894</td>
<td>FRI-142</td>
</tr>
<tr>
<td>Pálta, Silvia</td>
<td>S805</td>
<td>WED-554</td>
</tr>
<tr>
<td>Paz, Elvira</td>
<td>S363</td>
<td>SAT-313</td>
</tr>
<tr>
<td>Paz, Mads Sundry</td>
<td>S827</td>
<td>FRI-523</td>
</tr>
</tbody>
</table>
Author Index

Parouei, Fatemeh, S454 (TOP-052)
Parra-Robert, Marina, S325 (WED-220)
Parra, Viviana Barrientos, S840 (FRI-492)
Parruti, Giustino, S1122 (WED-203)
Parslow, Dominique, S389 (WED-285)
Parthasaradhy, Kumaraswamy, S207 (THU-237)
Pascale, Alina, S498 (FRI-286)
Pascher, Andreas, S484 (THU-531)
Pascual, Andrea González, S376 (WED-264)
Pascual, Manuel, S481 (THU-526)
Pascual, Sonia, S470 (THU-503), S481 (THU-525), S587 (THU-136), S883 (FRI-126), S1124 (WED-205)
Pascucci, Giuseppe Rubens, S1018 (FRI-218)
Pasculli, Giuseppe, S493 (FRI-277)
Pasthout, Hasina, S46 (OS-053-YI)
Pasqua, Laura Giuseppina Di, S795 (WED-533)
Pasquazzi, Caterina, S1056 (TOP-106), S1122 (WED-203)
Passenberg, Moritz, S485 (THU-534), S12 (LBO-04), S543 (SAT-241)
Pavesi, Andrea, S545 (SAT-213)
Pawlicks, Piotr, S837 (FRI-486)
Pavone, Vincenzo, S88 (OS-124-YI)
Pavlova, Desislava, S198 (FRI-550)
Pavic, Magda Pletikosa, S880 (FRI-122)
Pavlou, Lourdes, S1018 (FRI-218)
Pavlovskaya, Agnieszka Pawlowska, S327 (WED-224)
Pavlyuk, Oleg, S875 (FRI-115)
Pavolova, Desislava, S198 (FRI-550)
Paz, Ankoor, S273 (WED-380), S312 (SAT-454), S623 (THU-445), S1011 (THU-390)
Paz, Ankoor, S173 (FRI-448)
Paz, Bhaumik, S149 (FRI-411)
Paz, Hailey, S58 (OS-075)
Paz, Keyur, S314 (SAT-548)
Paz, Mahesh, S260 (WED-358), S809 (FRI-466)
Paz, Manish, S84 (OS-119-YI)
Paz, Neel, S31 (OS-029)
Paz, Poula, S127 (TOP-092)
Paz, Roshni, S660 (SAT-409), S661 (SAT-410), S812 (FRI-471)
Paz, Sameer, S479 (THU-521)
Paz, Shray, S689 (SAT-453)
Paz, Sonal, S1202 (THU-210)
Paz, Vishal, S7 (GS-007)
Paterno, Rafael, S201 (FRI-554), S244 (WED-334), S279 (TOP-043), S282 (SAT-326), S284 (SAT-330), S313 (SAT-547)
Pathak, Gaurav, S623 (THU-445)
Pathak, Piyush, S73 (OS-101-YI), S297 (SAT-390)
Pathil-Warth, Anita, S1147 (TOP-110)
Patil, Nilesh, S326 (WED-222)
Patino, Verónica, S852 (WED-489)
Patmore, Lesley, S1100 (WED-169)
Patriarca, Francesca, S88 (OS-124-YI)
Patrizia, Carrieri, S114 (LBP-21), S627 (THU-453), S865 (SAT-129)
Patte, Dimitrios, S77 (OS-108-YI)
Patterson, Matt, S31 (OS-029)
Patzer, Alexia, S1018 (FRI-218)
Patwardhan, Vilas, S56 (OS-073), S844 (FRI-500)
Patha, Yashwi Haresh Kumar, S274 (WED-382)
Paul, Dirk, S606 (THU-416)
Paul, Lorena, S19 (OS-011-YI)
Pauling, Josch, S527 (SAT-213)
Paulissen, Jasmie, S1025 (FRI-231)
Paul, Sashi, S587 (THU-135)
Paulsen, Ida, S986 (THU-311)
Paulweber, Bernhard, S863 (SAT-126)
Paul, Jana, S594 (THU-147)
Paul, Matthew, S905 (FRI-160)
Paw, Michel De, S307 (SAT-538)
Pavlovskaya, Desislava, S198 (FRI-550)
Pavlova, Desislava, S198 (FRI-550)
Pavone, Luigi, S38 (OS-124-YI)
Pavone, Luca, S383 (WED-250)
Pavlova, Desislava, S198 (FRI-550)
Pavolova, Agnieszka Pawlowska, S327 (WED-224)
Payancé, Audrey, S86 (OS-121-YI)
Payo-Serafin, Tania, S554 (SAT-263)
Pazi, Swaleh, S865 (SAT-129)
Peccatori, Jacopo, S88 (OS-124-YI)
Pech, Maciej, S576 (THU-118)
Pech, Kjørgen Ran, S1048 (FRI-268)
Pech-Radosavljevic, Markus, S491 (FRI-273)
Pescarolli, Valentina, S729 (SAT-517)
Pecorella, Irene, S260 (FRI-383)
Pedersen, Julie Steen, S723 (SAT-507)
Pedersen, Kamilla, S801 (WED-545)
Pedra, Federica, S12 (LBO-04)
Pedrotti, Simona, S740 (WED-423)
Pedroza, Lourdes, S1202 (THU-211)
Peddikeyil, Musthafa, S1006 (THU-383)
Peeters, Michael, S923 (FRI-190), S1114 (WED-190)
Pegram, Hannah, S1087 (WED-151)
Pehlivanov, Nonko, S31 (OS-030)
Peiffer, Kai-Henrik, S90 (OS-126)
S185 (FRI-341), S313 (SAT-546), S1039 (FRI-254), S1042 (FRI-259)
Pei, Sun, S735 (WED-399)
Pelacho, Beatriz, S326 (WED-223), S560 (SAT-275)
Pelegar, Anna, S267 (WED-370), S273 (WED-381)
Peleman, Cédric, S764 (WED-446)
Pelizzaro, Filippo, S511 (FRI-308)
Pelicano, Rinaldo, S55 (OS-070)
Pelicelli, Adriano, S40 (OS-045), S55 (OS-070), S107 (LBP-11), S247 (WED-340), S994 (THU-323), S1122 (WED-203)
Pelloux, Hervé, S894 (FRI-142)
Peloso, Andrea, S24 (OS-018-YI), S531 (SAT-220)
Pelttekian, Kovork, S426 (FRI-363)
Peltier, Sébastien, S806 (WED-555)
Pelton, Matthew, S1011 (THU-390)
Peltzer, Mona, S535 (SAT-227)
Pelusi, Serena, S500 (FRI-288), S535 (SAT-227), S661 (SAT-410), S669 (SAT-422), S733 (WED-393), S992 (THU-318), S1173 (THU-165)
Peña, Luis, S989 (THU-315)
Penaranda, Guillaume, S684 (SAT-445)
Peña-San Felix, Patricia, S546 (SAT-247)
Pencek, Richard, S386 (WED-280)
Peneranda, Guillaume, S834 (FRI-481)
Peng, Cheng-Yuan, S444 (SAT-374), S1083 (WED-147), S1180 (THU-174), S1206 (THU-217)
Peng, Emily, S675 (SAT-432)
Peng, Feng, S274 (WED-382)
Peng, Jiayi, S1143 (SAT-161)
Peng, Ming-Li, S271 (WED-376), S340 (WED-250)
Peng, Wei, S1152 (SAT-173)
Peng, Weng Chuan, S535 (SAT-228)
Peng, Wenhui, S1036 (FRI-250)
Peng, YiHong, S784 (WED-510)
Penicaut, Capucine, S875 (FRI-115)
Penners, Christian, S22 (OS-015), S416 (FRI-348)
Pennisi, Grazia, S500 (FRI-288), S609 (THU-421), S673 (SAT-430), S803 (WED-549)
Peña, Juliana Beltrão, S483 (THU-530)
Pereira, Juliana, S483 (THU-530)
S1275
Author Index

Pereira, Sheila, S470 (THU-503)
Pereira, Stephen, S408 (WED-317)
Pereira, Vítor Magnó, S85 (OS-120), S889 (FRI-134)
Pereiró, Christie, S2 (OS-003), S272 (WED-378), S291 (SAT-340), S390 (WED-288), S579 (THU-124), S683 (SAT-443), S693 (SAT-460), S709 (SAT-484)
Perera, Thamara, S466 (THU-497)
Peretz, Asaf, S1195 (THU-199)
Perenya, David, S44 (OS-050-YI), S45 (OS-051-YI), S465 (THU-495), S470 (THU-505), S489 (THU-545)
Perez, Adriana, S961 (THU-278)
Pérez, Ana, S683 (SAT-443)
Pérez, Beatriz Pillado, S697 (SAT-465), S706 (SAT-479)
Pérez-Bosque, Ana, S356 (THU-246)
Pérez-Campuzano, Valeria, S970 (THU-290)
Pérez, Carla Fiorella Murillo, S971 (THU-291)
Pérez-Carreón, Julio Isael, S151 (FRI-414), S160 (FRI-426)
Pérez, Clara, S989 (THU-315)
Pérez, Cristian, S361 (FRI-384)
Pérez-del-Pulgar, Sofía, S1089 (WED-154)
Pérez-Díaz del Campo, Nuria, S611 (THU-425), S617 (THU-435), S626 (THU-452), S637 (THU-470)
Pérez, Elena Santos, S272 (WED-378)
Pérez-Fernandez, Elia, S366 (TOP-061)
Pérez, Fernando García, S853 (WED-491)
Pérez, inaugural, Julio Isael, S151 (FRI-414), S160 (FRI-426)
Pérez, Jaime, S385 (WED-279)
Pérez, Javier Fernandez, S932 (FRI-206)
Pérez, Juan Manuel Minoz, S674 (SAT-431)
Pérez, Laura Marquez, S573 (THU-114)
Pérez, Martina, S158 (FRI-437), S250 (WED-343), S664 (SAT-415), S851 (THU-486)
Pérez-Palacios, Domingo, S1098 (WED-166)
Pérez, Renata, S112 (LBP-16), S618 (THU-436)
Pérez-San-Gregorio, María Angeles, S632 (THU-462)
Pérez, Sara Lorentz, S133 (THU-404), S470 (THU-503), S573 (THU-114), S1187 (THU-181)
Pérez, Valeria, S843 (FRI-499), S984 (THU-308)
Pérez, Victor Perez, S894 (FRI-140)
Péricas, Juan M, S693 (SAT-460)
Péricas, Juan M., S349 (THU-235)
Péricás, Juan M, S700 (SAT-468), S819 (FRI-509)
Péricás, Juan Manuel, S279 (TOP-043), S780 (WED-474)
Percili, Filippo, S880 (FRI-121)
Perignon, Claire, S473 (THU-511)
Perini, Lisa, S407 (WED-315)
Perino, Alessia, S734 (WED-397)
Perissetti, Abhilash, S296 (SAT-349)
Periti, Giulia, S669 (SAT-422), S992 (THU-318)
Perro, Carla Federico, S1103 (WED-174)
Peron, Jean Marie, S61 (OS-081)
Perramón, Meritxell, S325 (WED-220)
Perron, Michel, S1058 (WED-114), S1167 (SAT-195)
Persano, Mara, S592 (THU-143), S593 (THU-194)
Persico, Marcello, S713 (SAT-493), S789 (WED-521)
Perttler, Elke, S968 (THU-288)
Perucchini, Chiara, S5 (OS-005)
Perugoria, María Jesús, S28 (OS-024-YI), S57 (OS-074-YI), S527 (SAT-212)
Peroulat, Kalliopi, S1025 (FRI-231)
Pezzato, Francesco, S407 (WED-315)
Pezzica, Samantha, S605 (THU-415), S611 (THU-425)
Pfeifferkorn, Maria, S1043 (FRI-260), S1050 (FRI-270)
Pfeifer, Bernhard, S961 (THU-279), S968 (THU-288)
Pfeifferberger, Jan, S594 (THU-147)
Pfuhl, Liva, S417 (FRI-350)
Pham, Huong, S600 (TOP-081), S673 (SAT-428)
Pham, Toan, S937 (TOP-056)
Phan, Minh, S197 (FRI-549), S469 (THU-502)
Phen, Samuel, S75 (THU-116), S582 (THU-128), S586 (THU-134)
Philipp, Alexander, S596 (THU-150)
Philippart, Marie, S464 (THU-493), S923 (FRI-190)
Philips, Gino, S48 (OS-059-YI), S452 (SAT-390), S524 (TOP-066)
Philips, Alexandra, S203 (FRI-557)
Philips, Sandra, S324 (WED-218)
Philips, Sherree, S852 (WED-488)
Philo, Mark, S434 (SAT-356)
Pianko, Stephen, S860 (SAT-121)
Piano, Filomena Del, S797 (WED-535)
Piano, Salvatore, S10 (LBO-01), S185 (FRI-341), S237 (WED-320), S250 (WED-343), S253 (WED-348), S865 (SAT-129)
Picalausa, Corinne, S772 (WED-458)
Picardi, Antonio, S36 (OS-036), S665 (SAT-416)
Picariello, Lucia, S545 (SAT-245)
Pich, Julia, S730 (TOP-084)
Pich, Judit, S10 (LBO-01)
Pichelmair, Andreas, S945 (THU-256)
Pichiotti, Roberto, S783 (WED-507), S802 (WED-547), S803 (WED-549)
Pichler, Felix, S235 (SAT-331)
Pierattolo, Lorenzo, S1056 (TOP-106), S1072 (WED-133), S1103 (WED-174), S1105 (WED-176), S1122 (WED-203), S1142 (SAT-159)
Pierre, Tim St, S983 (THU-306)
Pieceuxaux, Hubert, S923 (FRI-190)
Pieper, Honkoop, S1100 (WED-169)
Pietrangelo, Andrea, S966 (THU-285), S987 (THU-313)
Author Index

Author Index

Journal of Hepatology 2023 vol. 78(1) | S1213–S1305

S1277
Author Index

Pace, Elisa, S10 (LBO-01), S15 (OS-001), S158 (FRI-423), S163 (FRI-431), S166 (FRI-437), S171 (FRI-445), S250 (WED-343), S664 (SAT-415), S851 (WED-486)
Pajuk, Josef, S628 (THU-454)
Pajuk, Julius, S177 (OS-108-YI), S214 (THU-345)
Pajuk, Mathias, S163 (FRI-432)
Poujol-Robert, Armelle, S86 (OS-121-YI)
Poullard, Severine, S598 (THU-154)
Poulin, Sebastien, S1115 (WED-191)
Poulsen, Peter Bo, S614 (THU-429)
Poumpouridou, Effimia, S465 (THU-494)
Poupel, Lucie, S27 (OS-023-YI)
Poriki, Sophia, S978 (THU-298)
Powell, Elizabeth, S239 (WED-324), S846 (WED-478)
Poyard, Thierry, S106 (LBP-10)
Poza, Joaquín, S697 (SAT-465), S705 (SAT-478), S706 (SAT-479)
Poço, Francisco, S902 (FRI-153)
Poço-Morales, Macarena, S735 (WED-398)
Possamai, Lucia, S735 (WED-398), S851 (WED-486)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187), S214 (THU-345), S804 (WED-551)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187), S214 (THU-345)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187), S214 (THU-345), S804 (WED-551)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187), S214 (THU-345), S804 (WED-551)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187), S214 (THU-345), S804 (WED-551)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187), S214 (THU-345), S804 (WED-551)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187), S214 (THU-345), S804 (WED-551)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187), S214 (THU-345), S804 (WED-551)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187), S214 (THU-345), S804 (WED-551)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187), S214 (THU-345), S804 (WED-551)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187), S214 (THU-345), S804 (WED-551)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187), S214 (THU-345), S804 (WED-551)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187), S214 (THU-345), S804 (WED-551)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187), S214 (THU-345), S804 (WED-551)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187), S214 (THU-345), S804 (WED-551)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187), S214 (THU-345), S804 (WED-551)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187), S214 (THU-345), S804 (WED-551)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187), S214 (THU-345), S804 (WED-551)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187), S214 (THU-345)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187), S214 (THU-345)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187), S214 (THU-345)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187), S214 (THU-345)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187), S214 (THU-345)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187), S214 (THU-345)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187), S214 (THU-345)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187), S214 (THU-345)
Possamai, Lucia, S735 (WED-398), S851 (WED-486), S992 (THU-318), S1173 (SAT-187), S214 (THU-345)
Author Index

Razavi, Homie, S872 (TOP-096), S876 (FRI-116), S888 (FRI-132), S910 (FRI-170), S934 (FRI-212)
Reaziz, Shearer, Devin, S872 (TOP-096), S876 (FRI-116), S910 (FRI-170), S934 (FRI-212)
Razavi, Shearer, Kathryn, S872 (TOP-096), S876 (FRI-116), S888 (FRI-152), S934 (FRI-212)
Razek, Mai Abdel, S1212 (THU-224)
Razputrik, Rok, S553 (SAT-261)
Razvan-Ioan, Simu, S1123 (WED-204)
Reano, Simone, S804 (WED-551)
Reau, Nancy S, S9 (OS-012), S631 (THU-460), S876 (FRI-116), S888 (FRI-152), S934 (FRI-212)
Redondo, Ana, S349 (THU-235), S778 (WED-470)
Reiter, Florian P, S47 (OS-057), S108 (LPB-12), S586 (THU-150), S1139 (SAT-156)
Reiter, Florian P, S625 (THU-449)
Rex, Daniel, S605 (SAT-129)
Rexing, Johanna, S150 (FRI-412), S349 (THU-235), S778 (WED-470)
Rey, David, S876 (FRI-132), S1028 (FRI-237)
Reyes, Archie C., S422 (FRI-356)
Reyes, Maribel, S1156 (SAT-177)
Reynolds, Justin, S1008 (THU-386)
Reynolds, Kieran, S1129 (WED-213)
Rey, Silvia Garcia, S838 (FRI-488)
Rezende, Guilherme, S618 (THU-436)
Rezen, Tadeja, S553 (SAT-261), S793 (WED-529)
Rezvani, Milad, S785 (WED-512)
Rhee, Hyungjin, S12 (LBO-04)
Rheinwald, Karl-Peter, S712 (SAT-492)
Rhu, Jinsoo, S471 (THU-506), S474 (THU-513)
Riahi, Chassan, S61 (OS-081)
Riado, Daniel, S90 (OS-127-YI), S299 (SAT-521)
Riário, Ioana, S541 (SAT-238)
Riback, Lindsey, S100 (LPB-01)
Ribaldone, Davide, S626 (THU-452), S713 (SAT-494)
Ribalta, Alba Ardevel, S279 (TOP-043), S1192 (THU-192)
Ribeiro, Andrea, S397 (WED-297), S398 (WED-299)
Ribera, Jordi, S250 (WED-343), S833 (FRI-480)
Ribes, Carmen, S251 (WED-344), S911 (FRI-171)
Ribi, Val, S911 (FRI-171)
Riccardo, Ana-Rita, S1038 (FRI-252)
Riccieri, Federico, S840 (FRI-492)
Riccic, Chiara, S40 (OS-045), S55 (OS-070)
Ricco’, Beatrice, S942 (THU-251)
Ricco, Gabriele, S691 (SAT-456), S1091 (WED-157)
Richard, Layese, S46 (OS-055), S833 (FRI-480)
Richards, Christopher, S1159 (SAT-182)
Richards, Lisa, S648 (TOP-075), S649 (TOP-083)
Richardson, Carrie, S1187 (THU-182)
Richardson, Naomi, S416 (FRI-347), S443 (SAT-372), S447 (SAT-380)
Riches, Nicholas, S916 (FRI-178), S1117 (WED-193)
Rich, Nicole, S472 (THU-508)
Richter, Martin, S748 (WED-421)
Riker, Jens, S576 (THU-118)
Rico, Maria Del Carmen, S302 (SAT-526)
Rico, Maria del Carmen, S760 (WED-440), S770 (WED-457)
Riddell, Anna, S1033 (FRI-246)
Rider, Elora, S277 (WED-266)
Ridola, Lorenzo, S105 (LPB-09), S218 (THU-352), S994 (THU-323)
Riedel, Christoph, S285 (SAT-331)
Riefolo, Mattia, S519 (FRI-322)
Riegler, Eva, S532 (SAT-222)
Riescher-Tuczkiwicz, Alix, S258 (WED-356)
Rifai, Amelia, S1203 (THU-212)
Rigamonti, Cristina, S40 (OS-045), S55 (OS-070), S56 (OS-073)
Author Index

Rollo, Paolo, S407 (WED-315)
Rolph, Tim, S808 (TOP-091), S820 (FRI-512)
Romagnoli, Renato, S455 (TOP-059), S460 (THU-485), S486 (THU-357)
Romagnoli, Veronica, S691 (SAT-456), S1091 (WED-157)
Romano, Antonino, S750 (WED-424)
Romano, Caroline, S116 (LBP-23)
Romano, Fabrizio, S480 (THU-523)
Romano, Corinna, S691 (SAT-456)
Romano, Javier Sánchez, S449 (SAT-383)
Romano, Caroline, S116 (LBP-23)
Romano, Javier Sánchez, S449 (SAT-383)
Romano, Antonino, S750 (WED-424)
Romano, Caroline, S116 (LBP-23)
Romeo, Sara, S1190 (THU-188)
Romeo, Sara Sara, S668 (SAT-420)
Romeo, Stefano, S665 (SAT-416), S733 (WED-393), S803 (WED-549)
Romo, Álvaro Hidalgo, S1178 (THU-171)
Romero, Carmen Lara, S302 (SAT-526), S654 (SAT-400), S703 (SAT-472), S728 (SAT-515), S838 (FRI-488)
Romero, Daniel Brown, S558 (SAT-271)
Romero, Emanuel, S612 (THU-426), S627 (THU-453), S640 (THU-474), S646 (THU-559), S760 (WED-440), S770 (WED-457)
Romero, Gutiérrez, Marta, S87 (OS-123-YI), S587 (THU-136), S996 (THU-326), S998 (THU-331)
Romero, Mario, S481 (THU-525)
Romero, Marta, S544 (SAT-244)
Romero, Michael, S765 (WED-448)
Romero, Miriam, S690 (SAT-454), S697 (SAT-465), S706 (SAT-479), S1105 (WED-177)
Romero, Rene, S971 (THU-291)
Romero, Sarah, S306 (SAT-535)
Ronca, Vincenzo, S447 (SAT-380)
Rosado, Isabelle, S52 (OS-066), S107 (LBP-11), S1161 (SAT-185)
Rosa, Laura De, S691 (SAT-456)
Rosa, Laura De, S691 (SAT-456)
Rosales, A Gabriela, S1079 (WED-141)
Rosat, Aurélie, S481 (THU-526)
Rosato, Valerio, S36 (OS-036), S1082 (WED-146)
Roca, Caren, S886 (FRI-130)
Roe, Christoph, S213 (THU-344), S233 (THU-372)
Rosell-Cardona, Cristina, S356 (THU-246)
Rosenberg, Nofar, S549 (SAT-252)
Rosenberg, William, S867 (SAT-130)
Rosenquist, Christian, S666 (SAT-417), S668 (SAT-421)
Rosenstock, Moti, S544 (SAT-243)
Rosenthal, Philip, S965 (THU-284)
Rosen, Tim, S527 (SAT-213)
Rossi, Martina, S513 (FRI-311)
Rossi, Florian, S40 (OS-045), S55 (OS-070)
Rosinka, Magda, S880 (FRI-121)
Roskams, Tania, S78 (OS-110), S549 (SAT-252), S753 (WED-430)
Rosler, Elen, S548 (SAT-251)
Rosso, Daniel, S792 (WED-527)
Roselli, Matteo, S283 (SAT-226), S533 (SAT-223), S534 (SAT-226), S536 (SAT-230), S541 (SAT-238), S942 (THU-261)
Rout, Ashley, S687 (SAT-449)
Rout, Charles, S492 (FRI-274)
Roux, Marine, S672 (SAT-427)
Roux, Olivier, S10 (LBO-01)
Roya, Alice, S951 (THU-263)
Royda, Elisabetta, S536 (SAT-229), S774 (WED-462)
Rowe, Ian, S157 (FRI-422), S867 (SAT-130)
Roy, Akash, S274 (WED-382)
Roy, Nicola, S918 (FRI-182), S1182 (THU-176)
Royo, Laura, S546 (SAT-247)
Royo, Maite, S915 (FRI-177)
Royo, Sara Pastor, S268 (WED-372)
Roy, Saswata, S177 (FRI-453)
Roy, Subhajit, S800 (WED-544)
Rozina, Teona, S5210 (THU-221)
Rozman, Danijana, S553 (SAT-261), S793 (WED-529)
Rupaj, Enaid, S733 (WED-393)
Ruan, Jian, S543 (SAT-242)
Ruan, Alberto Tainahones, S326 (WED-223)
Ruan, Qi, S330 (WED-229)
Ruas, Jorge, S741 (WED-409)
Rubbia-Brandt, Laura, S531 (SAT-220)
Rubí, Alicia R, S1191 (THU-190)
Rubín, Ángel, S470 (THU-503)
Rubín, Moises Nevah, S458 (THU-482)
Rubin, Raymond, S241 (WED-328)
Rubio, Aleen, S1164 (SAT-191), S1169 (SAT-197)
Rubio, Ana Belén, S163 (FRI-431), S851 (WED-486)
Rubio Garcia, Ana Belen, S15 (OS-001)
Rubio-Ponce, Andrea, S78 (OS-109-YI)
Rubio, Sonia Albertos, S913 (FRI-175)
Rudder, Maxime De, S76 (OS-106-YI)
Rudilosso, Antonia, S729 (SAT-517)
Rudjær, Lise, S321 (TOP-036)
Rudler, Marika, S198 (FRI-550), S318 (SAT-556), S492 (FRI-274), S494 (FRI-279)
Rudolf, Erin, S822 (FRI-515)
Rudolfsen, Jan Håkon, S614 (THU-429)
Rudolph, Bryan, S66 (OS-089)
Rui, Fajuan, S638 (THU-471), S696 (SAT-463), S724 (SAT-510), S1096 (WED-165)
Ruiz, Armando Raúl Guerra, S686 (SAT-132)
Ruiz, Beatriz Pachin, S1024 (FRI-228)
Ruiz-Blazquez, Paloma, S38 (OS-042-YI), S339 (WED-247)
Ruiz-Cano, Eugenia, S791 (WED-524)
Ruiz-Cobo, Juan Carlos, S375 (WED-263), S392 (WED-290), S904 (FRI-158), S1082 (WED-145), S1205 (THU-216)
Ruiz de Gauna, Mikhail, S529 (SAT-215), S538 (WED-404), S541 (WED-408)
Ruiz, Elena, S1126 (WED-208)
Ruiz-Fernandez, Gloria, S697 (SAT-465), S705 (SAT-478), S706 (SAT-479)
Ruiz, Francisco Rivas, S269 (WED-374)
Ruiz, Isaac, S981 (THU-301)
Ruiz, Joaquín, S915 (FRI-177)
Ruiz, María Dolores Gómez, S1124 (WED-205)
Ruiz, Mathias, S965 (THU-284)
Ruiz, Pablo, S461 (THU-487), S486 (THU-536)
Ruiz, Patricia Cordero, S964 (THU-282), S980 (THU-301), S998 (THU-331)
Ruiz, Pilar Diaz, S928 (FRI-198)
Ruiz-Tapiador, Juan Ignacio Arenas, S573 (THU-114)
Ruglade, Jody, S316 (FRI-393)
Author Index

Samyn, Marianne, S1000 (THU-334)
Sanabria-Cabrera, Judith, S18 (OS-007)
Sanai, Faisal, S859 (SAT-119)
Sanace, Julie, S27 (OS-023-VI)
Sanchez, Abdel, S865 (SAT-129),
S900 (FRI-151),
Sanchez, Abdel Acosta, S1051 (FRI-272)
Sánchez-Aldehuelo, Rubén, S73 (OS-102),
S475 (THU-514)
Sánchez, Ana María, S1911 (THU-190)
Sanchez, Angela Puente, S2 (GS-003),
S251 (WED-344)
Sanchez, Antonio, S85 (OS-120)
Sanchez, Antonio Diaz, S883 (FRI-126)
Sanchez, Armando, S290 (SAT-337)
Santacana, Juan, S939 (TOP-058)
Sánchez-Bueno, Francisco, S469 (THU-501)
Sánchez-Camila, S971 (THU-291)
Sánchez-Martín, Alba, S734 (WED-397)
Santapietro, Sandra Izquierdo,
S480 (THU-524)
Santarone, Flavia, S12 (OS-124-YI),
S685 (SAT-446)
Santos, Catarina Esteves, S902 (FRI-154)
Santos, Lorrane, S658 (SAT-405)
Santos-Silva, Ermelinda, S972 (THU-291)
Sanyal, Arun, S1 (GS-001), S13 (LBO-05),
S31 (OS-029), S49 (OS-062),
S171 (FRI-445), S560 (SAT-275),
S737 (WED-403)
Sanchez, Antonio, S470 (THU-503),
S682 (SAT-442),
S1172 (THU-162)
Sanchez, Barry, S375 (THU-168),
S1200 (THU-206)
Sanchez, Beate, S874 (FRI-114)
Sanchez, Ruben, S357 (SAT-232),
S573 (THU-114),
S189 (THU-185)
Sankar, Kamya, S489 (TOP-065)
Sanou, Armel Moumound, S930 (FRI-202)
Sansó, Andreu, S1191 (THU-190)
Sanatamia, Diego Burgos, S8 (GS-009),
S73 (OS-102), S964 (THU-282),
S860 (THU-301), S988 (THU-331)
Sanatamia, Eva, S532 (SAT-221)
Santa Marisa Rodriguez, German Jose,
S1126 (WED-208)
Santanionio, Teresa, S107 (LBP-11),
S1082 (WED-146)
Santaroni, Stella, S88 (OS-124-YI),
Santarén, Sandra Izquierdo,
S685 (SAT-446)
Santos, Lorrane, S658 (SAT-405)
Sanchez, Armando, S290 (SAT-337)
Santos, Andre A., S734 (WED-397)
Santos, Catarina Esteves, S902 (FRI-154)
Santos, Lorrane, S658 (SAT-405)
Santos-Silva, Ermelinda, S972 (THU-291)
Sanyal, Arun, S1 (GS-001), S13 (LBO-05),
S31 (OS-029), S49 (OS-062),
S171 (FRI-445), S560 (SAT-275),
S737 (WED-403)
Sanchez, Antonio, S470 (THU-503),
S682 (SAT-442),
S1172 (THU-162)
Sanchez, Barry, S375 (THU-168),
S1200 (THU-206)
Sanchez, Beate, S874 (FRI-114)
Sanchez, Ruben, S357 (SAT-232),
S573 (THU-114),
S189 (THU-185)
Sankar, Kamya, S489 (TOP-065)
Sanou, Armel Moumound, S930 (FRI-202)
Sansó, Andreu, S1191 (THU-190)
Sanatamia, Diego Burgos, S8 (GS-009),
S73 (OS-102), S964 (THU-282),
S860 (THU-301), S988 (THU-331)
Sanatamia, Eva, S532 (SAT-221)
Santa Marisa Rodriguez, German Jose,
S1126 (WED-208)
Santanionio, Teresa, S107 (LBP-11),
S1082 (WED-146)
Santaroni, Stella, S88 (OS-124-YI),
Santarén, Sandra Izquierdo,
S685 (SAT-446)
Santos, Lorrane, S658 (SAT-405)
Santos-Silva, Ermelinda, S972 (THU-291)
Sanyal, Arun, S1 (GS-001), S13 (LBO-05),
S31 (OS-029), S49 (OS-062),
S171 (FRI-445), S560 (SAT-275),
S737 (WED-403)
Sanchez, Antonio, S470 (THU-503),
S682 (SAT-442),
S1172 (THU-162)
Sanchez, Barry, S375 (THU-168),
S1200 (THU-206)
Sanchez, Beate, S874 (FRI-114)
Sanchez, Ruben, S357 (SAT-232),
S573 (THU-114),
S189 (THU-185)
Sankar, Kamya, S489 (TOP-065)
Sanou, Armel Moumound, S930 (FRI-202)
Sansó, Andreu, S1191 (THU-190)
Sanatamia, Diego Burgos, S8 (GS-009),
S73 (OS-102), S964 (THU-282),
S860 (THU-301), S988 (THU-331)
Sanatamia, Eva, S532 (SAT-221)
Santa Marisa Rodriguez, German Jose,
S1126 (WED-208)
Santanionio, Teresa, S107 (LBP-11),
S1082 (WED-146)
Santaroni, Stella, S88 (OS-124-YI),
Santarén, Sandra Izquierdo,
S685 (SAT-446)
Santos, Lorrane, S658 (SAT-405)
Santos-Silva, Ermelinda, S972 (THU-291)
Sanyal, Arun, S1 (GS-001), S13 (LBO-05),
S31 (OS-029), S49 (OS-062),
S171 (FRI-445), S560 (SAT-275),
S737 (WED-403)
Sanchez, Antonio, S470 (THU-503),
S682 (SAT-442),
S1172 (THU-162)
Sanchez, Barry, S375 (THU-168),
S1200 (THU-206)
Sanchez, Beate, S874 (FRI-114)
Author Index

S284 (SAT-330), S289 (SAT-336), S294 (SAT-345), S313 (SAT-547), S316 (SAT-553), S337 (WED-243), S939 (TOP-058)

Schwab, Patrick, S1151 (SAT-171)
Schwade, Daniel, S596 (THU-150)
Schwartz, Fionnuala, S483 (THU-530)
Schwartz, Myron, S227 (SAT-213)
Schwarzinger, Michael, S859 (SAT-120)
Schwarz, Kathleen, S971 (THU-291)
Schwarzl, Jakob, S354 (THU-242)
Schwarz, Michael, S37 (OS-039-YI), S90 (OS-127-YI), S193 (FRI-551), S201 (FRI-554), S244 (WED-334), S286 (SAT-332), S288 (SAT-335), S292 (SAT-342), S299 (SAT-521), S1135 (SAT-150)
Schweiger, Sofia, S238 (WED-232)
Schwiering, Fabian, S330 (WED-230)
Schwinge, Dorothee, S60 (OS-079-YI), S450 (SAT-385)
Scifo, Gaetano, S40 (OS-045), S55 (OS-070)
Scilabria, Simone, S457 (THU-480)
Scionti, Francesca, S568 (SAT-288)
Scivieres, Marco, S966 (THU-285), S987 (THU-313), S1002 (THU-336)
Scivetti, Paolo, S40 (OS-045), S55 (OS-070)
Scott, Charlotte, S445 (SAT-375)
Seah Lee, Way, S971 (THU-291)
Seaman, Sian, S434 (SAT-356)
Sebagh, Mylène, S981 (THU-303)
Sebastiani, Giada, S609 (THU-421), S645 (THU-557), S900 (FRI-151)
Sebode, Marcial, S56 (OS-073)
Seco, Luis Manuel Cervera, S736 (WED-400)
Seed, Paul, S36 (OS-037)
Seehofer, Daniel, S483 (THU-529)
Segaux, Lauriane, S467 (THU-498)
Segeral, Olivier, S897 (FRI-146)
Segovia-Miranda, Fabián, S361 (FRI-384)
Segovia-Zafra, Antonio, S142 (FRI-403)
Ségrestin, Bérénice, S603 (THU-410)
Sendr, Charlotte, S445 (SAT-375)
Sevenants, Linde, S410 (FRI-330)
Sevenants, Linde, S410 (FRI-330)
Sevenants, Linde, S410 (FRI-330)
Sevenants, Linde, S410 (FRI-330)
Sevenants, Linde, S410 (FRI-330)
Sevenants, Linde, S410 (FRI-330)
Sevenants, Linde, S410 (FRI-330)
Sevenants, Linde, S410 (FRI-330)
Sevenants, Linde, S410 (FRI-330)
Sevenants, Linde, S410 (FRI-330)
Sevenants, Linde, S410 (FRI-330)
Sevenants, Linde, S410 (FRI-330)
Author Index

SIGAL, Michael, S351 (THU-238)
SIGON, Giordano, S624 (THU-446)
SIGUENZA, Rebeca, S700 (SAT-468)
SIGUER, Martin, S1160 (SAT-184)
SIJTSMA, Marijn, S14 (LBO-06)
SILKAROOSI, Masoumeh, S342 (TOP-038), S347 (THU-233)
SILBERHUMER, Gerd, S470 (THU-505)
SILBERSTEIN, Francesca Ccecheri, S1056 (TOP-106), S1105 (WED-176), S1142 (SAT-159)
SII, Lei, S523 (FRI-329)
SILletta, Marianna, S593 (THU-145)
SILWING, Niza, S522 (FRI-327)
SMITH, Coleman I., S89 (OS-125)
SMITH, Daniel, S632 (THU-461)
SMITH, Daniel, S632 (THU-461)
SMITH, Amy Rhoden, S35 (OS-034)
SMILDK, Vaclav, S292 (SAT-341), S300 (SAT-522), S341 (SAT-553), S381 (FRI-477), S393 (FRI-495)
SINAI, Christian, S536 (FRI-329)
SINAI, Emmanuel, S460 (WED-302)
SINATTI, Gaia, S646 (THU-360), S685 (SAT-446)
SINCLAIR, Marie, S311 (SAT-543), S625 (THU-450)
SINGH, Amit, S575 (THU-116), S582 (THU-128), S586 (THU-134), S1189 (FRI-185)
SINGH, Ashwani, S179 (FRI-459), S468 (THU-499), S627 (THU-453), S693 (SAT-125), S865 (SAT-129), S900 (FRI-151)
SINGANAYAGAM, Arjunha, S284 (SAT-329), S452 (SAT-389)
SINGARAJA, Roshni Rebecca, S351 (THU-237)
SINGH, Ananda, S1059 (WED-116)
SINGH, Ankita, S310 (SAT-542), S983 (THU-305)
SINGH, Jenn, S1151 (SAT-171), S1167 (SAT-196)
SINGH, Manavi, S417 (FRI-350)
SINGH, Neetu, S436 (SAT-360)
SINGH, Ravinder, S17 (OS-006-YI), S1047 (FRI-267)
SINGH, Roshni, S1180 (THU-173)
SINGH, Seema, S649 (TOP-083)
SINGH, Shivaraj, S253 (WED-348)
SINGH, Shraddha, S228 (THU-362)
SINGH, Sumeet, S735 (WED-398)
SINGH, Virendra, S253 (WED-348)
SINKAL, Edford, S916 (FRI-178), S1117 (WED-195)
SINN, Dong Hyun, S267 (THU-369), S305 (SAT-533), S513 (FRI-312), S585 (THU-132), S631 (THU-459), S821 (FRI-514)
SINNER, Friedrich, S47 (OS-057)
SIPKEI, Nora, S23 (SAT-017-YI), S42 (OS-047-YI)
SIRIBELLI, Alessia, S120 (LB-29), S837 (FRI-487)
SIRIPON, Nipaporn, S217 (THU-349)
SIRILIN, Claude, S839 (FRI-490)
SIRIONI, Sandro, S381 (WED-272)
SIRVENT, Pascal, S806 (WED-555)
SISTILLI, Gabriella, S784 (WED-509)
SISTL, Ramakrishna, S560 (SAT-274)
SI, Tengfei, S445 (SAT-376)
SITKO, Marek, S505 (FRI-296), S1205 (THU-215)
SIVANANTHA, Tirukonda Prasanna, S278 (WED-389)
SIVERTSON NORDHUS, Katharine, S421 (FRI-355)
SJÖBLOM, Nelli, S997 (THU-329)
SJÖLUND, Wilhelm, S778 (WED-470)
SKALICKY, Susana, S45 (OS-051-YI)
SKINNER, Charlotte, S601 (TOP-088)
SŁADKANY, Lubomir, S871 (SAT-136)
SKOEN, Richard, S266 (WED-367)
SKOL, Kristian, S996 (THU-327)
SKRÖDER, Helena, S654 (SAT-399)
SKRYPNYK, Igor, S136 (THU-408)
SKRYPNYK, Roman, S136 (THU-408)
SŁUKOWSKA, Beata, S871 (SAT-136)
SKYTHPE, Maria Kleiasgaard, S657 (SAT-304)
Slagle, Ashley F., S1087 (WED-151)
SLAUGHER, Eugene, S230 (THU-367)
SLEiman, Marwan, S995 (THU-324)
SLITZ, Florence, S24 (OS-018-YI), S531 (SAT-220)
SLUKIC, Aleksandra, S364 (FRI-390)
SLOOTER, Charlotte, S44 (OS-049-YI)
SMADH, Yad, S170 (FRI-442), S930 (FRI-204)
SMEDSRED, Bård, S449 (SAT-383)
SMETS, Lena, S345 (THU-229), S452 (SAT-390), S753 (WED-430)
SMID, Vaclav, S292 (SAT-341), S727 (SAT-513)
SMIT, Colette, S892 (FRI-138)
SMITH, Amy Rhoden, S35 (OS-034)
SMITH, Coleman L., S89 (OS-125)
SMITH, Daniel, S632 (THU-461), S722 (SAT-506)
SMITH, David, S548 (SAT-251), S1029 (FRI-238), S1029 (FRI-239), S1051 (FRI-272)
SMITH, Graham, S411 (FRI-331)
SMITH, Helen, S397 (WED-297)
SMITH, Ian, S434 (SAT-355)
SMITH, Jeff, S35 (OS-034)
SMOLINSKA, Agnieszka, S840 (FRI-492)
SMOOT, Roy L., S44 (OS-050-YI), S465 (THU-495)
SMUD, Astrid, S245 (WED-336)
SMUK, Melanie, S726 (SAT-512)
SMUTS, Heidi, S1184 (THU-178)
SMYK, Wiktor, S950 (THU-262)
SNABEL, Jessica, S786 (WED-515)
SNIJDERS, Romée, S14 (LBO-06), S373 (WED-258), S592 (THU-304)
SNIR, Tom, S415 (FRI-345)
SOARDO, Giorgio, S500 (FRI-288)
SOARES, Elza, S253 (WED-348)
SÔBENOKO, Natalia, S56 (OS-073)
SÔBOLEWSKI, Cyril, S146 (FRI-408)
SOBRINO, Carmen I., S397 (WED-296)
SOBRINO, Nieves Martín, S886 (FRI-129)
SOCHA, Lukas, S505 (FRI-296)
SOCHA, Piotr, S837 (FRI-486), S950 (THU-262), S967 (THU-286)
SOE, Phymar, S386 (FRI-130)
SOFFREDINI, Roberta, S1154 (SAT-175), S1159 (SAT-181), S1164 (SAT-190)
SOFIA, Michael J., S1171 (SAT-202)
SOFIAS, Alexandros Marios, S26 (OS-022)
SOGABE, MAKI, S1041 (FRI-257)
SOGI, Philippe, S161 (FRI-429), S859 (SAT-120)

S1288 Journal of Hepatology 2023 vol. 78(S1) | S1213–S1305
Author Index
Author Index

Stecchi, Michele, S640 (THU-475), S691 (SAT-457)
Steenkiste, Christophe Van, S229 (THU-364), S764 (WED-446)
Stefanescu, Horia, S151 (FRI-413), S178 (FRI-457), S245 (WED-337), S283 (SAT-327), S295 (SAT-347), S297 (SAT-519)
Stefanini, Benedetta, S586 (THU-134)
Stefanini, Bernardo, S499 (FRI-287), S597 (THU-153)
Stefanini, Lucia, S217 (THU-350)
Steffens, Andrea, S1208 (THU-218)
Stein, Stephanie, S450 (SAT-385), S485 (THU-353), S940 (THU-249)
Stein, Philip, S938 (TOP-057)
Steinmann, Silja, S379 (WED-269)
Steinhoff, Leonie, S622 (THU-444)
Steiner, Kristina, S264 (WED-365)
Steinberg, Idan, S773 (WED-460)
Steinberg, Gregory, S762 (WED-446)
Stefanini, Lucia, S217 (THU-350)
Steffens, Andrea, S1208 (THU-218)
Stein, Stephanie, S450 (SAT-385), S485 (THU-353), S940 (THU-249)
Stein, Philip, S938 (TOP-057)
Steinmann, Silja, S379 (WED-269)
Steinhoff, Leonie, S1124 (WED-206), S1125 (WED-207)
Stein, Kerstin, S1147 (TOP-110)
Steinmann, Elke, S1020 (FRI-221)
Steinberger, Jonathan, S489 (TOP-065)
Steinberg, Gregory, S762 (WED-446)
Stein, Kerstin, S1147 (TOP-110)
Steinmann, Elke, S1020 (FRI-221), S1032 (FRI-244), S1044 (FRI-262)
Steinberger, Jonathan, S489 (TOP-065)
Stefanini, Benedetta, S586 (THU-134)
Stefanini, Bernardo, S499 (FRI-287), S597 (THU-153)
Stefanini, Lucia, S217 (THU-350)
Steffens, Andrea, S1208 (THU-218)
Stein, Stephanie, S450 (SAT-385), S485 (THU-353), S940 (THU-249)
Stein, Philip, S938 (TOP-057), S969 (THU-289), S1003 (THU-378)
Stein, Kerstin, S1147 (TOP-110)
Steinmann, Elke, S1020 (FRI-221)
Stefanini, Lucia, S217 (THU-350)
Steffens, Andrea, S1208 (THU-218)
Stein, Stephanie, S450 (SAT-385), S485 (THU-353), S940 (THU-249)
Stein, Philip, S938 (TOP-057), S969 (THU-289), S1003 (THU-378)
Stein, Kerstin, S1147 (TOP-110)
Steinmann, Elke, S1020 (FRI-221), S1032 (FRI-244), S1044 (FRI-262)
Steinberger, Jonathan, S489 (TOP-065)
Steinberg, Gregory, S762 (WED-446)
Stein, Kerstin, S1147 (TOP-110)
Steinmann, Elke, S1020 (FRI-221)
Stefanini, Benedetta, S586 (THU-134)
Stefanini, Bernardo, S499 (FRI-287), S597 (THU-153)
Stefanini, Lucia, S217 (THU-350)
Steffens, Andrea, S1208 (THU-218)
Stein, Stephanie, S450 (SAT-385), S485 (THU-353), S940 (THU-249)
Stein, Philip, S938 (TOP-057), S969 (THU-289), S1003 (THU-378)
Stein, Kerstin, S1147 (TOP-110)
Steinmann, Elke, S1020 (FRI-221), S1032 (FRI-244), S1044 (FRI-262)
Steinberger, Jonathan, S489 (TOP-065)
Stein, Kerstin, S1147 (TOP-110)
Steinmann, Elke, S1020 (FRI-221)
Stefanini, Benedetta, S586 (THU-134)
Stefanini, Bernardo, S499 (FRI-287), S597 (THU-153)
Stefanini, Lucia, S217 (THU-350)
Steffens, Andrea, S1208 (THU-218)
Stein, Stephanie, S450 (SAT-385), S485 (THU-353), S940 (THU-249)
Stein, Philip, S938 (TOP-057), S969 (THU-289), S1003 (THU-378)
Stein, Kerstin, S1147 (TOP-110)
Steinmann, Elke, S1020 (FRI-221), S1032 (FRI-244), S1044 (FRI-262)
Steinberger, Jonathan, S489 (TOP-065)
Stein, Kerstin, S1147 (TOP-110)
Steinmann, Elke, S1020 (FRI-221)
Stefanini, Benedetta, S586 (THU-134)
Stefanini, Bernardo, S499 (FRI-287), S597 (THU-153)
Stefanini, Lucia, S217 (THU-350)
Steffens, Andrea, S1208 (THU-218)
Stein, Stephanie, S450 (SAT-385), S485 (THU-353), S940 (THU-249)
Stein, Philip, S938 (TOP-057), S969 (THU-289), S1003 (THU-378)
Stein, Kerstin, S1147 (TOP-110)
Steinmann, Elke, S1020 (FRI-221), S1032 (FRI-244), S1044 (FRI-262)
Steinberger, Jonathan, S489 (TOP-065)
Stein, Kerstin, S1147 (TOP-110)
Steinmann, Elke, S1020 (FRI-221)
Stefanini, Benedetta, S586 (THU-134)
Stefanini, Bernardo, S499 (FRI-287), S597 (THU-153)
Author Index

Tsai, Yi-Hsuan, S361 (FRI-385)
Tsakiris, Evelyn, S762 (WED-442)
Tsang, Simon, S48 (OS-058)
Tschuschner, Annette, S339 (WED-248)
Teng, Kuo-Chih, S1180 (THU-174), S1206 (THU-217)
Teng, Leo, S544 (SAT-243)
Tseng, Tai-Chung, S53 (SAT-219), S1061 (WED-119)
Teng, Te-Wei, S1057 (TOP-112)
Tsereteli, Maia, S890 (FRI-135), S891 (FRI-136), S909 (FRI-167), S925 (FRI-193), S931 (FRI-205)
Tsertsvadze, Tengiz, S898 (FRI-133), S921 (FRI-187), S1204 (THU-214)
Tse, Yee-Kit, S1064 (WED-123), S1069 (WED-129), S1146 (SAT-166), S1148 (SAT-167)
Tsien, Cynthia, S426 (FRI-363)
Tsigas, Alexandros-Pantelis, S766 (WED-449), S933 (FRI-210)
Tseng, Kuo-Chih, S1180 (THU-174), S1206 (THU-217)
Tseng, Tai-Chung, S53 (SAT-219), S1061 (WED-119)
Tsochatzis, Emmanuel, S105 (LBP-09), S475 (THU-514), S656 (SAT-402), S660 (SAT-409), S661 (SAT-410), S668 (SAT-420), S812 (FRI-471)
Tsou, Phoebe, S432 (FRI-363)
Tsuchiyama, Koichi, S733 (WED-395)
Tsukishima, Albert, S886 (FRI-130)
Tsuchiyama, Akira, S180 (FRI-461), S489 (THU-546)
Tsuchiya, Kaoru, S598 (THU-554), S644 (THU-555), S1113 (WED-189)
Tsui, Yu, S48 (OS-058)
Tsuneyama, Koichi, S733 (WED-395)
Tsutsui, Tsuneyama, S588 (SAT-448)
Tual, Christelle, S1161 (SAT-185)
Tu, Chaoyong, S488 (THU-540)
Tudhope, Fiona, S195 (FRI-546)
Tudor, Andra, S220 (THU-355)
Tudrujek, Magdalena, S505 (FRI-296)
Tuffield, Marianne, S444 (SAT-374), S1034 (FRI-248)
Tufoni, Manuel, S191 (FRI-540)
Tülek, Tufan, S279 (WED-391)
Tun, Nway, S263 (WED-364)
Tuo, Biguang, S329 (WED-228), S974 (WED-419)
Turan, Dilara, S181 (FRI-463)
Turan, İlker, S181 (FRI-463)
Turato, Cristian, S552 (SAT-258), S766 (WED-449)
Turcanu, Adela, S9 (OS-012), S1054 (TOP-100)
Turco, Celia, S994 (THU-322)
Turco, Laura, S54 (OS-069), S86 (OS-121-YI), S87 (OS-123-YI), S970 (THU-290)
Turetti, Fabio, S945 (THU-255)
Turkina, Anastasia, S260 (WED-357)
Turner, Jessica, S1202 (THU-210)
Tursunova, Dilorom, S113 (LBP-19)
Tushuizen, Maarten, S14 (LBO-06)
Tsusuki, Tsubasa, S686 (SAT-448)
Tyagi, Purnima, S1013 (TOP-102), S1045 (FRI-263)
Tyaht, Alexander, S349 (THU-235)
Tyc, Katarzyna, S352 (THU-239)
Uchihara, Naoki, S644 (THU-554)
Uchida-Kobayashi, Sawako, S566 (SAT-286)
Uchida-Kobayashi, Sawako, S566 (SAT-286)
Uchida-Kobayashi, Sawako, S566 (SAT-286)
Uchtenich, Natalie, S373 (WED-258)
Ullah, Shamsh, S168 (FRI-439)
Ulyanov, Anatoly, S489 (TOP-665)
Ulyanov, Anatoly, S489 (TOP-665)
Ullik, Deniz, S469 (THU-502)
Ulcok, Umut, S405 (SAT-541)
Umar, Narmeen, S373 (WED-258)
Umar, Narmeen, S373 (WED-258)
Urban, Kristina, S552 (SAT-258), S766 (WED-449)
Urban, Matthew, S765 (WED-448)
Urban, Matthew, S765 (WED-448)
Urban, Matthew, S765 (WED-448)
Urban, Stephanie, S1025 (FRI-232)
Urbano, Geminias, S912 (FRI-173)
Uere, Daren, S324 (WED-218), S547 (WED-420), S770 (WED-455)
Urie, Tore, S529 (SAT-216), S537 (SAT-232)
Us, Gediz Dogay, S645 (THU-556)
Us, Gediz Dogay, S645 (THU-556)
Uson, Clara, S90 (OS-127-YI), S299 (SAT-521)
Uson, Clara, S90 (OS-127-YI), S299 (SAT-521)
Uson, Eva, S290 (SAT-337)
Utpatel, Kirsten, S521 (FRI-324)
Uva, Paolo, S446 (SAT-377)
Uysal, Alper, S274 (WED-382)
Vaccaro, Marco, S592 (THU-144), S1118 (WED-196)
Vaidya, Arun, S282 (SAT-325), S290 (SAT-338)
Vaidyanathan, Akshaya, S576 (THU-118)
Vaillant, Andrew, S1150 (SAT-169), S1160 (SAT-183)
Vainilovich, Yelena, S198 (FRI-550), S807 (TOP-077)
Vairetti, Mariapia, S795 (WED-533), S804 (WED-550)
Vaishnav, Manas, S73 (OS-101-YI), S197 (FRI-548), S297 (SAT-350), S587 (THU-135), S693 (SAT-459)
Vaittinner, Prabakar, S1193 (THU-194)
Vaknin, Ilan, S119 (THU-289), S415 (FRI-345)
Valaydon, Zina, S380 (WED-271)
Valbuena, Monica Barreales, S171 (FRI-445)
Valcheva, Tsvetana, S1172 (THU-162)
Valcheva, Velichka, S969 (THU-289), S987 (THU-313), S990 (THU-317), S1002 (THU-336)
Valdecantos, Pilar, S331 (WED-231)
Valderrama, Valderrama, Axel Pamela Benitez, S690 (SAT-454)
Valdez, Ivan, S79 (OS-112)
Valderwas, Miranda, S311 (THU-399), S489 (THU-546)
Valde, Luke, S632 (THU-462)
Valenti, Chiara, S729 (SAT-517)
Valenti, Luca, S500 (FRI-288), S535 (SAT-227), S609 (THU-421), S646 (THU-559), S661 (SAT-410), S669 (SAT-422), S673 (SAT-430), S733 (WED-393), S772 (WED-459), S803 (WED-549), S992 (THU-318), S1173 (THU-165)
Valentín, Nicolás Stankovic, S211 (THU-342)

Journal of Hepatology 2023 vol. 78(S1) | S1213–S1305
Author Index

Valentino, Pamela, S971 (THU-291)
Valenzuela, Esteban Fuentes, S470 (THU-503), S480 (THU-524)
Valenzuela, María, S171 (FRI-445)
Valerio, Heather, S910 (FRI-169)
Valerio, Luigi, S729 (SAT-517)
Valery, Patricia, S239 (WED-324), S846 (WED-478)
Valla, Dominique, S106 (LPB-10), S670 (SAT-424), S681 (SAT-440), S776 (WED-467)
Vallée, Greg, S426 (FRI-363)
Valle, Juan, S541 (SAT-238)
Valles, Foix, S131 (THU-399), S489 (THU-546)
Valley-Omar, Ziyaad, S1184 (THU-178)
Valle, Emmanuelle, S355 (THU-244)
Vallier, Ludovic, S122 (LPB-34), S140 (FRI-400), S433 (SAT-354)
Vallier, Marie, S806 (WED-555)
Vallot, Ariane, S585 (THU-133)
Valsan, Arun, S86 (OS-121-YI), S827 (FRI-524), S846 (WED-477), S848 (WED-481)
Valva, Pamela, S1037 (FRI-251)
Valverde, Angela Martínez, S331 (WED-231), S440 (SAT-367), S777 (WED-468)
Van Beckhoven, Dominique, S880 (FRI-121)
van Bömmel, Florian, S108 (LPB-12), S201 (FRI-555), S483 (THU-529), S507 (FRI-299), S1043 (FRI-260), S1050 (FRI-270), S1071 (WED-132), S1087 (WED-151), S1134 (SAT-148), S1138 (SAT-154), S1139 (SAT-156), S1147 (TOP-110)
Vandecaveye, Vincent, S48 (OS-059-YI), S524 (TOP-066)
van de Graaf, Stan, S55 (OS-071-YI), S412 (FRI-333), S427 (FRI-364), S1025 (FRI-231)
vanden Berg, Otto, S568 (SAT-289), S836 (FRI-485)
vand en Berg, Aad, S14 (LBO-06)
Van den Berge, Koen, S1034 (FRI-248)
vanden Beukel, Michelle, S382 (WED-274)
Van den Branden, Astrid, S764 (WED-446)
van den Brand, Floris, S14 (LBO-06), S44 (OS-049-YI)
Vandenbroucke, Roosmarijn, S229 (THU-364)
vanden Heuvel, Marius, S740 (WED-407)
vanden Hoek, Anita M., S805 (WED-553)
Van der Meer, Adriaan, S14 (LBO-06), S56 (OS-073), S382 (WED-274)
van der Merwe, Schalk, S345 (THU-229), S363 (FRI-389), S452 (SAT-390), S753 (WED-430)
vander Meulen, Stef, S382 (WED-274)
vanderschuuren, Emma, S300 (SAT-524)
vander Valk, Marc, S880 (FRI-121), S892 (FRI-138)
vander Veen, Lars, S761 (WED-441)
van der Woerd, Wendy L., S965 (THU-284), S969 (THU-289)
de van der Werken, Harmen, S1016 (TOP-108), S1019 (FRI-219)
Vandriel, Shannon M., S971 (THU-291)
van Duyvenvoorde, Wim, S763 (WED-444), S786 (WED-515)
van Ekhol, Kiri, S1100 (WED-169)
e van Eijk, Hans, S350 (THU-236)
vangan, Nyamtsengel, S1104 (WED-175)
vangara, Sasanka, S209 (FRI-339)
van gerven, Nicole, S14 (LBO-06)
van Güzel, Hardeep, S1039 (FRI-255)
van Grunsven, Leo, S410 (FRI-330)
van Gulik, Thomas, S568 (SAT-289)
Vanhaecke, Tamara, S752 (WED-428), S775 (WED-465)
Vanherr, Jean-Christophe, S1025 (FRI-231)
van Herwaarden, Manon, S14 (LBO-06)
van Heuven, Bertie Joan, S786 (WED-515)
van Hoek, Bart, S14 (LBO-06), S382 (WED-274)
av van Hooff, Maria, S46 (OS-053-YI)
Vanhouven, Christian, S226 (THU-361)
van hul, Noëmi K. M., S410 (FRI-330), S433 (SAT-353), S945 (THU-255)
van Ijzendoorn, Manon, S14 (LBO-06)
vankleef, Laurens, S83 (OS-118)
van Lennemns, Claire, S473 (THU-511)
van Melkbeke, Lukas, S363 (FRI-389)
vanneste, Bavo, S445 (SAT-375)
vanni, Estor, S40 (OS-045), S55 (OS-070), S88 (OS-121-YI), S374 (WED-260)
van Rensburg, Christo, S1108 (WED-181)
Rosmalen, Belle, S568 (SAT-289)
van Rosmalen, Marieje, S454 (TOP-052)
van Rursseult, Hannah, S1051 (FRI-272)
van Schalk, Willem, S123 (LPB-36)
van selm, Lena, S924 (FRI-192)
van trieu My, S78 (OS-110)
van Weegheul, Michel, S427 (FRI-364)
vanWelzen, Berend, S892 (FRI-138)
vvan Wessel, Daan, S969 (THU-289)
Vanwolleghem, Thomas, S14 (LBO-06), S52 (OS-065-YI), S61 (OS-080-YI), S279 (TOP-043), S300 (SAT-524), S622 (THU-444), S880 (FRI-121), S1034 (FRI-248), S1054 (TOP-100), S1114 (WED-190), S1132 (SAT-145), S1138 (SAT-154)
Vaqquiero, Javier, S38 (OS-041-YI)
V, Dheapak, S462 (THU-489)
Ven, Trieu My, S78 (OS-110)
Vega, Javier, S683 (SAT-443)
veidal, Sanne, S321 (TOP-036)
veilefll, Félix, S233 (THU-372)
velasco, Jose Antonio Velarde-Ruiz, S195 (FRI-546)
velasco, María Soledad, S1191 (THU-190)
velasquez, Hector, S883 (FRI-125), S886 (FRI-130), S1189 (THU-187), S1200 (THU-207)
velazquez, René Malé, S195 (FRI-546)
velkov, Stoyan, S945 (THU-256)
veloz, Maria Guerra, S91 (OS-128), S642 (THU-551), S905 (FRI-161), S1179 (THU-172)
vendelbo, Mikkel holm, S958 (THU-274), S985 (THU-309)
venere, Rosanna, S40 (OS-045), S55 (OS-070)
verenito, Marino, S47 (OS-057)
Author Index

Zhang, Yiling, S1055 (TOP-101)
Zhang, Ying, S858 (SAT-117)
Zhang, Xiaoli, S520 (FRI-323)
Zhou, Shun, S446 (SAT-378), S540 (TOP-236)
Zhou, Tao, S422 (FRI-357), S429 (TOP-366)
Zhou, Xiaolei, S520 (FRI-323)
Zhou, Xin, S784 (TOP-510), S812 (FRI-470)
Zhou, Xingang, S103 (THU-397), S131 (THU-400)
Zhou, Xingping, S204 (FRI-559)
Zhou, Xinyuan, S856 (TOP-099)
Zhou, Xiaojun, S1080 (WED-142)
Zhou, Xuehong, S1094 (WED-162)
Zhou, Yong, S784 (WED-510), S812 (FRI-470)
Zhou, Yuxin, S543 (SAT-242), S557 (SAT-269)
Zhou, Zhipeng, S503 (FRI-294)
Zh, Andrew X., S574 (THU-115), S580 (THU-125)
Zh, Bingbing, S193 (FRI-544)
Zh, Chuanwu, S195 (FRI-546), S395 (TOP-294), S638 (THU-471), S696 (SAT-463), S724 (SAT-510), S1068 (WED-127), S1078 (WED-140), S1080 (WED-142), S1094 (WED-162), S1110 (WED-184)
Zh, Jie, S1078 (WED-140), S1094 (WED-161)
Zh, Jinyi, S540 (SAT-236)
Zh, Zhiyi, S395 (WED-294), S638 (THU-471), S696 (SAT-463), S724 (SAT-510), S1110 (WED-184)
Zhou, Lu, S406 (WED-313)
Zhou, Shun, S446 (SAT-378), S540 (TOP-236)
Zhou, Tao, S422 (FRI-357), S429 (TOP-366)
Zhou, Xiaolei, S520 (FRI-323)
Zhou, Xin, S784 (TOP-510), S812 (FRI-470)
Zhou, Xingang, S103 (THU-397), S131 (THU-400)
Zhou, Xingping, S204 (FRI-559)
Zhou, Xinyuan, S856 (TOP-099)
Zhou, Xiaojun, S1080 (WED-142)
Zhou, Xuehong, S1094 (WED-162)
Zhou, Yong, S784 (WED-510), S812 (FRI-470)
Zhou, Yuxin, S543 (SAT-242), S557 (SAT-269)
Zhou, Zhipeng, S503 (FRI-294)
Zh, Andrew X., S574 (THU-115), S580 (THU-125)
Zh, Bingbing, S193 (FRI-544)
Zh, Chuanwu, S195 (FRI-546), S395 (TOP-294), S638 (THU-471), S696 (SAT-463), S724 (SAT-510), S1068 (WED-127), S1078 (WED-140), S1080 (WED-142), S1094 (WED-162), S1110 (WED-184)
Zh, Jie, S1078 (WED-140), S1094 (WED-161)
Zh, Jinyi, S540 (SAT-236)
Zh, Zhiyi, S395 (WED-294), S638 (THU-471), S696 (SAT-463), S724 (SAT-510), S1110 (WED-184)
Zhou, Lu, S406 (WED-313)
Zhou, Shun, S446 (SAT-378), S540 (TOP-236)
Zhou, Tao, S422 (FRI-357), S429 (TOP-366)
Zhou, Xiaolei, S520 (FRI-323)
Zhou, Xin, S784 (TOP-510), S812 (FRI-470)
Zhou, Xingang, S103 (THU-397), S131 (THU-400)
Zhou, Xingping, S204 (FRI-559)
Zhou, Xinyuan, S856 (TOP-099)
Zhou, Xiaojun, S1080 (WED-142)
Zhou, Xuehong, S1094 (WED-162)
Zhou, Yong, S784 (WED-510), S812 (FRI-470)
Zhou, Yuxin, S543 (SAT-242), S557 (SAT-269)
Zhou, Zhipeng, S503 (FRI-294)
<table>
<thead>
<tr>
<th>Name</th>
<th>Affiliations</th>
<th>Page Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zimmer, Yair</td>
<td>S719 (SAT-500)</td>
<td></td>
</tr>
<tr>
<td>Zimny, Sebastian</td>
<td>S329 (WED-228), S417 (FRI-349)</td>
<td></td>
</tr>
<tr>
<td>Zimpel, Carolin</td>
<td>S527 (SAT-213), S536 (SAT-230), S557 (SAT-268)</td>
<td></td>
</tr>
<tr>
<td>Zingone, Fabiana</td>
<td>S407 (WED-315)</td>
<td></td>
</tr>
<tr>
<td>Zinober, Kerstin</td>
<td>S19 (OS-010-YI), S222 (THU-357), S289 (SAT-336), S316 (SAT-553), S393 (TOP-058)</td>
<td></td>
</tr>
<tr>
<td>Zito, Giovanni</td>
<td>S457 (THU-480)</td>
<td></td>
</tr>
<tr>
<td>Zito, Rossella</td>
<td>S803 (WED-549)</td>
<td></td>
</tr>
<tr>
<td>Žižalová, Kateřina</td>
<td>S727 (SAT-513)</td>
<td></td>
</tr>
<tr>
<td>Zizer, Eugen</td>
<td>S1139 (SAT-156)</td>
<td></td>
</tr>
<tr>
<td>Zizzo, Andrèanne N.</td>
<td>S971 (THU-291)</td>
<td></td>
</tr>
<tr>
<td>Zlamal, Thomas</td>
<td>S996 (THU-327)</td>
<td></td>
</tr>
<tr>
<td>Zmora, Niv</td>
<td>S243 (WED-333), S315 (SAT-550), S393 (WED-291)</td>
<td></td>
</tr>
<tr>
<td>Zmrljak, Ursula Prosenec</td>
<td>S553 (SAT-261)</td>
<td></td>
</tr>
<tr>
<td>Zollino, Teresa</td>
<td>S40 (OS-043), S55 (OS-070)</td>
<td></td>
</tr>
<tr>
<td>Zoller, Heinz</td>
<td>S232 (THU-369), S961 (THU-279), S967 (THU-286), S968 (THU-288), S113S (SAT-150)</td>
<td></td>
</tr>
<tr>
<td>Zollner, Caroline</td>
<td>S1139 (SAT-156)</td>
<td></td>
</tr>
<tr>
<td>Zoncapè, Mirko</td>
<td>S660 (SAT-409), S661 (SAT-410), S668 (SAT-420), S812 (FRI-471)</td>
<td></td>
</tr>
<tr>
<td>Zoratti, Caterina</td>
<td>S711 (SAT-489)</td>
<td></td>
</tr>
<tr>
<td>Zorn, Markus</td>
<td>S963 (THU-281)</td>
<td></td>
</tr>
<tr>
<td>Zorrila, Rafael Ruiz</td>
<td>S936 (FRI-214)</td>
<td></td>
</tr>
<tr>
<td>Zorrilla, Luis Eduardo Pariente</td>
<td>S697 (SAT-465)</td>
<td></td>
</tr>
<tr>
<td>Zouari, Fedi</td>
<td>S680 (SAT-439)</td>
<td></td>
</tr>
<tr>
<td>Zoubek, Miguel</td>
<td>S18 (OS-007)</td>
<td></td>
</tr>
<tr>
<td>Zougmoré, Honoré</td>
<td>S170 (FRI-442)</td>
<td></td>
</tr>
<tr>
<td>Zou, Heng</td>
<td>S41 (OS-046)</td>
<td></td>
</tr>
<tr>
<td>Zou, Huaibin</td>
<td>S235 (TOP-047)</td>
<td></td>
</tr>
<tr>
<td>Zou, Liangfeng</td>
<td>S117 (LBP-24)</td>
<td></td>
</tr>
<tr>
<td>Zoulim, Fabien</td>
<td>S52 (OS-066), S101 (LBP-04), S107 (LBP-11), S118 (LBP-27), S498 (FRI-286), S687 (SAT-450), S701 (SAT-469), S1014 (TOP-104), S1046 (FRI-265), S1058 (WED-113), S1134 (SAT-148), S1160 (SAT-184), S1161 (SAT-185), S1170 (SAT-199)</td>
<td></td>
</tr>
<tr>
<td>Zou, Zhaozhao</td>
<td>S591 (THU-142)</td>
<td></td>
</tr>
<tr>
<td>Zou, Zhengsheng</td>
<td>S145 (TOP-078)</td>
<td></td>
</tr>
<tr>
<td>Zuberi, Bader Faiyaz</td>
<td>S319 (SAT-557)</td>
<td></td>
</tr>
<tr>
<td>Zubiaga, Ana</td>
<td>S137 (FRI-395), S529 (SAT-215), S738 (WED-404), S741 (WED-408)</td>
<td></td>
</tr>
<tr>
<td>Zucman-Rossi, Jessica</td>
<td>S537 (SAT-232)</td>
<td></td>
</tr>
<tr>
<td>Zuin, Massimo Giovanni</td>
<td>S978 (THU-297)</td>
<td></td>
</tr>
<tr>
<td>zur Wiesch, Julian Schulze</td>
<td>S1139 (SAT-156), S1147 (TOP-110)</td>
<td></td>
</tr>
<tr>
<td>Zwick, Christian</td>
<td>S445 (SAT-375)</td>
<td></td>
</tr>
<tr>
<td>Zykus, Romanas</td>
<td>S283 (SAT-327)</td>
<td></td>
</tr>
<tr>
<td>Zéretanos, Christos</td>
<td>S1128 (WED-211)</td>
<td></td>
</tr>
</tbody>
</table>
Disclosures: no commercial relationships

The following abstract submitters have indicated that they have no relationships with commercial entities that might be perceived as having a connection with their presentation:

Abad Guerra Javier
Abdelhameed Ahmed
Abdule Amina
Abe-Chayama Hiromi
Abedin Nada
Adamcova Selcanova Svetlana
Adisasmita Michael
Aggarwal Deepankshi
Agirre Lizaso Aloña
Aguilar Ballester María
Ahn Keun Soo
Ajaz Saima
Alaa Basma
Alarcón-Sánchez Brisa Rodope
Alegret Marta
Alexopoulou Alexandra
Alfaiaite Dulce
Alfano Vincenzo
Alhamaee Annah
Alicia Delorme
Aliwa Benard
Allaire Manon
Allen Sophie
Almeida Isadora
Alonso Martin Carmen
Alvarado-Tapías Edilmar
Amador Alberto
Amer Johnny
Amina Roig Clara
Amin Amr
Ampuero Javier
An Jihyun
Ananchuensook Prooksra
Andersen Ina
Andrade Raul J.
Andreaa Livia Bumru
Angel Enrique
Angelakis Athanasios
Ankavay Maliki
Annunziata Francesco
Antwi Milton
Apodaka-Biguri Maider
Archer Ann
Ariño Silvia
Ariungerel Nomin
Armando Angelo
Arnaiz Gonzalez Esther
Artru Florent
Artzner Thierry
Arvanit Pinelopi
Ashfaq Khan Muhammad
Ashimkhanova Aiymkul
Askgard Gro

Aslanikashvili Ana
Astbury Stuart
Athakhitmongkol Thanapat
Attia Yasmeen
Aurélie Beaufrère
Avellan Calvo Ana
Avitabile Emma
Ay Ömer
Babu Rosny
Bachinger Fabian
Baliashvili Davit
Bannon Lian
Barabanchyk Olena
Barrett Lisa
Bassegoda Octavi
Battistella Sara
Belkacem Acidi
Beltrán Pereira Luciano
Benedé Raquel
Benítez Gutiérrez Laura
Benítez Zafra Federica
Benjamín Jaya
Bentanachs Roger
Bergquist Annika
Berlakovich Gabriela
Bernal Monterde Vanesa
Bevilacqua Michele
Bhadoria Ajeet Singh
Bianco Cristiana
Bindal Vasundhra
Birrer Fabienne
Biswas Sagnik
Bitetto Davide
Blasín Benedetta
Blázquez Vicens Joan
Boesch Markus
Booijink Richell
Boothman Helen
Bourgeois Alexandre
Bozward Amber
Brandão-Mello Carlos
Breitennecker Kristina
Bresson-Hadni Solange
Brindley James Hallimond
Brodosi Luca
Brol Maximilian Joseph
Brouwer Willem Pieter
Bruneau Alix
Bryce Kathleen
Buch Stephan
Büchler Christa
Cadamuro Massimiliano
Cairolí Victoria
Caliman-Sturdza Olga Adriana

Calió Alberti
Calvo Sánchez Henar
Camelo Castillo Anny
Canillas Lidia
Cao Hongcui
Carotenuto Pietro
Carvalho Armando
Castañé Helena
Catañeda Andres
Castelnuovo Gabriele
Castillo Elisa
Castoldi Mirco
Cavazza Anna
Celaj Stela
Celik Ferya
Cespiati Annalisa
Chai Jin
Chatterjee Saurabh
Chibourk Sara
Chenello Liliana
Chi Chen-Ta
Chirapongsathorn Sakkarin
Cho Jai Young
Cholankeril George
Chon Young Eun
Choudhury Ashok Kumar
Chow Victor Yung Sin
Chua Damien
Chun Ho Soo
Ciaccio Antonio
Cirella Antonio
Claes Wouter
Clark Sarah
Clayton-Chubb Daniel
Clusmann Jan
Cogliani Miriam
Colognesi Martina
Colyn Leticia
Conde Isabel
Correia Fabio
Coukos Alexander
Crocombe Dominic
Crouch Emilie
Csarmann Katja
Cytryn Edward
Dalbeni Andrea
D’Amato Daphne
D’Ambrosio Francesca
D’Amico Gennaro
Darwish Murad Sarwa
Das Avinata
Davidov Yana
De Boer Ynto
De Bonis Encinoso Mario
Disclosures

Khokhliuk Olena
Kjærgaard Kristoffer
Klöhn Mara
Kobayashi Takashi
Kocar Eva
Komeylian Hamed
Komori Atsumasa
Kon Kazuyoshi
Koob Dennis
Körner Christiane
Kosako Yost Kelli
Kotlinowski Stuart
Koob Dennis
Krause Jenny
Kreimeyer Henriette
Krooss Simon
Kuenzler Patrizia
Kumar Pavitra
Kumari Suja
Kurahashi Tomohide
Lacotte Stéphanie
Ladegaard Grønkjær Lea
Lamarque Catherine
Lamatsch Sven
Langer Mona-May
Lantinga Marten A.
Lapenna Lucia
Lapitz Ainhoa
Larsen Anett Kristin
Lasco Roberta
Latif Muhammad Ummair
Lazzeri-Barcelo Francesca
Leite Nathalie
Lewis Declan
Liang Yan
Liguori Antonio
Lo Ching-Chu
Lombrani Rosa
Loosen Sven H
Loqivist Pia
Lu Tingting
Luque Urbano María de los Reyes
M Rodrigues Robim
Ma Ann T
Mañas Rocio IR
Madejón Antonio
Maderuelo Esther
Madhusudana Girija Sanal
Maharshi Sudhir
Maheshwari Deepanshu
Mahmoud Tasnim
Malik Sabeen
Mallet Vincent
Mandilara Dionisia
Manuli Chiara
Maricca Mimino
Mao Yaakov
Maras Jaswinder
Marciano Sebastiá
Marta Garbin Marta
Martell Marja
Martí-Aguado David
Martín Alia
Martínez Navidad Cristian
Martinez-Sanchez Celia
Mašek Jan
Matar Rolà
Mathew Babu
Mayer Carlotta
Mazzola Alessandra
McInnes Neil
McPherson Stuart
Medina Pizana Mariana Yazmin
Mello Tommaso
Méndez Isabel
Mercado-Gómez María
Meroni Marica
Meunier Lucy
Miliardi Giulia
Millan Lorenzo Marina Eliana
Miller Hamish
Minier Nicolas
Miura Satoshi
Moeckli Beat
Mohammad Tabish
Moles Anna
Montano-Loza Aldo J
Monteiro-Vallejo Rocio
 Moriarty Aoife
Morsica Giulia
Motta Benedetta Maria
Mourya Akash Kumar
Mujica Endrina
Mukherji Atish
Najmi Musath
Nakao Yasuhiro
Nakashima Hirohiko
Nances Mbaoko Raisa
Nandakar Sanket
Nardelli Silvia
Nassar Islam
Nasser Nour
Nesbitt Robin
Nguyen Thi Thu Nga
Nieto Natalie
Nikzad Newshe
Nimanang Supot
Nimma Induja
Ninganhor Massih
Niu Junqi
Njei Basile
Noon Luke
Ntandja Wandji Line Caroline
Odriozola Herrán Aitor
Oh Joo Hyun
Oldroyd Christopher
Olivas Albercht Pol
Onghena Louis
Ono Hiroki
Orpen-Palmer Josh
Ortmayr Gregor
Osmali Zgijim
Osti Valentino
Otero Sanchez Lukas
Ouazan Denis
Pachisra Aditya Vikram
Pacic Ruiz Beatriz
Pagan Giuila
Palasantzas Victoria
Pallotzi Maria
Pandey Sushmita
Pantic Ivana
Pantziou Spyridon
Papachristoforou Eleni
Parisse Simona
Pascale Alina
Patel Ankoor
Paternostro Rafael
Payo-Serafin Tania
Pedroza Lourdes
Peiffer Kai-Henrik
Peltzer Monas
Peñas Herrero Irene
Penners Christian
Pennisi Grazia
Pereyra David
Perez Martima
Perez Diaz del Campo Nuria
Perez-Campuzano Valeria
Persano Maria
Peschard Simon
Pezzato Francesco
Pfefferkorn Maria
Philippart Marie
Piecha Felix
Permettoso Lorenzo
Pillado Perez Beatriz
Piñar Gutiérrez Ana
Pinto Elisa
Piper Hanley Karen
Pirola Carlos
Pocurull Anna
Pollmanns Maike Rebecca
Pooja Devan
Pors Susanne
Pose Elisa
Protopapa Francesa
Provera Alessia
Puente Sanchez Angela
Pujol Claudia
Puri Puneet
Purssell Huw
Qiu Tian Yu
Quinn Nessa
Quarsi Maria
Radchenko Anastasii
Raevens Sarah
Rahamans Syed Mushfiqur
Rancatore Gabriele
Raschid-Alvajieh Jassin
Rau Monika
Rausch Lilli
Rauter Laurin
Ravindranayagam Noel
Reic Tatjana
Remih Katharina
Rezen Tadeja
Rhun Jinsoo
Richardson Naomi
Riches Nicholas
Riescher-Tuczkievicz Alix
Rimi Margherita
Rivera Jesus
Rivero Calaf Angel
Robert Marie Gladys
Rodda Sheridan
Roderburg Christoph
Rodrigues Pedro Miguel
Rodriguez-Tajes Sergio
Disclosures: commercial relationships

The following abstract submitters have indicated that they have relationships with commercial entities that might be perceived as having a connection with their presentation:

Abbott Jane
Abeyesekera Kushala
Aboona Majd
Abramov Frida
Agarwal Kosh
Aguilera Sancho Victoria
Ahmed Osman
Aizenshtadt Aleksandra
Ajmera Veeral
Albary Kutbuddin
Ala Afab
Albertos Rubio Sonia
Ali Syed Afroz
Ali Nida
Alkhoury Naim
Almishri Wagdi
Altangerel Enkhjargal
Anderson Phylea
Andrea Fausto
Angata Kiyohiko
Armisen Javier
Asselah Tarik
Åström Hanne
Atallah Edmond
Bager Palle
Bajaj Jasmohan S
Balcar Lorenz
Baldassarre Maurizio
Ballester María Pilar
Barchuk William
Bauer David JM
Becker Svea
Begré Lorin
Bellilos Eleanor
Bell Adam
Ben Khaled Najib
Benedicto Ana
Benichou Bernard
Bennett Kris
Bertoletti Antonio
Bhanja Abhinab
Bihari Chhagan
Bittermann Therese
Bloom Patricia
Bobowski-Gerard Marie
Bono Ariadna
Booij Tijmen
Boonstra Andre
Bosch Miriam
Bouquet Jerome
Boursier Jerome
Bowlus Christopher
Boyd Anders
Boyle Alison
Boeringer Ruth
Brugmann Philip
Brunner Nathalie
Bucksics Theresa
Buller-Taylor Terri
Bungay Rebecca
Burgart Lukas
Caballero Francisco J.
Cabezas Joaquin
Cable Edward
Cales Paul
Campari Claudia
Campbell Cori
Caon Elisabetta
Capel Jeroen
Capoza Thomas
Cappelli Simone
Cappuyens Sarah
Cardenas Andres
Cardoso Mariana
Carey Ivana
Castéla Laurent
Castven Darko
Castven Jovana
Causy Cyrielle
Caviglia Gian Paolo
Cederborg Anna
Celsa Ciro
Chan Wah Loong
Chang Devon Y.
Chanteranne Brigitte
Chavanelle Vivien
Chen San-Chi
Chen Kaina
Chen Shin-Wei
Chen Guoliang
Chen Yue
Cheng Cho-Chin
Cherubini Alessandro
Chng Elaine
Choi Won-Mook
Choi Yun-Jung
Chotkoe Shivi
CHUNG Sungwon
Cimermanic Peter
Civiltarese Antonio
Collins Amy
Comoz Bertrille
Conway Brian
Cooreman Michael
Corpechot Christophe
Cortese Mario
Costello Agnes
Costentin Charlotte
Cracius Rares
Cristoferi Laura
Cui Ang
Currie Sue
Curtis Megan
Dahari Harel
Dajti Elfin
Dalegaard Magnus Illum
D'Alessio Antonio
Dandri Maura
D'Anna Stefano
De Berdt Pauline
De Brito Nunes Maria
De Graaff Barbara
De la Torre Manuel
De Langlard Mathieu
De Lédinghen Victor
De Sena Elena
De Vincenzi Antonio
Debing Yannick
Deltreierre Pierre
Deng You
Deshpande Kedar
Dhanda Ashwin
Di Giorgio Angelo
Di Pasqua Laura Giuseppina
Diaz Luis Antonio
Diaz Gonzalez Alvaro
Diaz-Mitoma Francisco
Dietz-Fricke Christopher
Dinjar Kujundžić Petra
Dixon Emmanuel Dauda
Dixon Thomas
Dodge Esther
Dold Leona
Domínguez-Hernández Raquel
Dongelmans Edo
Dubourg Julie
Duca Leonardo
Dushaj Elizabeta
Ebrahimi Fahim
Edwards Katherine
Edwards Lindsey A
Elias Kathleen
Elshabrawi Ahmed
Elston Robert
Engel Bastian
Epstein Rachel
Espiritu Christine L.
Etzion Ohad
Fatima Ifrah
Disclosures

Medina Diogo
Meister Thomas
Melgar-Lesmes Pedro
Mellini Stefania
Mellekjær Anders
Mercier Renee-Claude
Messaomere Eric
Meszaros Magdalena
Michel Maurice
Middelburg Tim
Miethe Alexander
Minchenberg Scott
Miraus Laura
Missen Louise
Moga Lucile
Mohamed Osama
Mohamed Almuthana
Mohammed Mansur
Møller Thomas
Morelli Maria Cristina
Morris Heather
Mueller Sebastian
Mullender Claire
MUNTEANU Mona
Nahon Pierre
Nana Melanie
Nanji Zehrah
Ndow Gibril
Ness Erik
NG Irene Oi-Lin
Ngo Vinh Hanh
Nguyen Khac Eric
Niehaus Christian
Nikolopoulos Georgios
Niyomsri Siwaporn
Noehr-Meldgaard Jacob
Norton Luke
Novac Ovidiu
Novakova Barbora
Nyholm liris
O'Farrell Marie
Offenberger Florian
Olahendorf Valerie
Oliazola Paula
Oliazola Irene
Olynyk John
Paganelli Massimiliano
Pagani Alessia
Pajnag Melissa April
Palom Adriana
Palominio Sara
Pammer Lorenz Michael
Pan Qin
Panella Riccardo
Papatheodoridis George
Park Min Kyung
Parker Richard
Passos-Castilho Ana Maria
Patmore Lesley
Patrick Ingiliz
Pauly Jana
Pedersen Kamilla
Peleman Cedric
Pellegrino Shannon
Pelusi Serena
Pencek Richard
Perez Clara
Peter Joy
Petitjean Mathieu
Phillips Bethany
Picchio Camila
Piñero Federico
Pirozzi Claudio
Plonowski Artur
Pollicino Teresa
Poulsen Peter Bo
Poynard Thierry
Præstholm Stine Marie
Prier Lindvig Katrine
Pulaski Hanna
Puoti Massimo
Qian Shuwen
Quaranta Maria Giovanna
Ramier Clémence
Rashu Elias
Rastovic Una
Ratziu Vlad
Ravaoli Federico
Rawles Jacqui
Razavi Homie
Razavi-Shearer Devin
Reiter Florian P
Remy André-Jean
Riess Peter
Riback Lindsey
Ricco Gabriele
Riella Mary
Roca Suarez Armando Andres
Roder Christine
Rodriguez Candelaria Esther
Roessler Stephanie
Rohr-Udilova Nataliya
Romero Gomez Manuel
Romero-Gutiérrez Marta
Ronca Vincenzo
Rønn Madsen Martin
Roqueta-Rivera Manuel
Rosenthal Jolan
Rösle Martin
Roulot Dominique
Rubio Aileen
Ruiz-Cobo Juan Carlos
Ruiz-Fernandez Gloria
Ryder Rachel
Saeidinejad Mahdi
Sakata Toshihiro
Salberg Matti
Salpini Romina
Sánchez-Aldehuelo Rubén
Sandmann Lisa
Sanduzzi Zamparelli Marco
Santol Jonas
Sawhney Sangeeta
Schaub Johanna
Scheiner Bernhard
Schleicher Eva Maria
Schmidt Mark A
Schneider Caitlin
Schregel Ida
Schroder Dominik
Schwab Patrick
Schwarz Michael
Segovia-Miranda Fabián
Seko Yuya
Semmler Georg
Serdjebi Cindy
Serfert Yvonne
Serper Marina
Seto Wai-Kay
Seung Seok Oh
Sevak Jayesh Kumar
Shah Syed Hassan Bin Usman
Shaham-Niv Shira
Shaheen Abdel-Aziz
Shang Ying
Shenvi Swapna
Shim Wan Seob
Shin Hyunjae
Shlomai Amir
Shringarpure Reshma
Siakavellas Spyridon (Spyros)
SIDALL Sabrina
Silvestri Laura
Simbrunner Benedikt
Sims Karen
Singal Ashwani
Singh Jenn
Singh Roshni
Smith Helen
Snijders Romée
Sonneveld Milan
Sopko Bibb Rachel
Sorensen Henrik
Soria López Estela
Sorz Thomas
Spivak Igor
Standen Mary
Stapleton Beth
Stauffer Winston
Steffens Andrea
Steppich Katja
Stern Louise
Stiess Michael
Stirnimann Guido
Stoelinga Anna
Suess Gregory
Sun Natalie
Swearingen Kjersti
Swiatek-de Lange Magdalena
Swift Brandon
Tahata Yuki
Tajudin Muna
Tamaki Nobuharu
Tan Chin King
Tanaka Atsushi
Taub Rebecca
Tchamgoue serge
Teicher Kirk Frederik
Telep Laura
Teilez Luis
Ten Hove Marit
Teng Margaret
Terbah Ryma
Terol Chaffer Isabel
Testoni Barbara
Thakar Shubhankar
Thennati Rajaman nar
Theodoreson Mark
Thing Mira
Thorhauge Katrine
Thornton Michael
Thuy Le Thi Thanh
Tincopa Monica
Tomah Shaheen
We express our deepest appreciation to the following people, who have given us generous and invaluable help as abstract reviewers for the EASL Congress 2023.

Abdelmalek Manal
Adams Leon
Agarwal Kosh
Alazawi William
Alisi Anna
Andersen Jesper
Andersson Emma
Andrade Raul Jesús
Bager Palle
Bansal Ruchi
Barfod O’Connell Malene
Bataller Ramon
Baumert Thomas
Ben-Ari Ziv
Bengsch Bertram
Berg Thomas
Bernal William
Beuers Ulrich
Böttler Tobias
Braconi Chiara
Bureau Christophe
Buti Maria
Cabibbo Giuseppe
Caraceni Paolo
Carbono Marco
Castera Laurent
Cazzagon Nora
Childs Kate
Conti Filomena
Corey Kathleen
Culver Emma
Dalekos George
Dao Thi Viet Loan
Darwish Murad Sarwa
De Knegt Robert
Degasperi Elisabetta
Degertekin Bülent
Dietz Julia
Edeline Julien
Elsharkawy Ahmed
Fabrellas Nuria
Fisicaro Paolo
Flisiak Robert
Folseraas Trine
Frances Rubin
Francque Sven
Fraquelli Mirella
Ganne Carrie Nathalie
Garcia Pagan Juan Carlos
Gilgenkrantz Helene
Gill Upkar
Goossens Nicolas
Gottwein Judith
Gougelet Angelique
Govare Olivier

Graupera Isabel
Gual Philippe
Hagstrom Hannes
Hansen Bettina
Hernandez-Gea Virginia
Huch Meri
Hydes Theresa
Iannacone Matteo
Iavarone Massimo
Idilman Ramazan
Jalan Rajiv
Kondili Loreta
Krag Aleksander
Lemoine Sara
Lleo Ana
Long Michelle
Longhi Maria Serena
Lotersztajn Sophie
Lucifora Julie
Luukkonen Panu
Macias Rocio
Magnusson Maria
Mantovani Alessandro
Mariño Zoe
Marra Fabio
Marschall Hans Ulrich
Mas Valeria
Merle Uta
Moreno Christophe
Morgan Marsha
Moschetta Antonio
Nault, Jean Charles
Negro Francesco
Newsome Philip
Oude Eferink Ronald
Pais Raluca
Palletr Laura
Papatheodoridis George
Papp Maria
Parkar Richard
Petta Salvatore
Pinzani Massimo
Piscaglia Fabio
Pischke Sven
Procopet Bogdan
Pollicino Teresa
Pons Monica
Ponziani Francesca
Pose Elisa
Postic Catherine
Protopopescu Camelia
Ramachandran Prakash
Ratziu Vlad
Rautou Pierre-Emmanuel
Reesink Hendrik W

Reeves Helene
Reiberger Thomas
Reid Leila
Reverter Enric
Rich Nicole
Rinella Mary
Riveiro-Barciela Mar
Rodríguez-Peralvarez Manuel L.
Romeo Stefano
Russo Gomez Manuel
Rowe Ian
Saborowski Anna
Schäfer Denise
Schattenberg Jörn
Schulze-zur Wiesch Julian
Scorletti Eleonora
Scott Charlotte
Semmler Georg
Senzolo Marco
Serfaty Lawrence
Shawcross Debbie L.
Shiri Sverdlov Ronit
Shlomai Amir
Sonneveld Milan
Spee Bart
Steinmann Eike
Strick-Marchand Helene
Szabo Gyongyi
Tacke Frank
Thabut Dominique
Thiele Maja
Thompsen Karen
Towey Jennifer
Trebricka Jonel
Trépo Eric
Tripathi Dhiraj
Trovato Francesca Maria
Tschaetzis Emmanuel
Turco Laura
Vaccia Michele
Valenti Luca
van Bommel Florian
van Mil Saskia
Verma Sumita
Vesterhus Mette
Vinken Mathieu
Vonghia Luisa
Wagner Martin
Webb Glynn
Westbrook Rachel
Williams Felicity
Wong Vincent
Yasuko Iwakiri